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THE INFLUENCE OF PRINCIPALS' LEADERSHIP STYLES ON SCHOOL TEACHERS' JOB SATISFACTION – STUDY OF SECONDARY SCHOOL IN JAFFNA DISTRICT

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Abstract- The study was designed to investigate the effects of principals' leadership styles on teachers' job satisfaction. The design of the study was descriptive survey design. For the data collection, only the primary data collection technique was used by the researcher. Questionnaire was given to selected sample in order to get needed data. In an attempt to focus the study, one reach question was posed and two hypotheses were formulated and tested. According to the purpose of the paper, Stranded questionnaires were used. Answers to these questions were analyzed using Regression analysis and Correlation analysis. Findings of this study states that Autocratic leadership has negative impact on teachers' job satisfaction. In addition with that Democratic leadership has positive impact on job satisfaction.

Index Terms- Democratic leadership, Autocratic leadership and Job satisfaction

Introduction

School administration is an important part of our education system. Administrators face a variety of issues on a daily basis. Every school administrator has a personal educational leadership philosophy. This philosophy covers a multitude of areas which school administrators will deal with on a daily basis.

Any school is only as strong as the leadership and administration that runs it. Being a school administrator or in a school leadership position is a thankless job and one that comes with making difficult decisions. However an effective school leader can change the face of a school and the benefits of seeing student growth.

A leader is recognized as a person who sets direction and influences people to follow that direction. Some early researchers attempted to define effective leadership styles and to relate them with various aspects of organizational outcomes (eg, Lewin et al., 1939). However, recently, researchers have focused on two main facets of leadership viz autocratic leadership style and democratic leadership style. A leader is a person who sees something that needs to be done, knows that they can help make it happens and gets started. A leader sees opportunity and captures it. He/she sees future that can be different and better and help others see that picture too. He/she is a coach, an encourager and is willing to take risks today for something better for tomorrow. A leader is a communicator, co-ordinator and listener.

The democratic control means aiding the dialogue, encouraging employees to contribute towards ideas, and processing all the accessible information to the finest verdict. The democratic leader should be talented enough to converse that decision back to the group to boost up unity in the plan that is chosen. In an autocratic leadership style, the person in charge has total authority and control over decision making.

School administration is itself often part of larger administration units. The conditions of teachers' working life are influenced by the administration and leadership provided by principals, and it is widely assumed that school leadership directly influences the effectiveness of teachers and the achievement out comes of students

Job satisfaction is how content an individual is with his or her job. Leadership styles have the impact on job satisfaction of employees. This study also analyzed the relationship between the autocratic and democratic leadership style among school teachers.

Review of literature

Leadership provides the basis for co-operation in several ways. Good two-way communication, man-to-man personal leadership, use of participation and creation of opportunity for need satisfaction are meant for increasing the understanding between the leader and his subordinates of their mutual viewpoints. This increased understanding through the reactions of individual personalities promotes favorable feelings and attitudes among them.

It has been revealed that positive leadership behavior of the principal and the decision making process have made an impact in developing teachers' interest on school activities, loyalty and job satisfaction (Hettige, 1996).

To be successful as a leader, principals should identify the different aspects of his role as a leader. “Their first challenge is to reorient headship from management to leadership. Not only do they have to assume the role of leadership, switching from implementation to initiation, focusing on outcomes and taking risks, but they also need to adopt leadership strategies and styles suitable for hierarchical school organization” (New Education Act for General Education in Sri Lanka, 2009). The extent to which a job gives an employee opportunity to interact with other co-workers enhances the sense of community at work (Camman, Fischman, Jenkins & Wesh, 1983), but the organizational climate which will pave way for such interaction is determined by the leadership style (Buckner, 1988).

According to the Kearneya, “Participative decision making approach plays very important role in employees’ job satisfaction. The employees achieve lots of personal benefits from this approach including human resource benefits like housing provided, group insurance, disability income protection, retirement’s benefits, sick leave, social security, and profit sharing.

Smith (1998) asserts that if the task is highly structured and the leader has good relationship with the employees, effectiveness will be high on the part of the employees. His findings further revealed that democratic leaders take great care to involve all members of the management.

Lewin et al (1939) concluded that democratic style of leadership is the most effective, but Smith and Peterson (1988) pointed that the effectiveness of group leaders is dependent on the criterion which was being used to assess leadership.

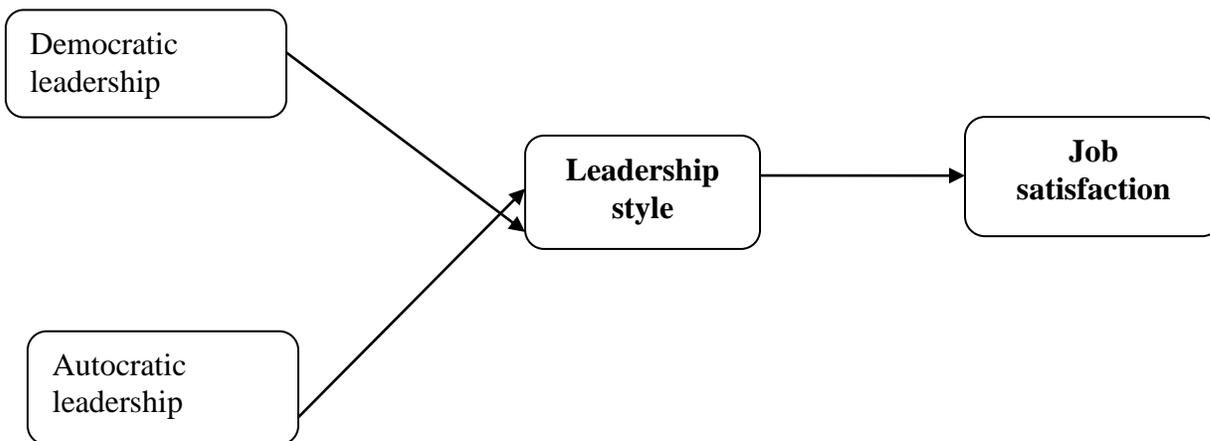
Popoola (1984) defined job satisfaction as the totality of employees’ social and psychological well-being relative to job performance. It culminates in satisfactory interpersonal relations, financial rewards, fringe benefits, training and promotion, decision-making and free channels of communication among others. This predisposes employees to hard work and optimum productivity.

Basically, such achievements in secondary schools are dependent on two identifiable leadership styles namely; autocratic and democratic leadership styles (Lunenberg & Ornstein, 1991). While the autocratic leadership style appears generally self-centered and allows minimum participation of the subordinates in decision making, the democratic style is rather people oriented and counts on the participatory contribution of the subordinates (Mgbodile, 2004). It permits initiatives; originality and creativity in school work operations and promotes hard work among the subordinates.

Patricia (2002) studied transactional and transformational leadership, and how the two relate to job satisfaction. The participants of the study were engineers and technical support staff at an aerospace company. This study used the Multifactor Leadership Questionnaire (MLQ) and Job Describe Index (JDI) to measure transactional and transformational leadership and job satisfaction. The study concluded that transactional leadership was not positively related to job satisfaction but that transformational leadership was.

Based on previous studies we can say that there are no sufficient studies on Principals’ *leadership styles on Secondary school teachers’ job satisfaction* in Sri Lanka. Hence the present study is focused on theories related to principal leadership styles and how teacher perceptions of these styles affect their job satisfaction.

Research model



Based on the theoretical and empirical literature, a theoretical framework was developed. The theoretical framework shows that the relationship among leadership style, and teachers’ job satisfaction. A principal’s leadership style might affect teachers’ job satisfaction. Teachers’ job satisfaction could improve their performance in the classroom. This model shows that leadership styles of their principal influenced their job satisfaction.

Objectives

- This study was carried out to achieve the following objectives.
- To identify the commonly practiced principals’ leadership styles in secondary schools
- To find out the significant relationship between principals’ leadership style and teachers job performance in secondary schools

Research Method

For this research purpose, data has been collected from the selected sample. The collected data would be used to test hypothesis of this research recognize truthiness of the research problem. For the data collection, only the primary data collection technique was used by the researcher. Questionnaire was given to selected sample in order to get needed data. Stranded questionnaires were used.

According to the purpose of the paper, researcher developed structural questionnaire that revised from other’s inventory. It has three parts. Part 1 of the instrument sought information on personal data of the respondent. Part two of the questionnaire is designed to analyze leadership style and behavior. The Multifactor Leadership Questionnaire (MLQ) was used to collect data on the two independent variables of autocratic and democratic leadership style.

Here respondents are asked to mark on the following scale

- 1 - Strongly disagree
- 2- Disagree
- 3- Neutral
- 4- Agree
- 5- Strongly agree

In part three, job satisfaction is analyzed. Job satisfaction questionnaire was developed by west AvenidaGavita and San clemente. 5point scale was used with scores ranging from 1 (very dissatisfied) to 5 (very satisfied). High scores indicated high levels of satisfaction.

Data Analysis Technique

After collecting the valid questionnaires, Statistical Package for the Social Sciences is used to do data analysis. The appropriate tools will be used to test the hypothesis and find reliability. The following statistical analysis will be used to do this research properly. They are Regression analysis, Correlation analysis, & Percentage analysis.

Research question

In this research, the main problem is that principal’s leadership style affects on teachers’ job satisfaction. Researcher clearly states this problem from the following research question.

“Whether there is a relationship between leadership styles of principals’ and teachers’ job satisfaction?”

Hypotheses of the research

If the organization intends to keep out performing in the violently competitive environment, leadership is the most influential factor. The objective of this research is to explore the relationships among principals’ leadership style and teachers’ job satisfaction. Researcher learned from the literatures that the leader’s leadership style has significant influence on the staff’s job satisfaction. Thus, this research develops hypothesis based on the research framework. Any research is carried out through hypotheses. It takes place inevitable part. At the end, it is tested, whether it is acceptable or not. This research is conducted based on the following hypotheses.

H1: Autocratic leadership style has negative influence on job satisfaction.

H2: Democratic leadership style has positive influence on job satisfaction.

Data Analysis

Regression analysis is used to predict the value of the one variable on the basis of other variables. In this study it is used to for leadership style and job satisfaction.

Regression analyzes for satisfaction and autocratic leadership style is given below.

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4067.355	1	4067.355	62.074	.000 ^a
	Residual	6421.395	98	65.524		
	Total	10488.750	99			

a.Predictors(Constant),democratic

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4067.355	1	4067.355	62.074	.000 ^a
	Residual	6421.395	98	65.524		
	Total	10488.750	99			

b. Dependent Variablesatisfaction

The above table is used to find out the overall fitness of Democratic leadership style and job satisfaction. F value indicates whether this model has overall significant or not. Based on the above result F value is 62.074 and its significant is at 0.000 at 0.01 significant levels. So the Democratic leadership style is significant for job satisfaction.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.623 ^a	.388	.382	8.09472

a. Predictors: (Constant), democratic

Regarding to the above model summery, R square value is 0.388. R square states to what extent Democratic leadership style determine satisfaction level. Here there is a weak relationship between democratic leadership style and satisfaction. R square value is also low. It indicates that only about 38.8% is explained by the variation in the score of democratic leadership style. The remaining is unexplained.

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	7.071	5.565		1.271	.207
	demo	1.958	.248	.623	7.879	.000

a. DependentVariable: satisfaction

According to the above table, the relationship between the two variable are Democratic leadership style as an independent variable and job satisfaction as a dependent variable and their coefficient is 1.958. The value of t-statistic of the above output is t= 7.879 with a significance of 0.000. Since the significance is less than 0.01, it can be said that at 1% significance level. Positive linear relationship exists between Democratic leadership and satisfaction.

Regression equation for satisfaction and Democratic leadership style is

$$Y = 7.071 + 1.96 * \text{Democratic leadership style}$$

Regression analyzes for satisfaction and autocratic leadership style is given below.

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2369.961	1	2369.961	28.607	.000 ^a
	Residual	8118.789	98	82.845		
	Total	10488.750	99			

a.Predictors:(Constant),autocratic dependent Variable satisfaction

The above table is used to find out the overall fitness of Autocratic leadership style and job satisfaction. F value indicates whether this model has overall significant or not. Based on the above result F value is 28.60 and its significant is at 0.000 at 0.01 significant levels. So the Autocratic leadership style is significant for job satisfaction.

Model Summary

Model	R	R Square	Adjusted Square	R	Std. Error of the Estimate
1	.475 ^a	.226	.218		9.10191

a. Predictors: (Constant), autocratic

Regarding to the above model summary, R square value is 0.475. R square states to what extent Autocratic leadership style determine satisfaction level. Here there is a weak relationship between democratic leadership style and satisfaction. R square value is also low. It indicates that only about 21.8% is explained by the variation in the score of Autocratic leadership style. The remaining is unexplained.

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	72.940	4.302		16.954	.000
	autocratic	-1.185	.222	-.475	5.349	.000

A. Dependent Variable: satisfac

According to the above table, the relationship between the two variable are Autocratic leadership style as an independent variable and job satisfaction as a dependent variable and their coefficient is 72.94. The value of t-statistic of the above output is t= 5.349 with a significance of 0.000. Since the significance is less than 0.01, it can be said that at 1% significance level. Negative linear relationship exists between Democratic leadership and satisfaction.

Regression equation for satisfaction and Democratic leadership style is

$$Y = 72.940 + -1.185 * \text{Autocratic leadership style}$$

Correlations

		demo	au	satis
demo	Pearson Correlation	1	-.363**	.623**
	Sig. (2-tailed)		.000	.000
	N	100	100	100
au	Pearson Correlation	-.363**	1	-.475**
	Sig. (2-tailed)	.000		.000
	N	100	100	100
satis	Pearson Correlation	.623**	-.475**	1
	Sig. (2-tailed)	.000	.000	
	N	100	100	100

** . Correlation is significant at the 0.01 level (2-tailed).

Findings and Conclusion

The main purpose of our study is to examine the impact of leadership style on employee job satisfaction. In this study researcher examine the two leadership style (Democratic leadership style and Autocratic leadership style). This conclusion is based on the selected sample. That means this, study aimed at finding the influences of leadership styles on job satisfaction at secondary schools in Jaffna educational zone. This research studied the relationship between leadership style of principals at schools and teachers' job satisfaction. Leadership style is one of the main factors determining job satisfaction.

Findings of this study states that Democratic leadership has positive impact on teachers' job satisfaction. In addition with that Autocratic leadership has negative impact on job satisfaction. This study empirically proves that Democratic leadership style will

increase teachers' job satisfaction. So the principals should practice democratic leadership style in order to increase teachers' job satisfaction then only, they give their full effort in their service.

This research only covered the secondary schools in Jaffna educational zone. But this is a small position of Jaffna district. So when doing research in future, attention should be made to cover large position. Hence findings of this research can be applied to all.

References:

- ✓ Buckner, J. C. (1988). The development of an instrument to measure neighborhood cohesion. *American Journal of Community Psychology*, 16(6), 771-791. <http://dx.doi.org/10.1007/BF00930892>
- ✓ Camman, Fischman, Jenkins, & Wesh (1983) Assessing the attitude and perception of organization members. In S.Seashore (Ed.), *Assessing organizational changes*. New York: John Wiley, 71-73
- ✓ Kearney,R.,Hays,S.(1994),*Labor Management Relations and Participative Decision Making*, *Public Administration Review*,54,pp.44-51.
- ✓ Kreitner, R. (1983). *Management* (2nd ed.). Boston: Houghton Mifflin
- ✓ Lewin, K., Lippit, R. and White, R.K. (1939), "Patterns of aggressive behavior in experimentally created social cultures", *Journal of Social Psychology*, Vol. 10, pp. 271-99
- ✓ Lunenberg, F.C. & Ornstein, A.C. (1991). *Educational Administration Concepts and Practices*.Belmont, C.A.: Wadworth.
- ✓ Mgbodile, T.O. (Ed.) 2004. *Fundamentals in Educational Administration and Planning*. Enugu:Magnet Business Enterprises.
- ✓ Mosadegh Rad, A. M., & Yarmohammadian, M. H. 2006. A study of relationship between managers' leadership style and employees' job ssatisfaction. *Leadership in Health Services*, Vol. 19, No. 2, pp. xi-xxviii.
- ✓ Nicholson II & patriaa W. D. 2007. Leading where it counts: An investigation of the leadership styles and behaviours that define college and university presidents as successful fundraisers. *International Journal of educational advancement*, Vol. 7, No. 4, pp. 256-270
- ✓ Popoola, D. (1984). Job Satisfaction and Employee Motivation in Institutions of Higher Education: The University of Lagos Experience. *Education and Development* 4(1), 417-425
- ✓ Smith, P. B., & Peterson, M. F. (1998). *Leadership, organizations and culture: An event management model*. London: SAGE Publications

USING ONTOLOGIES FOR KNOWLEDGE MANAGEMENT: ASSESSING TECHNOLOGY APPLICATIONS WITHIN AN ORGANISATION

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Abstract- This research work deals with the use of ontologies for knowledge management and the application of technology within an organization. Knowledge management has immense value to the organisation's activities. It is well known that knowledge has an immense value in all kinds of businesses and people's everyday life. The work presented in this dissertation aims to make a stronger connection between knowledge management and organizations. The approach taken is to use ontology based knowledge management. The study tries to propose technologies that support knowledge management activities within an organisation. In order to achieve this objective, the use of ontologies for knowledge management plays very important role in different ways.

Index Terms- Knowledge Management, Ontology, Technology.

I. INTRODUCTION

Organisations in the last few years have been looking at knowledge as a resource. They are giving such an important status to the knowledge resource that a special type of information systems are also being developed as knowledge management systems (Alavi and Leidner, 2001). Organisations need to acquire new knowledge and approach of managing that which will transform their operations in a continuous fashion for survival. (Van Eijnatten, 2004; Stacey, 2003). The goal of knowledge management is a practical one: to improve organisation capabilities through better use of the organisation's individual and collective knowledge resources. These resources include skills, capabilities, experience, routines, and norms, as well as technologies (Probst, 1998).

“Knowledge management (KM) is the set of activities and/or processes that seeks to change the organisation's present pattern of knowledge processing to enhance both it and its knowledge outcomes” (Firestone, 2008, p.17). This implies that knowledge management doesn't directly manage knowledge outcomes, but only impacts processes, which in turn impact outcomes.

The most common approaches to KM seem to be technology-oriented; they emphasize the explicit nature of knowledge, and tend to interpret it as an object that can be stored in repositories, manipulated, and transferred via information and communication technologies. These approaches are also described as the content perspective on KM (Hayes and Walsham, 2003).

Nonaka et al. (2001) suggest that socialization, externalization, combination and internalization can be used to create organisational knowledge by means of interacting between explicit and tacit knowledge. Literature has shown that a number of knowledge management approaches have been developed with the purpose of managing organisational knowledge, for example, the re-distributed knowledge management framework is developed to manage organisational help desk knowledge (Leung, 2011). Other examples

include the integrative framework that established an effective knowledge transfer process within an organisation (Goh, 2002), the distributed knowledge management framework that allows individual knowledge workers and distributed communities to manage organisational knowledge with the support of ontology (Pirro et al. 2010) and the distribution, interaction, competition and evolution (DICE) model that examines organisational knowledge from an ecological perspective (Chen et al. 2008). In order to manage knowledge, ontology plays an important role in enabling the processing and sharing of knowledge between experts and knowledge users. Besides it also provides a shared and common understanding of a domain that can be communicated across people and application systems.

Knowledge management is concerned with the representation, organisation, acquisition, creation, usage and evolution of knowledge in its many forms. To build effective technologies for knowledge management, there is the need to understand how individuals, groups and organisations use knowledge. Given that more and more knowledge is becoming encoded in computer-readable forms, there is the need to build tools which can effectively search through databases, files, websites and the like, to extract information, capture its meaning, organize it and make it available (Jurisica *et al.*, 1999).

Broadly, knowledge management is a purposeful and systematic management of knowledge and the associated processes and tools with the aim of realising fully the potential of knowledge in making effective decisions, solving problems, facilitating innovations and creativity and achieving competitive advantage at all levels (personal, group, organisation, country and so on (Kebede, 2010).

On this basis, it can be said that knowledge management is the coming together of organisational processes, information processing technologies, organisational strategies and culture for the enhanced management and leverage of human knowledge and learning to the benefit of the company (see figure 1).

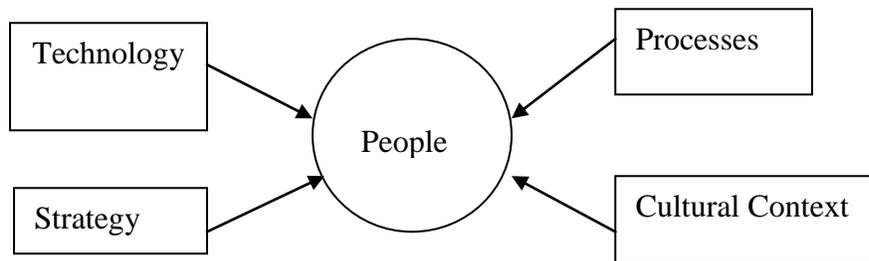


Fig 1. Key elements in Knowledge management (Source: Ahmed et al., 2002)

A fundamental to knowledge management is the codification of knowledge into two basic forms: explicit knowledge (i.e easily codified and shared) and tacit knowledge (e.g experiential, intuitive and communicated most effectively in face-to-face encounters). There is however, a middle ground. With dedicated and focused efforts, some knowledge believed to be tacit can be transformed into explicit knowledge. This body of knowledge is the organisation's implicit knowledge (Frappaolo, 2008).

II. TECHNOLOGIES SUPPORTING KNOWLEDGE PROCESSES

The most frequent way to present KM technologies is to associate them with knowledge processes, e.g. creation, storage and retrieval, transfer, and application; or socialization, externalization, combination, and internalization. Studies using this approach usually adopt a particular perspective of KM, identify a set of core processes, and list technologies that can be used to support them (Nonaka et al., 2001; Marwick, 2001; Alavi and Tiwana, 2003; Becerra-Fernandez et al., 2004; Jashapara, 2004). Their objective is either to

demonstrate that technology can actually support KM, or to illustrate how a particular KM model can be implemented with the aid of technology.

Technology can support and enable knowledge management in two ways:

1. It can provide the means for people to organise, store and access explicit knowledge and information, such as in electronic libraries or best practice databases.
2. It can help to connect people with people so that they can share tacit knowledge, such as through white pages, groupware or video conferencing.

Prakasan et al (2007) in Holsapple and Wu (2008) conclude that knowledge management has experienced sudden growth and produced a substantial literature. They point out that there are varying definitions and conceptions of knowledge management but that whatever view is adopted should recognise that knowledge management is of strategic importance to an organisation's success. One such view is provided by the collaboratively engineered knowledge management ontology, which defines knowledge management as "an entity's systematic and deliberate efforts to expand, cultivate, and apply available knowledge in ways that add value to the entity, in the sense of positive results in accomplishing its objectives or fulfilling its purpose" (Holsapple and Joshi, 2004). The ontology scopes out knowledge management very broadly as any process of generating new knowledge, acquiring valuable knowledge from outside sources, selecting needed knowledge from internal sources, assimilating knowledge to alter the state of internal knowledge resources, embedding knowledge into organisational outputs, and/or leading, coordinating, controlling and measuring these five kinds of activities.

III. ONTOLOGIES IN KNOWLEDGE MANAGEMENT

Jurisica, *et al.* (1999) defines ontology as "a branch of Philosophy concerned with the study of what exists". Ontologies provide a common understanding of a domain that can be communicated across people and application systems, and thus facilitate knowledge sharing and reuse (Fensel, 2000; Borst *et al.* 1997).

Steels (1993) in Gomez-Perez et al. (2004) states that, the objectives of knowledge management in an organisation are to promote knowledge growth, knowledge communication and knowledge preservation in the organisation. To achieve these objectives, corporate memories, persistent representation of knowledge and information are needed in an organisation. Knowledge management encourages organisations to create and use knowledge continuously to gain competitive advantage. Simultaneously, it also aims to improve the quality, content, value and transferability of individual and group knowledge within an organisation (Mentzas, *et al.*, 2001). The adoption of advanced technology is important to enable organisation to access useful knowledge from anywhere in the network. However, some of the knowledge management approaches range from industrial specific, theoretical, to procedure-wise, for example, the re-distributed knowledge management framework is developed to manage organisational help desk knowledge (Leung & Lau, 2006). Another example is the integrative framework that establishes an effective knowledge transfer process within an organisation (Goh, 2002). These designs are incapable of cooperating in the current distributed knowledge environment, particularly areas that deal with organisational knowledge. Generally, the approaches are customised to suit individual organisational knowledge management strategies and business requirements without consideration of system interoperability.

To improve inter-organisational knowledge management practice, the use of ontology is becoming increasingly important in the area of knowledge management research. The concept of ontology can also be applied to solve the interoperation problem in the distributed

knowledge management system environment. Ontology is defined as an explicit specification of a conceptualization, while a conceptualization is an abstract, simplified view of the world that we wish to represent for some purpose (Gruber, 1993).

In this approach, explicit knowledge of the knowledge management system is annotated in a form that is machine-processable metadata based on the domain or topic specific ontology (Davies et al., 2005; Mentzas et al., 2001). Using the ontology, one knowledge management system can communicate with others in spite of the underlying system, syntax and structure heterogeneities, thus allowing the involved systems to understand incoming requests and return the required knowledge as they are using the same set of vocabularies. Besides, the exploitation of ontological metadata enables ontology-based searching to take place for the retrieval of a more precise collection of knowledge.

IV. RESEARCH METHODOLOGY

This paper uses three case studies as overall research strategy to explore knowledge management practices within an organisation. The reasons for using case studies as research strategy are that each case discussed their issues and viewpoints on knowledge management practices within an organisation. Moreover, case studies allow for exploration and practical solutions for complex issues as well as developing new knowledge and skills for research. Therefore this research use journals and other sources from various authors in knowledge management.

V. DISCUSSION OF FINDINGS

The findings from the case studies used for this research.

Case Study 1: A case study of knowledge management implementation for Taiwanese Information Consulting Company. The case study states the kind of knowledge intensive enterprise, which solve customers' problem based on customization. The case discusses the importance of knowledge management to information consulting companies.

To the specialised consultants, they use management application software that is the accumulation of the knowledge as powerful tool to accomplish their consulting job. The key point of management consulting is to provide the customer with value –added element. The content of service includes collection of information, conversion of information. The objective of consulting service is to provide customer with his experience, knowledge and solutions to customer's problems.

The key point for consultants implementing knowledge management is knowledge and experience. The study discovered that professional knowledge is not only obtained from outside but also from the interaction of organisation's members. Information consulting company belongs to knowledge-intense enterprise, and need to master knowledge and wisdom to increase enterprises competitiveness.

The case proposed the goal of knowledge management enterprise. The expected benefits are:

1. Increase in the value and amount of an organisation's overall knowledge.
2. Elevating the service skill of consulting and advising, customer satisfaction and transferring of knowledge.
3. Enhancing the interior exchange within an organisation and the efficiency of obtaining the knowledge.
4. Increasing the knowledge learning ability for groups and individuals.

The case proposed a modified formula as $KM = (P + L + H)S$, where;

KM = Knowledge Management

P = People

L = Learning

H = Handling

S = Sharing

+ = Connection

This formula represents the knowledge management that can readily be implemented by connecting internet, learning previous processed information and unlimited sharing.

Case Study 2: A case study of Brazilian Energy Utility Company

Case study 2 is on the utilization of ontologies in a knowledge management project conducted by one of the largest Brazilian electric utilities active both in the production and in the distribution of energy. The case demonstrates that ontologies are, in many ways, a useful tool in knowledge management applications and shows that their use is not limited to the development of automated systems. The authors advocate that ontologies can be successfully used in knowledge management initiatives provided they are evaluated as to their content.

The authors in the case study states that within the information systems realm, ontologies are generally used as system models but their usage has not been restricted to software development. They advocate that once assessed as to its content, ontology may provide benefits to corporate communication and therefore, provide support to knowledge management initiatives.

Ontologies made a contribution to knowledge management in many ways.

1. In the preservation of specialised knowledge
2. In IS development for knowledge management support and interoperability
3. In reaching a consensus by means of content evaluation

Ontology is an instrument capable of making a common language operational. This promotes improvements in communication in the organisation.

Case study 3: A case study of Indonesia University of Education

Indonesia University of Education is a public university implementing knowledge management systems to increase competitive advantage and improve the performance of the university/higher education. There are two categories of knowledge namely the academic knowledge and organisational knowledge. The academic knowledge is the main aim for higher education, while the organisational knowledge includes knowledge which refers to the whole business process of the institution of education in terms of lack or excellence.

Academic knowledge framework is suggested to go through four main processes to form a culture of knowledge and collaboration.

1. Making knowledge visible
2. Increasing knowledge intensity
3. Building knowledge infrastructure
4. Developing knowledge culture

VI. CONCLUSION

The most important role of ontology in knowledge management is to enable and enhance knowledge sharing and reusing. Moreover, it provides a common mode of communication. Technologies are now being called upon to support knowledge management and not just to process data or information. Many advances contribute to taking information systems beyond mere data into the realm of

knowledge. However, the key to providing useful support for knowledge management is founded on how meaning is embedded in information models as defined in terms of ontologies.

This research has presented the findings of three case studies conducted to investigate the implementation of Knowledge Management within an organisation. In order to build a true knowledge-based enterprise, assimilating and integrating Knowledge Management practices into the daily work routines of organisations is important. The case studies provide useful insights and directions for which KM can be implemented in reality.

REFERENCES

- [1] Ahmed, P.K., Lim, K.K. and Loh, A.Y.E. (2002) *Learning through knowledge management*. Oxford: Butterworth-Heinemann.
- [2] Alavi, M. & Leidner, D.E. (2001) Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *MIS Quarterly*, **25**(1), pp. 107-136 [online]. [Accessed 26 May 2012]. Available at: <http://mgmt.iisc.ernet.in/~piyer/Knowledge_Management/KM%20and%20KMS%20Conceptual%20Foundations%20and%20Research%20Issues%20MIS%20Quarterly%2025%201%20March%20201.pdf>.
- [3] Alavi, M. and Tiwana, A. (2003), "Knowledge management: the information technology dimension", in Easterby-Smith, M. and Lyles, M.A. (Eds), *The Blackwell Handbook of Organizational Learning and Knowledge Management*, Blackwell Publishing, Malden, MA, pp. 104-21.
- [4] Becerra-Fernandez, I., Gonzalez, A. and Sabherwal, R. (2004), *Knowledge Management: Challenges, Solutions and Technologies*, Pearson Education, Upper Saddle River, NJ.
- [5] Borst, P., Akkermans, H. and Top, J. (1997) Engineering ontologies. *International Journal of Human - Computer Studies*, **46**(2), pp. 365-406.
- [6] Chen, D., Liang, T. and Lin, B. (2008) An Ecological Model for Organizational Knowledge Management, *Journal of Computer Information Systems*, **50**(3), pp. 11-22 [online]. [Accessed 26 May 2012]. Available at: <<http://lostlagoon.info/IMFILES/8PCS%20AN%20ECOLOGICAL%20MODEL%20FOR%20ORGANIZATIONAL%20KNOWLEDGE%20MANAGEMENT.pdf>>.
- [7] Davies, J., Duke, A., Kings, N., Mladenec, D., Bontcheva, K., Grcar, M., Benjamins, R., Contreras, J., Civico, M.B. and Glover, T. (2005) Next generation knowledge access. *Journal of Knowledge Management*, **9**(5), pp. 64-84 [online]. [Accessed 22 August 2012]. Available at: <<http://lpis.csd.auth.gr/mtpx/km/material/JKM-9-5e.pdf>>.
- [8] Firestone, J.M. (2008) On doing knowledge management, *Knowledge Management Research & Practice*, **6**, pp.13-22.
- [9] Frappaolo, C. (2008) Implicit knowledge, *Knowledge Management Research and Practice*, **6**, pp. 23-25.
- [10] Goh, S. C. (2002) Managing effective knowledge transfer: an integrative framework and some practice implications. *Journal of Knowledge Management*, **6**(1), pp. 23-30 [online]. [Accessed 26 May 2012]. Available at: <<http://www.emeraldinsight.com/journals.htm?issn=1367-3270&volume=6&issue=1&articleid=883755&show=html>>.
- [11] Gómez-Pérez, A., Fernández-López, M. and Corcho, O. (2004) *Ontological engineering: with examples from the areas of knowledge management, e-commerce and the semantic Web*. London: Springer.
- [12] Gruber, T.R. (1993) Toward principles for the design of ontologies used for knowledge sharing. *International Journal of Human-Computer Studies*, **43**, pp. 907-928 [online]. [Accessed 20 August 2012]. Available at: <<http://tomgruber.org/writing/onto-design.pdf>>.
- [13] Hayes, N. and Walsham, G. (2003), "Knowledge sharing and ICTs: a relational perspective", in Easterby-Smith, M. and Lyles, M.A. (Eds), *The Blackwell Handbook of Organizational Learning and Knowledge Management*, Blackwell Publishing, Malden, MA, pp. 54-77.
- [14] Holsapple, C.W. and Joshi, K.D. (2004) A formal Knowledge management ontology: conduct, activities, resources, and influences, *Journal of the American Society for Information Science and Technology*, **55**(7), pp.593-612.
- [15] Holsapple, C.W. and Wu, J. (2008) In search of a missing link, *Knowledge Management Research & Practice*, **6**, pp.31-40.
- [16] Jashapara, A. (2004), *Knowledge Management: An Integrated Approach*, Pearson Education, Harlow.
- [17] Jurisica, I., Mylopoulos, J. And Yu, E. (1999) Using ontologies for knowledge management: An Information Systems Perspective, Annual Conference of the American Society for Information Science, Washington, D.C. November 1 – 4 [online]. [Accessed 24 August 2012]. Available at: <<http://www.cs.toronto.edu/pub/eric/asis99.pdf>>.
- [18] Kebede, G. (2010) Knowledge management: An Information Science Perspective, *International Journal of Information Management*, **30**, pp. 416-424.
- [19] Marwick, A.D. (2001), "Knowledge management technology", *IBM Systems Journal*, Vol. 40 No. 4, pp. 814-30.
- [20] Mentzas, G., Aposolou, D., Young, R. And Abecker, A. (2001) Knowledge networking: A holistic solution for leveraging corporate knowledge. *Journal of Knowledge Management*, **5**(1), pp. 94-106 [online]. [Accessed 23 August 2012]. Available at: <<http://search.proquest.com.ezproxy.wlv.ac.uk/docview/230328411>>.
- [21] Nonaka, I., Reinmoller, P. and Toyama, R. (2001), "Integrated information technology systems for knowledge creation", in Dierkes, M., Berthoin Antal, A., Child, J. and Nonaka, I. (Eds), *Handbook of Organizational Learning and Knowledge*, Oxford University Press, Oxford, pp. 827-48.
- [22] Pirró, G., Mastroianni, C. and Talia, D. (2010) A framework for distributed knowledge management: Design and implementation. *Future Gener. Comput. Syst.* **26**(1), pp. 38-49 [online]. [Accessed 26 May 2012]. Available at: <<http://dx.doi.org/10.1016/j.future.2009.06.004>>.
- [23] Probst, G.J.B. (1998) Practical Knowledge Management: A Model that works. *Prism*, Second Quarter [online]. [Accessed 26 May 2012]. Available at: <<http://genevaknowledgeforum.sh>>.
- [24] van Eijnatten, F.M. and Putnik, G.D. (2004) Chaos, complexity, learning, and the learning organization, *The Learning Organization*, **11**(6), pp. 418-429.

Culturing Cellulolytic Fungi in Sea Water

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Abstract- This study aim to find the colonizing ability of cellulose degrading fungi which were derived from terrestrial sources, in sea water with salinity of 34‰, which can be used in degradation of marine algal debris in order to use as fertilizer.

Algal debris is rich in minerals but due to its salt content it takes relatively longer time to degrade by microbes. Here the fungus *Cladosporium* sp. depicted the highest activity of 64.01 FPU/ml, which was 20.74 FPU/ml in CBM medium on the same substrate; this shows their preference as well as tolerance to marine environment. While *Helminthosporium* sp. showed the activity of 60.65 FPU/ml which is also relatively higher than that of CBM medium, activity of fungal crude enzymes was evaluated in different temperature and varying pH medium, the optimum temperature for all given strains was 50°C while pH vary.

Index Terms- Biodegradation, cellulose, Fpase, fungi, enzyme, sea water, halophilic, salinity.

I. INTRODUCTION

Fungi are highly insubordinate microorganisms as they can prevail in many vast range of environments. As in insects presence of chitin in their cell wall gives more rigidity for their cell surface. In addition fungal enzymes also can tolerate considerably broader temperature variations, as decomposers their enzymes are extracellular and have the ability to function any relevant substrate. Moreover many terrestrial fungal species have shown the ability to retain the same efficiency of degrading in marine environments; many of the species of the genera are facultative halophiles such as *Aspergillus* sp. and *Cladosporium* sp. and *Trichoderma* sp. [1, 3]. Even in hyper saline environment like Great Salt Lake and Dead Sea many of the genera of terrestrial origin exists. In a study among 100 samples of water from dead sea 68 were positive [2]. It is also reported *Cladosporium* sp. was found on sub merged pine at Great salt lake at high salt concentration of 290-360‰ (parts per thousand) which is ten times higher than the salinity of sea water used here and *Cladosporium cladosporioides* was found in dead sea ecosystem where salinity is 300‰ [4]. Main purpose of the work is to culture the cellulose degrading fungi from terrestrial sources in sea water and examine their enzyme activity which can be used in production of compost using the algal debris from the sea, since algae is rich in minerals, but their degradation is relatively slow due to its high salt content.

II. Research Elaborations

2.1 Source of fungi and initial culturing

Samples were collected from sawdust, straw dust and sprinkled soil (garden, beach, Mud). Decaying wood particles and decaying leaf collected from the surroundings. Samples were

collected into sterile containers and stored separately. Potato dextrose agar medium was used to grow the initial cultures, where samples were cultured by streak plate method and sprinkle method (Figure 1).

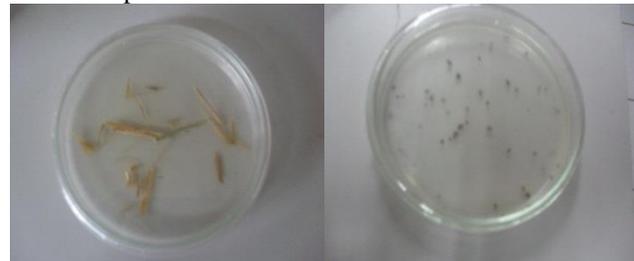
2.2 Methods of inoculation

2.2.1 Streak plate method

In order to isolate the fungi this method is best in practice. Initial streak is made with the sample then all other streaks are continuum of the previous strike using separate sterile tooth peck for each strike.

2.2.2 Sprinkled method

This is more suitable for the soil samples and sawdust. Particles were sprinkled on the medium. Well-spaced sprinkled particles would result in separation of colonies. Finally, petri-dishes were sealed with Para film, labeled and inverted dishes were incubated in a dark place. Visible colonies were observed after 4-7days.



Straw sprinkled

Sawdust sprinkled

Figure 1: Inoculation of samples for the first time on PDA medium by sprinkle method

2.3 Media used for sub culturing

2.3.1 Selective water agar medium

To separate the fungi causing cellulose digestion, a medium consisting cellulose as a sole carbon source was prepared. For cellulose whatman no. 1 filter paper made of 100% cellulose was used. Water agar medium was prepared by dissolving 4g of agar in 250ml of distilled water. Autoclaved pieces of filter paper (1cm×1cm) were used for inoculation.

After pouring the water agar medium on petri dishes, paper strips were carefully placed on top of the agar bed by a sterile forceps. After the inoculation, sealed dishes kept for 4-7 days of incubation. To avoid bacterial growth, antibiotic was added to the medium. This made the medium more selective to fungi.

Table 1: Antibiotics and their concentrations that used in the culture

Antibiotic	Ampicillin	Tetracycline
In a ml of stock solution	50mg/ml	100mg/ml

Final concentration in a ml of water Agar medium	50µg/ml	100µg/ml
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Table 1 depicts the amount of antibiotics that were added for the preparation of selective water agar medium. Sub culturing continued until the pure culture was available.

2.4 Culturing fungi in liquid cellulose basal medium on filter paper substrate and preparation of crude enzymes.

In order to extract the secreted cellulolytic enzymes by each fungal colony, it is important to culture them in a liquid medium. Cellulolytic basal medium (CBM) was chosen for this purpose. Cellulolytic basal medium (g /250ml in distilled water) was prepared [7].

Diammonium tartrate (C ₄ H ₁₂ N ₂ O ₆)	1.5
Potassium dihydrogen phosphate (KH ₂ PO ₄)	0.25
Yeast extract	0.02
MgSO ₄ • 7H ₂ O	0.15
CaCl ₂ •2H ₂ O	0.0002

CBM medium was autoclaved and 10ml aliquots were transferred to sterile 20ml bottles.

Cotton wool strips of same amount were submerged into the CBM medium aseptically inside the laminar airflow. Samples which were previously obtained from pure culture were inoculated by streaking on the submerged cotton strip aseptically by sterile tooth peck. Always a control bottle was kept without inoculation. Caps of the bottles were loosely fitted to allow the adequate air exchange. All the bottles were incubated for 4 days at room temperature (25°C). After the incubation, observations were made, and the liquid medium, which contains the crude fungal enzymes, was collected.

Each bottle contains the cellulolytic enzymes that were secreted as extra cellular enzyme by each fungus colony. At the time of isolation, which is after a period of incubation it is better to vortex in slow speed in order to ensure the distribution of enzymes all over the liquid medium. About 1ml of aliquot was taken by sterile micro pipet and placed into the 1.5ml sterile centrifuge tubes. Centrifugation was done at 12,000 r.p.m for 15 minutes. The resulted supernatant consists of proteins that are mostly the fungal crude enzymes. Centrifugation is important for the separation of fungal spores since spores could not be allowed in the later filter paper assay.

2.5 Filter paper Assay

International Union of Pure and Applied Chemists recommended filter paper assay (FPA) as the standard measure of cellulase activity. Enzymatic reactions often occur in the presence of buffer, which helps to keep the reaction environment stable. This is obtained by maintaining the ionic balance and the pH unchanged. 2ml 0.05M of Trisodium citrate dihydrate (C₆H₅Na₃O₇•2H₂O) buffer was used with the crude enzymes and filter paper strips (0.5cm×0.1cm) were used as substrate.

0.1ml of crude enzyme of each fungus was added with 0.15 ml of Trisodium citrate dihydrate solution, while the pH was maintained at 4.8. Always a blank was maintained in one tube without adding any fungal enzymes. Instead, it was replaced by same volume of sterilized distilled water. Then the Whatman no. 1 filter paper strip (0.5cm×0.1cm) was added as the substrate. Each tube was then incubated in 50°C shaking incubator running at 100 r.p.m [5].

2.6 Measuring the activity of cellulolytic enzymes from liquid cellulose basal medium

The activity of extracted fungal enzymes can be quantitatively measured. Here the concentrations of reducing sugars (products of enzyme activity) were measured using DNS reagent test since the optical absorbance can be more accurately measured numerically using spectrophotometer at 540nm.

2.6.1 Dinitrosalicylic acid method.

Dinitrosalicylic acid reagent was prepared by adding 1g 3, 5-dinitrosalicylic acid in 50ml of distilled water. 200mg crystalline phenol (optional) and 30g of Sodium potassium tartrate were added to the solution, which turns the solution into yellow colour. To this, 20ml of 2N NaOH was added. This turns the colour of the solution into transparent orange yellow. Finally, the stock was made into 200ml by adding distilled water. Stock was stored at 4°C in refrigerator, to prevent deterioration [9].

After the incubation, filter paper strips were carefully removed from the tubes using a glass rod. Then 0.5ml of DNS reagent was pipetted into each tube. This terminated all enzymatic reactions occurred in the tube. Then the lids of tubes were tightly closed, and placed in a water bath at 95-100°C for 10 minutes. After this, tubes were immediately transferred into an ice cold bath and kept for few minutes. 1ml of distilled water was pipetted into each tube before measuring the optical absorbance.

Colour change in each tube was measured by using UV spectrophotometer at 540nm wavelength. Finally, the optical absorbance readings were compared and plotted with the standard glucose curve to find the glucose (product) concentrations [9].

From each glucose and buffer mixture, 0.1ml of solution was added to 0.15ml of Trisodium citrate dihydrate buffer solution. Then each centrifuge tube was transferred into a water bath where tubes were incubated at 50°C temperature for an hour, same as the conditions given for the enzyme filter paper assay. After the incubation, 0.5ml of DNS reagent was pipetted into each tube and the lids of all tubes were tightly closed. Then the temperature in the water bath was raised to 95-100°C and kept for 10 minutes. Finally, the tubes were immediately transferred into an ice cold bath for few minutes and 1ml of distilled water was pipetted to each tube before measuring the absorbance of optical absorbance, and the samples were examined for the colour change.

Colour change in each tube including the control blank was measured by using UV spectrophotometer at 540nm wavelength. Finally, the optical absorbance readings were plotted against the concentration of glucose.

Table 2: Glucose concentration vs. Optical absorption at 540nm.

Glucose concentration	Optical absorption
3.35mg/0.5ml	0.766
2.50mg/0.5ml	0.580
1.65mg/0.5ml	0.378
1.00mg/0.5ml	0.228

As given in the table 2 optical absorbance differ according to the concentration of glucose, this is ranging from 1.00mg/0.5ml to 3.35mg/0.5ml resulted in optical absorbance ranging from 0.228 to 0.766 respectively.

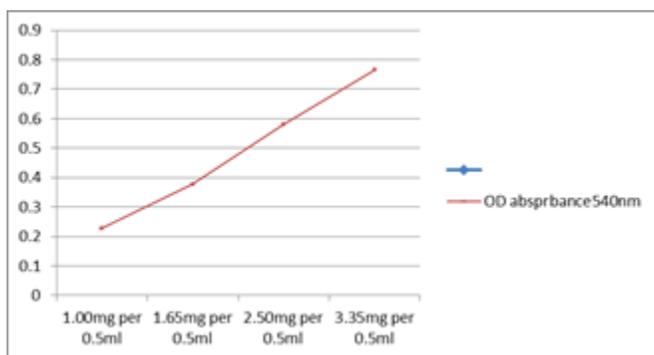


Figure 2: Glucose concentrations vs. Optical absorbance (540nm): - standard glucose plot.

This standard curve (Figure 2) was used to find the unknown concentrations of reducing sugars in all samples, dilutions used were translated into enzyme concentrations. Concentration of enzyme which would have released exactly 2.0 mg/ 0.5ml of glucose by means of a plot of glucose liberated against the logarithm of enzyme concentration was estimated.

Filter paper unit was calculated according to IUPAC-FPU. As given below:

$$FPU = \frac{0.37}{\text{Enzyme concentration to release 2mg glucose}} \text{ units} \cdot \text{ml}^{-1}$$

This quantitatively shows the activity of cellulolytic enzymes as given in Adney and Baker, 1996.

Percentage of saccharification of cotton wool by each enzyme is calculated by using given formula.

$$\text{Saccharification(\%)} = \left\{ \frac{\text{Glucose (mg/0.5 ml)}}{\text{Substrate (mg/0.5 ml)}} \right\} \times 100$$

Since Whatman no.1 filter paper consist of 98% cellulose, substrate concentration in 0.5ml can be derived as 49mg (cellulose). By applying the product (glucose) concentration retrieved from the standard glucose curve the percentage of saccharification was calculated.

2.7 Culturing fungi in sea water medium

Fungi samples were cultured in sea water medium using Whatman no. 1 filter paper strips (1cm ×2cm) as substrate to check its ability to grow in marine environment that is highly saline. Here the CBM medium was replaced by seawater which is autoclaved and aseptically transferred into 20ml sterile bottles.

Then autoclaved filter paper strips were carefully submerged inside the medium of sea water and inoculations were made by using sterile toothpicks. Lids of the bottles were loosely closed to ensure the airflow. After 4 days of incubation at room temperature (25°C) crude enzyme extracts were assayed on filter paper at 50°C for an hour and products were measured using DNS reagent test. Concentrations of reducing sugar were obtained from the standard glucose curve and, finally activity was calculated as FPU/ml. (Figure 3).



Figure 3: Colony of *Trichoderma* sp on filter paper strip immersed in Sea water.

2.8 Identification of fungi

In order to identify the fungal colonies colony colour, shape, border, and spots (if the spores are available) were recorded as given in table 4.2. Microscopic visuals were observed under high power (40×10) oil immersion objective. Spores and the mycelia were observed so clearly (Figure 4), and the data were recorded and used in classification. Fungi were classified up to the genus level by their morphological features. Classification was based on microscopic observation of mycelia as well as reproductive structures such as spores and fruiting bodies, if available. Characters used in classification were compared by considering mycelial characters such as presence of septa, whether mycelium was branched or not, on mature colonies the presence of reproductive structures such as sporangia, conidia and their morphology, types of spore they generate, whether spores are septate or not and position of rhizoids on the mycelium etc.



Cladosporium sp.

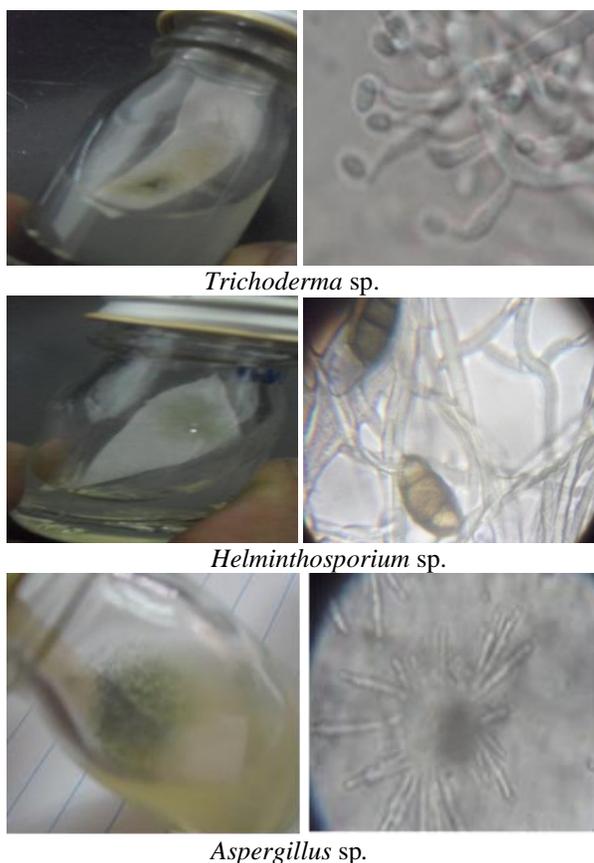


Figure 4: Fungal samples

2.9 Effects of pH and Temperature on fungal enzyme activity.

Enzyme activity related to variation in temperature and pH were measured separately. Filter paper assays of each fungal crude enzyme were kept in water baths at temperatures of 37^o, 50^o and 60^oC. After an hour of incubation DNS reagent test was done.

Similarly, pH of the each buffer solution was changed to 3, 6, 8, and 13 by adding either dil NaOH or dil HCl. Then crude enzyme of each fungus was added and filter paper strips were placed. Assay was incubated at 50^oC for an hour and products were measured using DNS reagent test. Concentrations of reducing sugars were obtained from the standard glucose curve and, finally activity of enzymes was calculated as FPU/ml.

III. Results and discussion

3.1 Comparison of the enzyme activity of fungi in Sea water medium with that of CBM.

According to the results (Figure 5), *Cladosporium sp.* showed an increased level of activity of 64.04 FPU/ml which is vastly higher than its previous observation that is 20.74 FPU/ml in CBM medium on the same substrate. And comparatively *Cladosporium sp.* showed the lowest activity among all four samples in CBM but in sea water it showed the highest enzyme activity. This showed it may have some preference to salinity of the sea as well as

tolerance, It is also reported *Cladosporium sp.* was found on sub merged pine at Great salt lake at high salt concentration of 290-360‰ (parts per thousand) which is ten times higher than the salinity of sea water used here [4] and *Cladosporium cladosporioides* was found in dead sea ecosystem where salinity is 300‰ [8]. In addition, *Helminthosporium sp.* and *Trichoderma sp.* also depicted higher tolerance as their enzyme activity was 60.65 and 53.24 FPU/ml respectively, whereas *Aspergillus sp.* depicted relatively lowest activity of 41 FPU /ml. None of the sample is sensitive to the salinity of sea water.

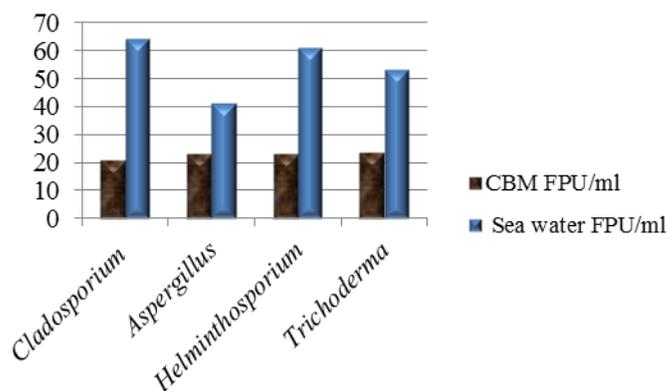


Figure 5: Comparison of the activity of fungi in Sea water with that of CBM.

3.2 Comparison of the percentage of saccharification of cellulose in Sea water with that of CBM media.

As shown in the comparison of enzyme activity in 3.1 saccharifying percentage of the cellulose filterpaper also resulted in similar manner. According to the results (Figure 6) where *Cladosporium sp.* was topping with 2.29% in sea water, which was denoted by the lowest saccharification of 0.775% in CBM medium. Further *Helminthosporium sp.*, *Trichoderma sp.*, and *Aspergillus sp.* also depicted increased levels of saccharification compare to that of in CBM medium.

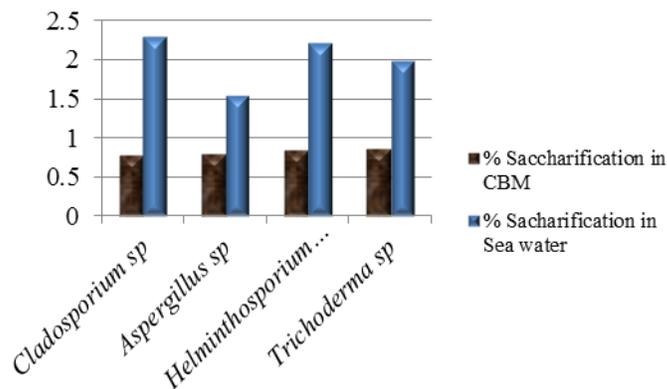


Figure 6: Comparison of the % of Saccharification of cellulose in Sea water with that of CBM.

3.1 Effect of environmental factors on saccharification of cotton. (Based on examining derived enzyme activity by filter paper assay).

Environmental parameters are one of the major factors in saccharification of fungal enzymes. Mainly during the storage of cotton humidity, temperature, and even pH of the substances come to contact may facilitate colonization of fungi. However in case of temperature, there is no proved relationship between temperature of colonization and optimal temperature of their enzymes. In addition preference of such parameters by each fungal species may differ.

3.1.1 Effect of temperature on the activity of cellulolytic fungal enzymes (FPU/ml).

The rate of an enzyme catalyzed reaction increases as the temperature has risen. Variations in reaction temperature by 1 or 2 degrees may introduce changes of 10 to 20% in the results. In this experiment, enzymatic reaction of given fungi (Figure 5) showed a peak at 50°C by reaching a peak of 32.5 FPU/ml. This shows that the temperature for the cellulolytic enzymes of three given fungi was 50°C. However, if further high temperatures are tested it is possible to find the point they get denature. Normally animal enzymes get denatured even at 40°C. Nevertheless, for fungi it is higher. It is also possible to observe the tolerance as well as the preference of high temperature (since 50°C as optimum) by fungal enzymes. According to the graph, the fungus *Trichoderma sp.* shows an increase in the rate of reaction until 50°C followed by decline afterwards.

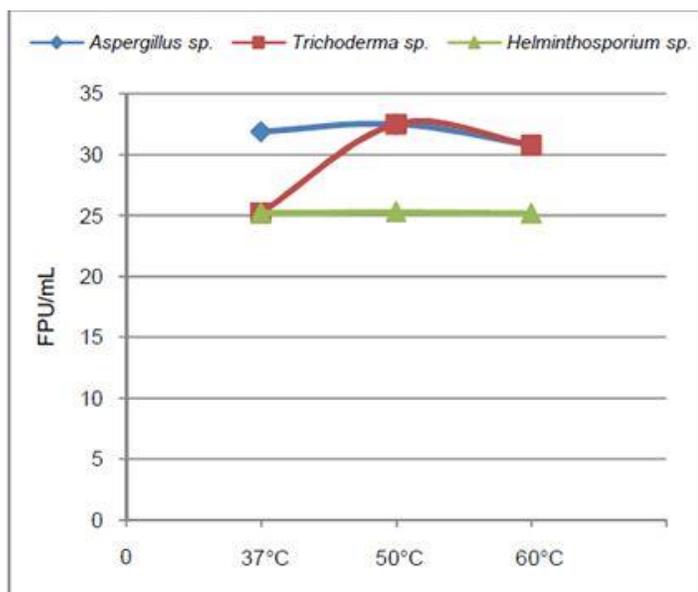


Figure 7: Temperature vs. activity of fungal enzymes (FPU/ml).

3.1.2 Effect of pH on the activity of cellulolytic fungal enzymes (FPU/ml)

Since enzymes are proteins, they are very sensitive to changes in pH. Each enzyme has its own optimum range for pH, where it is

most active, and the result is determined by the effect of pH on a combination of factors such as binding of the enzyme to substrate, catalytic activity of the enzyme, ionization of the substrate, and the variation of protein structure. The initial rates for many enzymatic reactions exhibit bell-shaped curves. The most favourable pH value (optimum pH) may vary among enzymes of different fungi. In this experiment (Figure 6) the optimum pH for fungus *Trichoderma sp.* and *Fusarium sp.* was closer to neutral, and for *Helminthosporium sp.* it is 3. It means *Helminthosporium sp.* prefers slightly acidic medium. For *Aspergillus sp.* the curve was peaking at very low pH that showed the preference of *Aspergillus sp.* towards acidic environment.

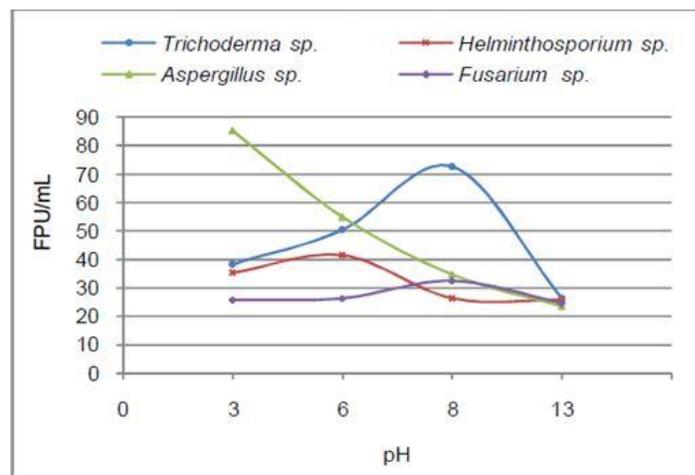


Figure 8: Effect of pH on the activity of cellulolytic enzymes from fungi.

IV. Conclusion and related works

Based on the results, the cellulose saccharifying ability of each fungus in sea water medium is increased. This shows the halophilic nature of them, though the fungi are terrestrial origin they have an individual preference as well as tolerance to marine environment. Some of the samples are facultative halophiles such as *Cladosporium sp.* and some *Aspergillus sp.*, even though they have no exposure to saline environment in any part of their life cycle as they are belongs to terrestrial ecosystem their potential metabolic activity is higher in marine environment. It is possible to use the extracted fungal enzymes in degradation of algal debris from sea in the production of fertilizer, since algae are rich in minerals but due to its salt content it takes longer time to decompose by microbes.

In a similar work done in Goa, India. Colonizing ability in higher concentration of salt solution was evaluated by the growth rate of the colony, and few species belong to *Aspergillus sp.* which is a facultative halophile [3]. In another work a total of 17 species were screened soil samples isolated from a manmade solar saltern in Ban Laem, Thailand, many of the isolated species were belongs to genera *Aspergillus sp.*[6] Even in hyper saline environment like Great Salt Lake and Dead Sea many of the genera of terrestrial origin exists. In a study among 100 samples of water from Dead Sea 68 were positive, isolated strains include *Aspergillus sp.* [2].

Acknowledgement

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REFERENCES

- [1] C.J.Alexopoulos and C.W. Mims, 1979. Introductory mycology, 3rd ED Wiley, NY.
- [2] T.I.Mbata, Sudanese journal of public health: 2008, vol.3(4), 172.
- [3] Saritha. N. , Valerie. G., Shweta. N. "Isolation and salt tolerance of halophilic fungi from mangroves and solar salterns, Goa, India", Indian journal of microbiology, 2012, 52(1): 22–27.
- [4] Cronin, A.D., Post, F.G., 1977, Report of a Dematiaceous hypomycete from the Grate salt lake, Utah, Mtcologia 69. 846-847.
- [5] Mandels, M., Andreotii, R.C.,1976. "Measurement of saccharifying cellulase". *Biotechnology Bioeng. Symp.* **6**, 21-23
- [6] Imran ali, Lakhana, K., Sansanalak, R. and Kumar, R., "Identification, phylogenetic analysis and characterization of obligate halophilic fungi isolated from a man made solar salternin Petchaburi province , Thailand", Annals of microbiology B. Smith, "An approach to graphs of linear forms (Unpublished work style)," 2012; DOI:10.1007/s13213-012-0540-6.
- [7] Pointing, S.B., 1999. "Qualitative methods for the determination of lignocellulolytic enzyme production by tropical fungi". *Fungal Diversity.* **2**, 17-33.
- [8] Asya S. Buchalo, Eviatar Nevo, Solomon P. Wasser, Paul A. Volz, "Newly Discovered Halophilic Fungi in the Dead Sea (Israel)". *Journey to Diverse Microbial Worlds, Cellular Origin and Life in Extreme Habitats.*, ED Kluver, Volume 2, 2000, pp 239-252.
- [9] Miller, G.L. ,1959. "Use of Dinitrosalicylic acid for determination of reducing sugar". *Anal. Chem.* **31**, 426-429.
- [10] Adney, B. and Baker, J. 1996. "Measurement of Cellulase Activities", Technical report, NREL/TP-510-42628.

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Mobile Monitoring and Inquiry System Using Fingerprint Biometrics and SMS Technology

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ABSTRACT

This paper described a mobile monitoring and inquiry system using the fingerprint biometrics and Short Message Service (SMS) technology. It was specifically developed for the monitoring of preschoolers' attendance during their schooling, which is beneficial to the working parents. The system adopted the Rational Unified Process (RUP), Visual C#.Net 2008 and MySQL Server 5.1 database and software development kit (SDK). The system was designed to automatically sends an alert SMS to the parents/guardians whenever the pupils logged-in/logged-out in the system. Likewise, it could receive an SMS inquiry and sent an SMS reply to the parents/guardians when no alert message was received after the expected time of logged-in/logged-out of the pupil. All the text messages used a predefined content of 160 characters or less, without graphics and are local texting only. Results of the system evaluation showed that the fingerprint scanning records an average of 93.48 % and 93.81 % accuracy for the login and logout respectively. The average time of sending an alert message to the parents/guardians is 27.20 s while 23.08 s for the reply of an SMS inquiry. The mobile monitoring and inquiry system using the fingerprint biometrics and SMS technology is convenient, economical and reliable method of monitoring, identifying and/or verifying users since it no longer requires identity cards or passwords memorization. Thus, the system could be used by the other levels of pupils depending on their monitoring needs. However, there is a need for some innovation like designing a multiple detection and recognition using a high resolution of camera for easy use of login and logout in the system.

Keywords: Mobile Monitoring, SMS Inquiry System, Fingerprint biometrics, SMS Technology

I. INTRODUCTION

School environment must be conducive to learning and free from any untoward incidents (e.g. illegal entry and kidnapping). As such several strategies were implemented by the school administrators to address such dilemma. Provision of proper student identification card, as they enter or leave the school campus was one of those strategies adopted by the school administrators.

However, based from observations, traditional personal authentication systems used personal token like Identification card (ID) that could be forgotten, lost or stolen. Thus, it does not suffice the issue on proper identification of students.

Hence, school administrators shifted to modern techniques of authentication analogous with the technology advancement i.e. use of personal computers, internet, swipe cards, PINs, use of password and the use of biometric finger scanning. All these, except for the biometrics, do not meet the stringent security requisites of authentication as these could easily be passed over, lost or guessed by other users.

Further observations showed that biometric fingerprint scanning was one of the best alternative and accepted method of authentication nowadays. It provided accurate identification of users, track and audit records of users. It can't be lost or stolen, no password memorization, thus, more reliable and user-friendly. It has a wide range of application such as attendance and payroll management, visitor management, access control, and door locks.

It was in this premise that the researchers thought of reinventing the current authentication system of school operators and administrators. This system would provide accurate user identification, monitoring, SMS alert and inquiry which could be used by the school administrators and the parents of the pupils. Thus, the researchers integrated the biometric finger scanning and short message service (SMS) or popularly known as texting. The SMS served as an information transmission between system and parents of the pupils. The system made use of wireless networks, mobile phone, Global System for Mobile communication (GSM) modem and biometric device.

A. STATEMENT OF THE PROBLEM

One of the major thrusts in any institution is to promote sound environment for its clientele and its staff. Hence, a safe and secure school premises is a requirement rather than a necessity only. Presence of any form of violence within school premises would adversely affect the educational process and operations of the institution; students' academic performance; and the loss of trust and confidence of the clientele. Nonetheless, school authorities got difficulty in responding these issues.

For this reason, the researchers designed and developed a system that would help the school operators and administrator to provide a safe and secure environment. A system that would enable the parents/guardians monitors their students and makes an inquiry about their pupil's attendance in the school through the integration of biometric fingerprint scanners and SMS or text messages.

B. OBJECTIVES OF THE STUDY

The general objective of this study was to design and implement a mobile monitoring and inquiry system using the fingerprint biometrics and SMS technology for preschoolers aged 4-6 years. Specifically, it aimed to:

1. Develop an authentication system for the pupil's entry and/or exit in the school campus.
2. Design an application software that would combine monitoring and alert system of pupils coming in and out of the school campus through biometric fingerprint scanning and text messaging (SMS) sent to students' parents or guardians.
3. Develop an SMS inquiry system between the school authorities and their clientele.
4. Conduct the testing of the system to both kinder and nursery pupils in terms of:
 - a. Biometric fingerprint scanning,
 - b. Text Messaging, and
 - c. SMS inquiry.

C. SIGNIFICANCE OF THE STUDY

The researcher is confident that the results of the study were deemed beneficial to the following stakeholders:

Pupils. Results of the study would ensure the authentication of the pupil's true identity, promote a sound environment for learning – thus, outstanding academic performance is highly expected. Also, students were exposed to a state-of-the-art information and communications technology (ICT) coping up with the modern world.

Parents. Results of the study provided the parents/guardians a most affordable mobile monitoring and inquiry system which enabled them checked and monitored their children's attendance to school through cellular phones, provided peace and security; checked as they would be automatically informed about the school attendance of their children. Consequently, it would promote a strong and effective partnership between the parent and the school administrators.

School Administrators. This technology would empower the school operators and administrators in conveying excellent services to their clientele as well as safe and peaceful learning environment to their clientele. Moreover, it would permit a creative and dynamic tripartite interaction among the school-parents and students.

Researcher. This study would enhance the researcher's technical knowledge and understanding on his field of specialization. Thereby, the difficulties encountered broaden the researcher's horizon in applying the new gained principles.

Future Researchers. This would serve as avenue for the improvement of future related studies on monitoring and security issues in any institution of concerned. Further, this would serve as vital inputs to future researchers who may embark in the development of a new technology associated with monitoring and security matters.

D. SCOPE AND DELIMITATION

The study focused on the development of a software intended for mobile monitoring, alert and inquiry system through the integration of biometric fingerprint scanning and short messaging service (SMS) popularly known as text messaging.

Generally, it is consisted of a computer, biometric device, GSM modem, and cellular phone connected in the wireless network. The system could generate automatic alert message sends to the parent/guardians as the pupils performed the login and logout in the system. Likewise, an inquiry and reply messages could be done on the system particularly when the parents/guardian received no texts after the expected logged-in or logged-out of the pupils. All the texts messages must not exceed 160 characters, no graphics and were local texting only.

The system is designed specifically for nursery and kindergarten pupils from age 4 to 6 years old. However, it can be used by the other pupils depending on their monitoring and security requirements.

This was a six (6) months study that commenced on April 2013 and ended on September 2013.

II. METHODOLOGY

This study employed a descriptive developmental method of research in the context of system development. Descriptive was used in discussing the results of the testing phase while developmental was used during the system development. The data were analyzed using the percentage technique and arithmetic mean after conducted the testing of the biometric fingerprint scanning, Text Messaging and SMS Inquiry.

The researcher made used of the fingerprint biometrics for authentication or verification of pupils in the school campus. The *DigitPersona* was used as fingerprint reader to capture the fingerprint image of the pupils when performing the login and logout in the system. The Microsoft Visual C#.Net 2008 was used to develop the system and the Software Development Kit (SDK) called *DigitalPersona One Touch for Windows SDK 1.4.0.1* was used for registration and recognition of the fingerprint images. A total of 76 fingerprint images of the pupils was stored in the database for the system's matching and verification process purposes. When the pupils placed or put his/her finger on the fingerprint reader, the device captured the fingerprint image and matched it sequentially on

the different fingerprint images stored in the database. Once a match was found, the searching and matching of images automatically stopped. Otherwise, a message prompted on screen informing that no matched found.

The Software Development Life Cycle (SDLC) was used in designing the software application of the system. The Rational Unified Process (RUP) methodology was adopted for the SDLC where RUP addresses the complete software development lifecycle wherein it was broken into cycles and each cycle working on a new generation of the software. These four major cycles of RUP are inception, elaboration, construction, and transition.

Inception. This is the planning cycle of the system development wherein the researcher developed an SMS-based application using the fingerprint biometrics which authenticates the pupils true identity based on his/her physical attributes. The activities included were the identification of the hardware and software requirements in the development of the system, scope of the project (attendance monitoring), schedule of activities (Gantt chart), and the total budget cost.

Elaboration. In this cycle, the researcher designed the requirements needed in system development. Included were the system components, system architecture, contextual diagram, data flow diagram, data dictionary, entity relationship diagram, user interface design, and system flowchart. These processes were discussed in this chapter.

Construction. The researcher made use of Microsoft Visual C#.Net 2008 and MySQL Server 5.1 to initially start the coding process. Additional tools for the software development kit (SDK) were used such as fingerprint reader, webcam, and GSM modem. Debugging and testing of the program for fixing bugs or errors of the design was also done in this cycle. Finally, the system was released and tested as beta version thru conducting a pilot test for five days.

Transition. After the beta testing, minor refinement was done to integrate corrections of bugs and the users' feedbacks which were focused mainly on fine-tuning of system, configuring, installing, and usability issues. In this cycle, the researcher was assured of the usability of the system to its target clientele (the pupils). The user's manual is prepared to facilitate using of the system. Screenshots of the human-machine interfaces, simplified diagram and software installation instructions were clearly presented in the manual.

In the development of SMS Inquiry system, the researcher was used of the GSM modem (USB SmartBro) and the mobile phone which are connected to the system. The GSM was used for sending the alert messages and receiving the text messages from the parents/or guardians. The mobile phone was used for receiving the text messages and alert messages from the system. The content of the alert message, text message, and SMS inquiry are in a predefined format and shown in the appendices. The system was used of the *Core.Net SMS Library 1.2* for the Software Development Kit (SDK) used in Microsoft Visual C#.Net 2008 when developing the SMS Inquiry system.

The system was tested and conducted at San Juanico Pre-School, Goa, Camarines Sur for the biometric fingerprint scanning of pupils thru logging-in and logging-out in the system at the school campus. The pupils were performed in the system for the duration of five (5) days in using the fingerprint scanner on the regular classes of 8:00-10:00 AM and 1:00-4:00 PM for the nursery and kindergarten pupils. The total number of pupils was registered in the system is 76 for both nursery and kindergarten pupils.

The researcher was conducted the testing of the text messaging and SMS inquiry using a mobile phone and the system. The system and the mobile phone are connected through a wireless network using the GSM modem (USB SmartBro) configured to the system. The testing of the mobile phone was used for the alert messages and text messages together with the system sent to the parents/or guardians. The alert messages are the messages received by the parents from the system after the pupils performed the login and logout at school campus. The text messages are the messages received by the parents from the system after the SMS inquiry thru mobile phone. The testing was conducted for a total of five (5) trails in both text messaging and SMS inquiry.

III. RESULTS AND DISCUSSION

A. System Components

As shown Figure 1, the four major interconnected components of the system were the biometric device, GSM device, mobile phone and database. The biometric device was used to capture the fingerprint image and verify the pupils by logging-in or logging-out in the system for the purpose of authenticating the pupil's identity. The GSM device served as the gateway to connect with the mobile phone users and the system. It is also used to send and receive the text messages via SMS. The text message sent and received by the system was stored in the database. The database recorded the logins and logouts, and saved the records of the incoming and outgoing text messages. The mobile phone is the last component of the system. This is used to make an SMS inquiry and text messaging service between the system and the parents/guardians.

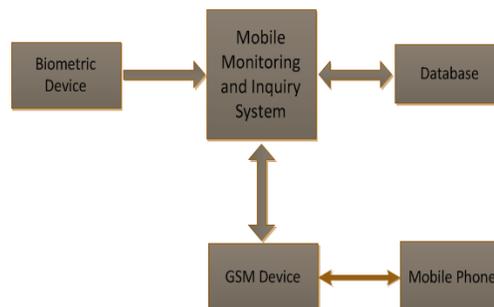


Figure 1: System Components

B. System Architecture

The Mobile Monitoring and Inquiry System (MMIS) is capable for monitoring the pupils in the school campus through sending an alert message and text message to the parents/guardians via SMS (Fig. 2). The system and the parents/guardians are connected through a wireless network. The two types of clients served by the system were the pupils and their parents/guardians. The pupil pressed his/her finger on the fingerprint reader and was recognized by the system through his own fingerprint. This act led to sending the pupils' parents/guardians an alert message which was received through mobile phone. The GSM device is responsible for sending an alert message or text message from the system to the parents. The mobile phone receives the information that was made by the system.

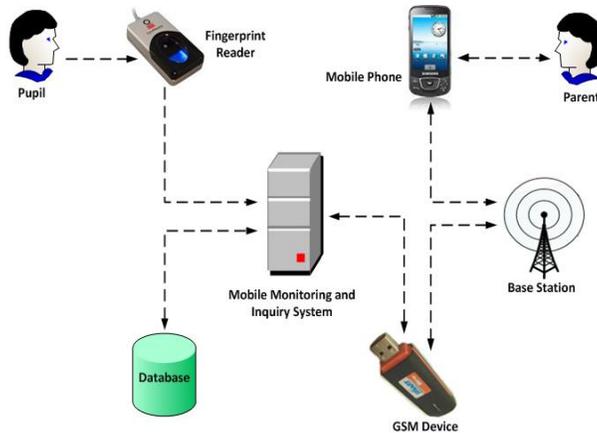


Figure 2: System Architecture

C. Context Diagram

The system requires two external inputs as illustrated in figure 3. One is the attendance details (finger print) coming from the pupils which served as the first input needed to be feed into the system which resulted to sending automatically an SMS alert to the parents/guardians. The second external input is the SMS Request sent by the parents/guardians that the system will received upon inquiry of the parents for not receiving an alert message that his son/daughter had already performed logged-in or logged-out from the school. The system replied via a predefined content SMS with the following pupils' information, name of the pupil, logged in / logged out time and the date of transaction.

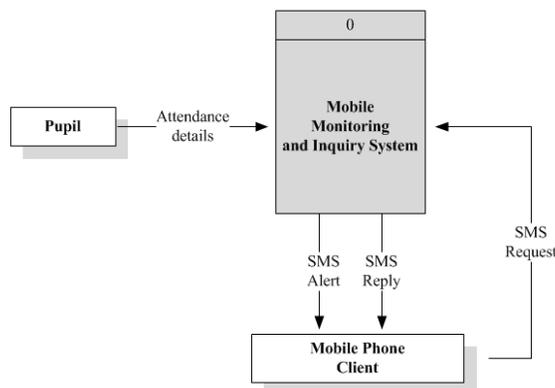


Figure 3: Contextual Diagram

D. Data Flow Diagram Level-0

Figure 4 shows the five major functions of the MMIS. These five major functions are Register Account, Login/Logout, Send SMS, Receive SMS, and Reply SMS. The Register Account function is used for the registration of the pupils and the fingerprint image capturing. The Login/Logout function authenticates the pupils when he/she logs in or logs out in the system and process an SMS alert message. The Send SMS function is used to send the Outgoing SMS needed to receive by the parent/guardian. The Receive SMS function is used for accepting the request or inquiry sent by the parents/guardians. The Reply SMS function sends the text reply to the guardian made by the system.

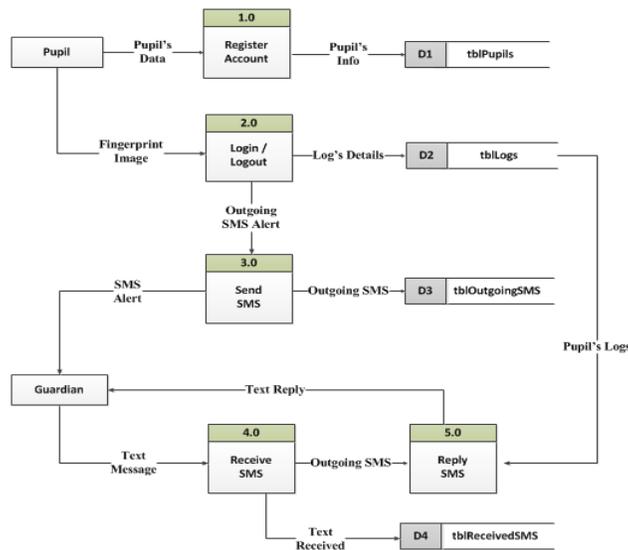


Figure 4: DFD Level 0

E. Entity Relationship Diagram (ERD)

Figure 5 shows the design and structure of the database that keeps the records of the pupils, fingerprint images, logs, sends and receives text messages. The data entry in the registration, login and logout, received and sent messages are stored in the database.

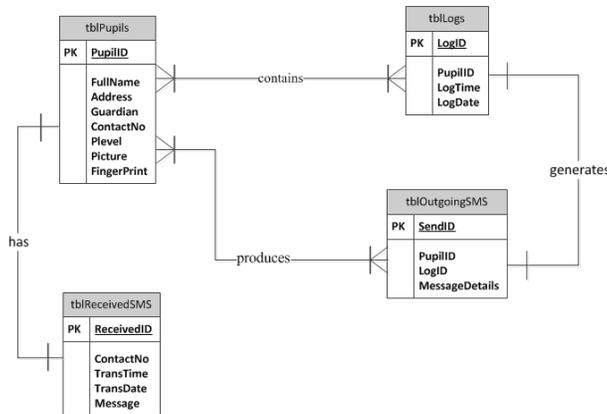


Figure 5: Entity Relationship Diagram

F. Testing Result for Biometric Fingerprint Scanning

The testing of the fingerprint biometrics focused on the execution of login and logout of the pupils. The use of the fingerprint biometrics is for the identification and verification of the pupils before sending an alert message to the parents/guardians. Table 1 shows the results after conducting the biometric fingerprint scanning. During logged in, 71 pupils on the average had performed the logged in in the school campus. Of this number, 93.48 % of the pupils were successfully recorded for the first attempt of pressing their fingers on the fingerprint scanner. The remaining 6.52%, 4.53 % of which was only recognized after the second attempt and this was due to improper position of finger . One and seventy hundredths (1.70) % were not recognized due to unregistered fingerprints.

Documentation of the logged out was also done. When the pupils performed the logged out in the system, 93.81% acceptance were recorded for the first attempt, while 5.24% done it twice. The remaining 0.5 % are for the unregistered fingerprint.

In the actual experimentation, 29.77% of the tested pupils missed out the logouts since they already approached their parents who were there to fetched them.

Table 1: Biometric Fingerprint Scanning

Day	Transaction	1 st Attempt		2 nd Attempt		3 rd Attempt		4 th Attempt		5 th Attempt		Number of Pupils
		Number	%	Number	%	Number	%	Number	%	Number	%	
Day 1	IN	56	87.50%	4	6.25%	1	1.56%	0	0%	3	4.69%	64
	OUT	40	88.89%	3	6.67%	1	2.22%	1	2.22%	0	0%	45
Day 2	IN	65	91.53%	4	5.63%	0	0%	0	0%	2	2.82%	71
	OUT	45	95.74%	2	4.26%	0	0%	0	0%	0	0%	47
Day 3	IN	81	95.29%	3	3.53%	0	0%	0	0%	1	1.18%	85
	OUT	63	96.92%	2	3.08%	0	0%	0	0%	0	0%	65
Day 4	IN	75	96.15%	3	3.83%	0	0%	0	0%	0	0%	78
	OUT	49	92.45%	4	7.55%	0	0%	0	0%	0	0%	53
Day 5	IN	53	96.36%	2	3.64%	0	0%	0	0%	0	0%	55
	OUT	49	93.81%	2.75	5.24%	0.25	0.48%	0.25	0.48%	0	0%	53

G. Testing Result for SMS Inquiry and Text Messaging

The mobile phone is used to connect with the system and the parents/guardians through SMS technology. The parent/guardian had regularly received an alert message from the system when the pupils performed the login or logout in the school campus. Table 2 shows the results of an SMS inquiry and text messaging. The alert message sent by the system to the parents/guardians has recorded an average received time of 27.20 seconds after the pupils performed the login or logout in the school campus. The shortest and longest time of sending an alert message is recorded to be 26.43 seconds and 28.41 seconds respectively. The SMS inquiry was also documented in terms of speed of recipient. The response time of sending the text message after the parents/guardians had sent their SMS inquiry to the system was recorded on the average of 23.08 seconds while the shortest and longest time were 16.49 seconds and 37.56 seconds respectively.

Table 2: SMS Inquiry and Text Messaging

Transaction	TRIAL					Average
	1 st	2 nd	3 rd	4 th	5 th	
The time elapsed when an alert message received by the parent/guardian after the pupils performed the login or logout in the system.	28.41 s	26.43 s	27.55 s	26.83 s	26.78 s	27.20 s
The time elapsed when a response text message received by the student guardian/or parent after sending an inquiry SMS request to the system.	16.49 s	20.50 s	19.77 s	21.09 s	37.56 s	23.08 s

IV. CONCLUSION

The Mobile Monitoring and Inquiry System (MMIS) was specifically developed for monitoring the pupil’s attendance in the school campus thru SMS Inquiry, and logging-in and logging-out in the system using the fingerprint biometrics and SMS technology. The system was used of the fingerprint scanner for the login and logout of pupils using their fingerprint at the school campus and the mobile was used for the SMS Inquiry or in the text messaging service. The used of the fingerprint scanner and the system provides most economical and accurate identifying of pupils since it no longer requires identity cards (ID) or passwords memorization. Thus, the system could be used by the other levels of pupils depending on their monitoring needs. Through the use of fingerprint scanner, the system sends a reliable text message or alert message to the parents/or guardians. The system combines the functionality of the fingerprint scanner and the GSM modem (USB SmartBro) in monitoring the attendance of pupils and sends the messages to parents/or guardians. The system provides a convenient way of monitoring the pupils through the use of mobile phone which is a common personal communication medium in most of the parents/or guardians today. The parents received automatically the alert messages from the system within the country only when they are working at the office or in other places after performing the pupils for the login and logout in the system. The system provides an SMS Inquiry for the clientele (parents, guardians) in monitoring of attendance of pupils at the school campus. The system thru SMS Inquiry delivered the text messages using the GSM modem and the mobile phone which are connected in the wireless network.

V. RECOMMENDATIONS

After conducting the testing, the researcher recommends for the future researchers in order to further improve the system. Some of the following recommendations were made:

1. Develop a multiple face detection and recognition device as a replacement of the fingerprint reader for easy login and logout transaction in the system. The system will use a high resolution of camera in detecting and recognizing faces of the pupils when entering and leaving the school campus. The system is capable of multiple face detections and recognitions using the camera that are uses for login and logout of the pupils and it sends automatically a text message to the parents based on the detected and recognized faces of the system.
2. Develop a fuzzy logic application for multiple face detection and recognition in recording the login and logout of pupils.

3. Design an embedded system for combining the use of the fingerprint reader and the GSM modem (USB SmartBro) in monitoring the pupil's attendance at the school campus thru logging-in and logging-out and sends a text message to the parents/guardians using their fingerprints.

REFERENCES

- [1] Arun S., Emmanuel K., Diwakar M., and Rajeswari R. (2013). Automated Attendance System using Biometrics with Embedded Webserver. *Graduate Research in Engineering and Technology (GRET) An International Journal, ISSN 2320-6632, Vol-1, Iss-II.*
- [2] Bhamare Mamata, Malshikare Tejashree, Salunke Renuka and Waghmare Priyanka. (2012). GSM Based LAN Monitoring and Controlling. *International Journal of Modern Engineering Research (IJMER), ISSN: 2249-6645, Vol.2, Issue. 2, 387-389.*
- [3] Prassanna J. and Senthilkumar MKS. (2012). Implementation of Biometric Attendance Management System on Cloud Environment. *International Journal of Modern Engineering Research (IKMER) Vol.2, Issue 3, ISSN:2249-6645, 1052-1054.*
- [4] Salameh, O. (2012). A Mobile Phone SMS-Based System for Diabetes Self-Management. *International Arab Journal of e-Technology, Vol.2, No.3.*
- [5] Sebastian Sherin, Neethu Rachel Jacob, Yedu Manmadhan, Anand V.R., and Jayashree. (2012). Remote Patient Monitoring System. *International Journal of Distributed and Parallel Systems (IJDPS) Vol.3, No.5.*
- [6] Sonia. (2011). Biometric Attendance Terminal and Its Application to Health Programs. *International Journal for Science and Emerging Technologies with Latest Trends 1(1): 10-14(2011) (ISSN No. 2250-3641).*
- [7] Sujithra M. and Padmavathi G. (2012). Mobile Device Security: A Survey on Mobile Device Threats, Vulnerabilities and their Defensive Mechanism. *International Journal of Computer Applications (0975-8887) Volume 56-No.14.*
- [8] Vashek Matyas and Zdenek Riha. (2011). Security of Biometric Authentication Systems. *International Journal of Computer Information Systems and Industrial Management Applications ISSN 2150-7988 Vol.3, 174-184.*
- [9] Yekini N.A., Rufai M.M and Adigun J.O. . (2012). A Biometric Model for Examination Screening and Attendance Monitoring in Yaba College of Technology. *World of Computer Science and Information Technology Journal (WCSIT) ISSN:2221-0741 Vol.2, No.4, 120-124.*
- [10] Yousif Ahmed, Zeinab Abd Alrahman, Razan Saad Aldeen, Elham Altyeib and Khansaa Taha. (2013). Designing of an Embedded Software System for Patient's Tele-Monitoring using SMS. *3rd International Conference on Intelligent Computational Systems (ICICS'2013)*
- [11] Yuan, M. (2011). A Design for E-government SMS Platform Based on Web. *International Conference on Management and Artificial Intelligence IPEDR, Vol.6 IACSIT Press.*

Scientific Investigation of the Environmental Impact of Mines Using Geospatial Techniques over a Small Part of Keonjhar District of Orissa

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Abstract- The impact of mining and mineral extraction activities can be significant on the surrounding land, water and air bodies, in any operational area. The environmental degradation ranges from localized surface and ground water contamination to the damaging effects of airborne pollutants on the regional ecosystem; which need the properly designed geospatial database. The monitoring of these environmental impacts requires a user-friendly and cost effective method to quantify the land cover changes over large time periods. Now-a-days, it has become compulsory to use the remote sensing techniques for regular monitoring of these environmental hazards in-and-around the mining areas. This paper provides a case study on the use of geospatial techniques for environmental monitoring in the mining areas.

Index Terms- Mining, airborne, Remote Sensing, Environmental Impacts.

I. INTRODUCTION

Mining tends to make a notable impact on the environment, the impact varying in severity depending on whether the mine is working or abandoned, the mining methods used, and the geological condition. It courses massive damage to landscape and biological communities of the earth. The unscientific mining of minerals possess a serious threat to the environment, resulting in the reduction of forest cover , erosion of soil in a greater scale , pollution of water, air and land and reduction in biodiversity. The problems of waste rock dumps become devastation to the landscape around mining areas (Sarmaand Kushwaha, 2005).

The Indian sub continent is replete with minerals and many states have rich coal resources. Soon after independence, India witnessed a spurt in the growth of heavy industries that needed large amount of mining of iron and manganese. Thus the mining operations in India began on a large scale in 1950s. Presently, in India more than 80000 ha of land are under various types of mining. Minerals from the earth crust, is second only to agriculture as the world's oldest and important activity. Since the history of mining is the history of the civilization from the prehistoric day's man has been interested about earth's minerals wealth. The crude stone implements of the early Paleolithic period. Post Neolithic pottery, the Egyptian pyramids, iron and manganese in various civilizations and the modern steel age are all testimony of mining activities of man. Natural resources gave

been over exploited for almost two centuries, without any concern about environment.

II. STUDY AREA

The study area is located between Latitude: 21°52.5' 0" to 22° 0' 0" N and Longitude: 85° 22.5' 0" to 85° 30' 0" E in the Joda Block of Keonjhar District of Orissa. The study area is rough terrain but an altitude changing from place to place.

III. LOCATION MAP OF THE STUDY

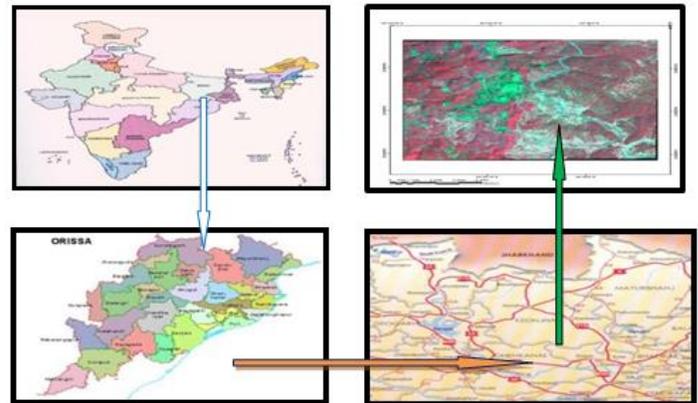


Figure 1: Location map of the study area.

IV. AIM & OBJECTIVES OF MY STUDY

1. To categories the study area into environmental zones with mining.
2. To determine the present Geospatial GIS techniques.
3. To determine Environmental Management of Mineral Resources.

V. PHYSIOGRAPHIC SETTING

The state is broadly divided into four geographical regions viz. the northern plateau, central river basins, eastern hills and coastal plains. But the northern plateau region comprises mainly, Mayurbhanj, Keonjhar and Sundergarh districts. The central river

basins lie between the northern plateau and eastern hills and include Bolangir, Sonepur, Sambalpur, Deogarh, Bargarh, Jharsuguda, Dhenkanal and Angul districts, and a part of Cuttack district. The eastern hills which constitute the last portion of the eastern ghats, lie to the south and southwest of central river basins stretching for about 250 km in northeast – southwest direction through the districts of Koraput, Rayagada, Nawarangpur, Malkangiri, Kalahandi, Nuapara, Gajapati and a part of Ganjam district. The eastern hills are elevated and are generally 900 m above sea level. (CHILIKA DEVELOPMENT AUTHORITY, state of Orissa, 2010)

VI. GEOLOGICAL SETTING

The physical features of the coastal regions of India are a sort of terra incognita. The coastal plains of Orissa are narrow in the north, wide in the middle, and narrow in the south (Sinha et al., 1971). Coastal Orissa is characterised by wide deltas. The monsoons are a great force in shaping the shore features. The ports on the east coast of India such as Ganjam, Kalingapatnam and others are protected by spits. The ports owe their existence to the projection afforded by bars and spits. The beach features work as natural breakwaters, providing relatively sheltered anchorage to these ports (Ahmad et al., 1972). Further, the rivers of Orissa have created large deltas at their confluence with the Bay of Bengal. The Mahanadi delta starts its projection on north east of Chilka Lake. The sediments brought by longshore drifting from the southwest during the Southwest monsoon, and currents or drifts are arrested in the Chilka lake. Starting from east there is a straight shoreline for about 120 km between the Mahanadi delta and Srikakulam. There are only two marine inlets within these long stretches, one at the narrow mouth (400-600 m) of the Chilkalake and the other on the mouth of the Rushikulya river. Chilkalake is located on the southwest corner of the Mahanadi delta and connected with the sea through a tidal inlet. It has wide sandy beach ridges and barrier spits which separates it from the Bay of Bengal.

VII. EARLIER WORK DONE ON THIS AREA

The land under permanent pasture has also decreased.

Fallow land –left without cultivation far one or less than one agricultural year. National forest policy in 1952. Waste land includes rocky. Arid and desert area and land put to other non agricultural uses included settlements, roads railways industry etc. Continuous use of land over a long period of time out taking appropriate measures to conserve and manage it. But the field work carried out between 1982 and 1986 in the Keonjhar district of Orissa State. very little work has been done previously on the pre history of this area, and fieldwork reported here ,carried out in part fulfillment of my doctoral work, here the initial aim of locating stone age sites through intensive exploration and then making a detailed study of their associated environment and land use pattern.

VIII. METHODOLOGY

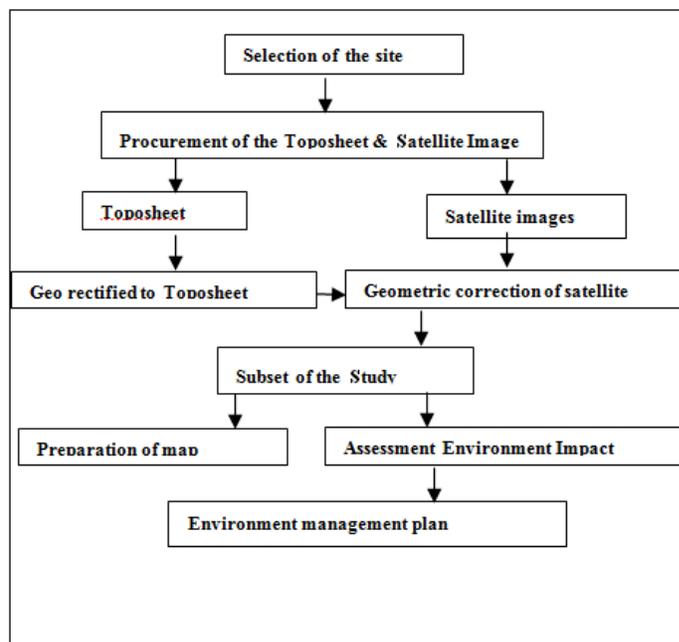


Figure2: Flowchart showing methodology.

Selection of the study area and get to the all the primary details. Digitized the mining boundaries by the geo rectified Toposheet and superimpose the Environment planning. The buffering zone is prepared in the Arc GIS software. Prepared the area of interest (AOI) from the satellite images

Selection of mine site: Keonjhar District is the one of the important iron mineral in the Orissa state. Mining started from 1976 in along 30 years has changes in the environment and surrounding covered the pollution, so the environmental purpose has to be measured or calculated

The Division zone form the satellite images are to be classified by the ERDAS SOFTWARE using. By the field verification /ground tooth prepared map with scientific. The error matrices from the supervised classified image and field verification for the kappa statistics. Calculate / analysis the attribute of the individual classes in the satellite image. Final attribute are prepared for a land use and verified the classes by the field verification, spatial and spectral matching also.

IX. DATA USED

- Primary data collected from the mining Agency(Mine Planning, local /regional maps)
- Toposheet have collected from the Geological survey of India in 1:50,000 scale.
- Regional maps (Geology, Geo morphological and previous land use maps).
- Satellite image collected glcf site.
- Land sat ETM⁺ Satellite image (date, 26-10-2001).
- Google image.

Remote Sensing Data	Landsat ETM ⁺ Satellite image
	Google Earth image
Co-lateral Data	Toposheet
	Regional maps

X. THE ROLE OF LAND-USE

Human systems depend critically on the state of the environment. Managing a sustainable evolution of land-use systems at the regional scale concerns various themes of vital importance:

Land-use/cover changes affect the hydrological cycle both qualitatively and quantitatively by influencing how precipitation is intercepted, evapotranspired, and retained in soils, which in turn determines the amount and speed of runoff. Land-cover change also influences local soil erosion and nutrient losses. At the scale of river basins, it determines water availability and the intensity and frequency of flooding;

Ecosystems and land in general store waste materials and provide critically important purification functions. The ability to provide these services is threatened by pollution and land degradation due to inappropriate land use, or over-exploitation that transgresses capacity thresholds. (Options summer, 1999)

- XI. ENVIRONMENTAL FACTOR**
- Eco-System Management
 - Air/Water Pollution Control
 - Water Resource Management
 - Flora/Fauna Conservation and Management
 - Land Use Planning
 - Social Sciences/Rehabilitation
 - Ecology
 - Environmental Health
 - Subject Area Specialists

So SCIENTIFIC INVESTIGATION is the important part of my research work, I highly indicate the investigation of mining area with respect to satellite images and demarcate the effected of surrounding area and finally there sustainable environmental management.

XII. IMPACTS ON LAND USE

There might be a considerable impact on the land in my study area but the mining activities as there are a lot of mines in and around this area. However, the economic needs of the local people who are economically backward are being met to a large extent. Considering the existing Agro-climatic conditions, in future there may be very little possibility for any change in the present land use pattern.

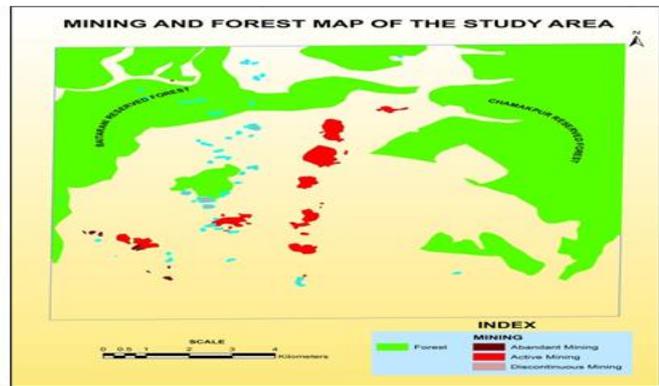
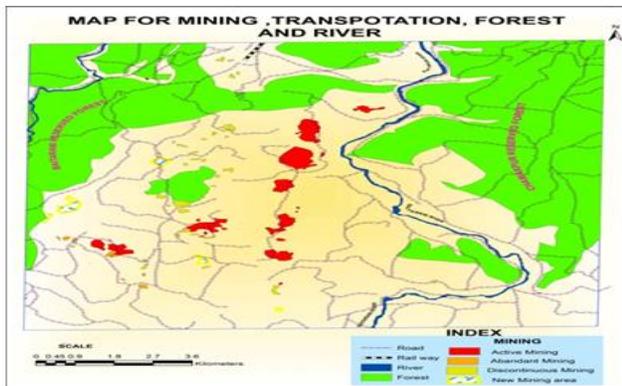


Figure3: (a) Map for Mining, Transportation, Forest and River (b) Mining and Forest map of the study area

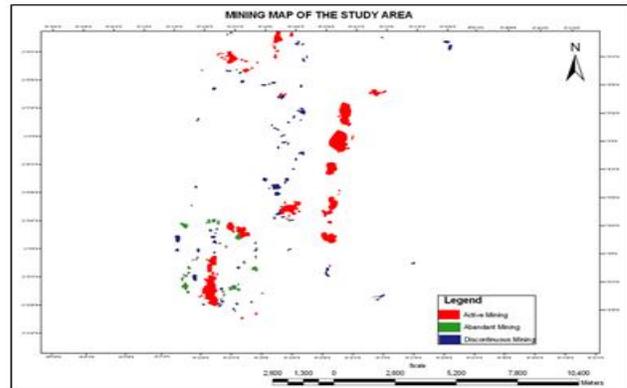
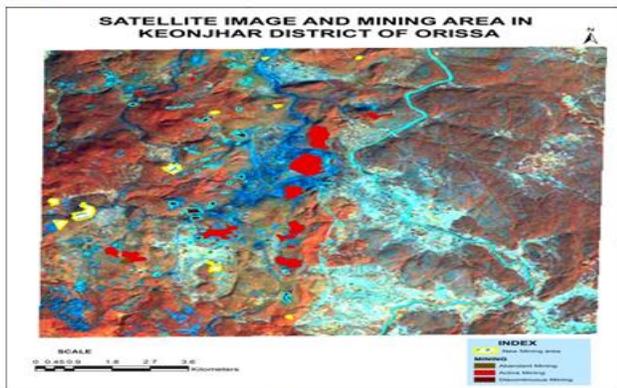


Figure4: (a) Map for Mining with respect to Satellite image (b) Mining map of the study area

Above showing the Map, that scientific investigation of the environmental impact of mines in the study area has been delineate for the purpose of transportation ,status of forest and mining zone with respect to satellite image. but here the area can be approached from Keonjhar town covering a distance of 56 KM road consisting of 7 km on NH 215 (Panikoili-KeonjharKalta) and 49 Km all weather roads between NH215and Srikagutu on Palaspanga- Bamberi road. It may be due to large scale of deforestation and vehicular movement. Similarly change in land scape is resulting in to affecting the solar radiation thus increasing the temperature. Apart from it, reduction in green cover is the major reason in alternation of this. Another reason of this air quality may be because of presence of dense forest in the

study area. It has been found out that forest comprises more than 50% of land use cover of the study area which acts as sink for any sort of air pollution and map (b) Above showing the features, there are three type of mining located in the area.

- Active Mining
- Abandant Mining
- Discontinuous mining

The big area covered by active mining that continue speeded in sounding area but in mining of abundant that quite low located in the area and lastly discontinues mining has been showing the lower part of active mining.

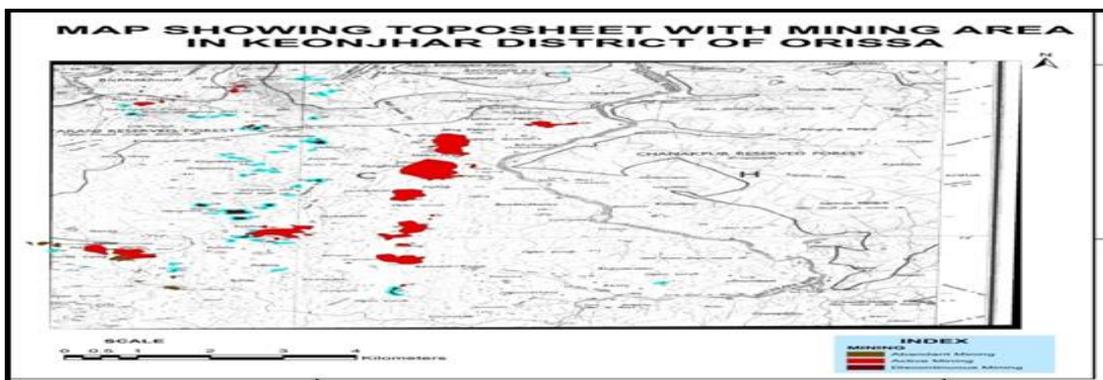


Figure4: (a) Map for Mining with respect to Toposheet.

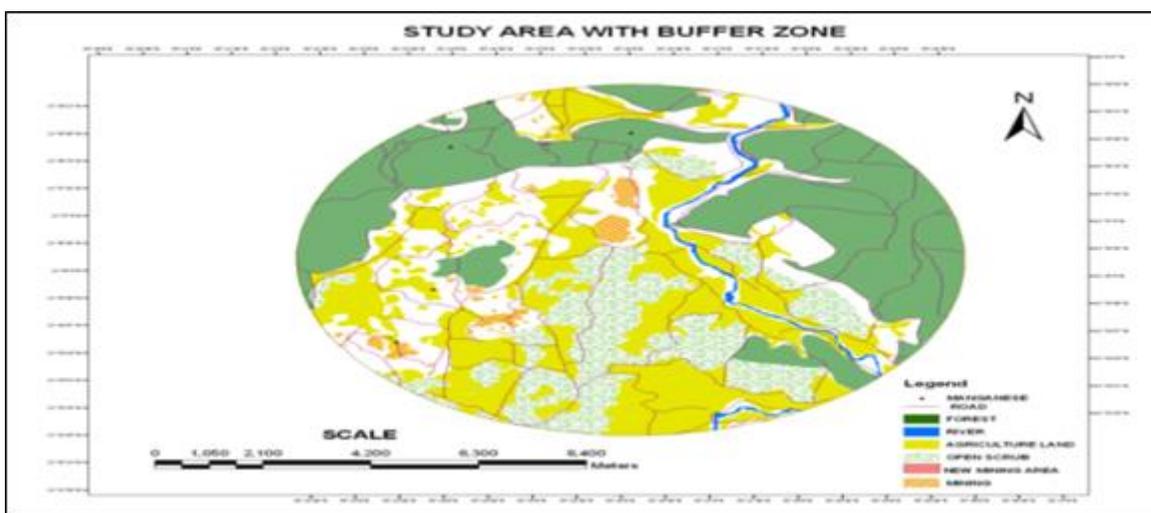


Figure 5: 18km buffer is prepared around the Joda block to delineate the impact area.

In figure4, 5 maps showing that mining map have to create in the Toposheet to tally with satellite image and finally create the buffer zone in the study area to gather investigation classes.

XIII. USE OF MINERALS

The ore produced from the mines are entire sold in domestic market and the size specification of the iron depends on the requirement of customer. A sponge iron plant in the stay in the near place. So which is managed the iron from the place. Iron are produced will be consumed for captive use in the sponges plant mainly for internal consumption in steel making shop.

XIV. IMPACTS DUE TO TRANSPORTATION OF THE MINERAL

Impact on existing environment & Local infrastructure

Major impact is Dust Generation

- Increase in Gaseous Pollutants like SO₂, NO_x
- Noise Pollution Control measures
- Installation of Dust Suppression System & Regular Water Sprinkling on haul roads
- Proper maintenance of Transportation vehicles
- Checking up for overloading of Transportation vehicle.

- Regular Air Quality Monitoring to check increment of pollutants.

Open cast mechanized method of mining is being adopted with the benching pattern of 6m height x 6m width. It involves deployment of machines like Wagon drill, excavator and development also followed by drilling, blasting, excavation, transportation, communication, sorting, sizing blending and dispatch.

XV. EXISTING MANPOWER

The mine is working with adequate number of management and technical personnel with the anticipated production of next five years. There is scope of further increase in the management and supervising manpower along with the miners and the hazri workers. Including Managerial, Skilled, Unskilled Personnel & laborers.

XVI. LAND DEGRADATION

Open cast mining causes various types environmental pollution. It is predicted that the process of mining have little impact on the existing ecological conditions of the project area. The increase in production in mine and other allied activities in the area shall have additional impact on abiotic and biotic environment of the area (although not significant) various environmental safe guards have been proposed to implement in the form of my study area report.

XVII. ENVIRONMENTAL CONCERNS

Open cast mining causes various types environmental pollution. It is predicted that the process of mining have little impact on the existing ecological conditions of the my study area

.The increase in production in mine and other allied activities in the area shall have additional impact on abiotic and biotic environment of the area (although not significant) Various environmental safe guards have been proposed to implement in the form of my study area report.

XVIII. DESCRIPTION OF THE ENVIRONMENT

Meteorological data have been collected at the pre-defined station located in the study area. Meteorological data such as Rainfall, Temperature, Humidity, Wind speed & Wind Direction have been generated as the primary data. Secondary data on meteorology have also been collected from the nearest station i.e. Keonjhar.

XIX. CLIMATE

The area experiences dry to moist subtropical climate with summer from March to May and monsoon from June to August. May is the hottest month and December to January is colder months.

But the average annual rainfall recorded for the last twelve years (1990 – 2001) in the region is 1366.78 mm. The annual rainfall recorded during last couple of years is in the range of 1200 – 1400 mm. On an average 90% of rainfall is received during monsoon from June to August. Similarly Maximum rainfall recorded is 537.68 mm during July, 1990. The maximum temperature of 39.460 C is found to be in the year 1994, while the minimum temperature of 12.70C is recorded during in 1992. Temperature recorded from the Meteorological station fixed in the study area during the study period indicates that the temperature ranged from 22.1 to 44.20C during March 2009 to May 2009.

Month	Wind Speed			Temperature			
	Mean	Max	% of Calm	Mean (Dry Bulb)		Highest	Lowest
				Max	Min		
October	3.60	47.88	23.13	42.50	24.60	36.20	24.20
November	3.87	25.92	20.69	32.80	16.70	33.70	13.30
December	4.82	30.24	0.00	29.80	13.80	30.60	13.30

Source: District statistical handbook.

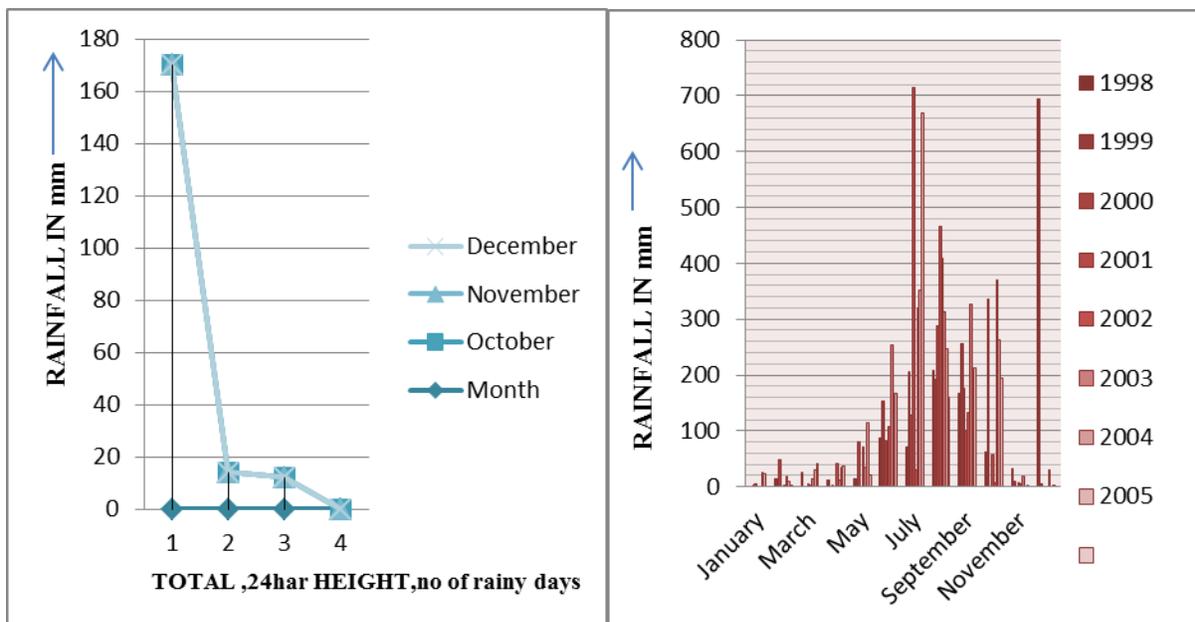


Figure 6: Rainfall of the study area and Yearly Rainfall data in the study area.

XX. WIND SPEED AND DIRECTION

The data on wind speed and wind direction have been collected during the study period. Wind direction and Wind speed play a vital role to disperse the containment of dust in the local surrounding in the transportation of dusts. The maximum wind speeds recorded during the study period were 18.6 Km/hr during the study period. Predominant wind direction is SW-SE. Daily data have been collected and a wind rose diagram has been prepared.

XXI. IMPACT ON BIODIVERSITY

Impact on Flora: The floral population in the core zone is very less. The lease comprises of forest land but the mining is confined to the broken up area & hence there will be no impact on the Floral Population within the area zone. The flora is likely to be affected as there are a cluster of mines around the mining area. Sal, Kendu, Mahul are the most dominant species in the forest in this region. Other plant species found are mainly Sisham, Bahada, Arjun, Kusum.

➤ *Impact on Fauna:* No endangered animals are found within the study area. But there will be some impact on the faunal diversity in the area due to heavy frequency of the mines in the study area. As this region is thick in forest cover, animal inhabitants are also found in the regions which are mainly Elephant, Bear, Jackal, Monkey etc.

XXII. IMPACT OF GROUND VIBRATION

During mining operations vibration is generated from various sources like transportation vehicle, equipment & machineries etc. Blasting operation not only cause vibration but also air blast. Among these, vibration and air blast from the blasting is most significant, as it has potential to cause

community concern. The vibration and air blast from blasting can lead to community concern primarily due to fear of structural damage.

XXIII. RISK ASSESSMENT & MANAGEMENT

Following hazards may occur during the course of mining
Fire hazards, Slope instability, Erosion and sedimentation, Road Accidents, Falling of boulders Blasting hazards

Following procedures will be followed for effective management of any disaster in the mine.

- Step – 1 : Identification of Disaster risk
- Step – 2 : Identification of persons at risk
- Step – 3 : Removal of hazard
- Step – 4 : Evaluation of the risk
- Step – 4 : Control measures to be taken

XXIV. ENVIRONMENT MANAGEMENT PLAN

- 1) Measures for controlling air pollution
 - Regular water spraying on haul roads. The volume of dust rising from waste dump areas & ore, roads, etc. by action of wind shall be checked by planting grasses and broad leaf trees. Ensuring transporting vehicles not to cross stipulated speed. Exhaust fumes in the internal combustion engines used in excavators, dumpers, dozers and other machinery shall be minimized by ensuring vigorous maintenance and stringent overhaul schedules.
- 2) Measures for controlling water pollution
 - Proper drainage system shall be done within the study site. There will be no effluent discharge from the project site, so the chance of water pollution is negligible. Appropriate measures shall be taken to ensure that the surface water quality in the project area is within permissible limits. Before water is supplied for consumption particularly for drinking purpose it has to be ensured that the water is free from any pathogens.

3) Solid Waste Management

The waste generated during conceptual mining period will be in the tune of 62.292 lakhs cum, out of which 37.375 lakhs cum of materials shall be used for construction of road, Railway siding and reclamation of quarry and the remaining 24.917 lakhs cum shall be dumped south-eastern side and western side of the lease area as ear marked in the conceptual plan. This will cover an area of 20 hec. But I mention to only small part of my study area.

4) Occupational safety and health

To avoid any adverse effect on the health of workers due to dust, noise and vibration etc. extensive measures has to be adapted related to safety aspect. Regular maintenance and testing of all equipments & machineries as per manufacturer's guidelines. Periodical medical examination of all workers by medical specialists shall be conducted.

5) Socio economic measures

The work, does not involve any displacement of human habitation, hence no habilitation package is needed for displacement. The activity envisages the deployment of local laborers. So, it is likely that the general economic condition of the local people will improve. The peripheral development package will also improve their health and sanitation. Health and education facilities created in the project shall be extended to villagers also. Roads development in the project shall be utilized by the villagers. Providing employment to local people will be the major factors for upliftment of the society.



Figure7: Photographs collected from different places in the study area.

XXV. RESULTS AND DISCUSSIONS

A rapidly changing economic profile in mineral sector is putting a two-way pressure on environmental and social changes on the ground. This is leading a two way pressure on environmental institution. On one hand there is a growing public awareness demand for better environment management, while the level of non compliance of polluted industries is increasing. Rapid growth in industrial & mineral sector is increasing workload for the environmental regulators to process the application, proper monitoring & enforcing compliance and to respond to large number of public complaints. The ability of state institutions to manage the environmental & social impacts of mining is also lacking.

The study area showing that total coverage of the land like vegetation, forest, mining activity zone and drainage cover area .but deeply see the total area is mining activity .that for the

results is show the forest and vegetation land is going to decrease from previous production or planting .The total forest cover is 65% in1975 (Ref. Toposheet 1975) but now we observe only 45% area are under forest cover (Ref.Recent satellite image) and also the increased mining activity. Other part of the way is shown that pollution is so much speeded that surrounding area is cover by dust. So the environment is highly polluted and not suitable for habitation. Malaria and other vector borne disease are spreading in that area

XXVI. CONCLUSION

The present study will be very useful in assessment of some change in land use pattern due to mining activity. The change in agriculture and forest land due to this activity will further help in actually finding out the adverse effect on vegetation of the area. This result of study will certainly be helpful in designing the mining or land use management plan and conservation of the study area which is a vital step in ecological planning .The proposed infrastructures facility shall be of use to people of the area. The roads, transportation facilities and rest sheds can be utilized by the community of the area. The revenue of the State Govt. shall be definitely increasing due to the enhanced production. The study area is surrounded by industries from all sides. The entire project area is devoid of any endangered flora and fauna.

REFERENCES

- [1] K. Sarma and S.P.S. Kushwaha., (2005) coal mining impact on land use /land cover in jaintia hills district of Meghalaya, India using remote sensing and GIS technique.
www.csre.iitb.ac.in/~csre/conf/wp-content/uploads/.../OS5_17.pdf
- [2] P. Rabade., (2008) Environment impact assessment of land use planning around the leased limestone mine using remote sensing techniques.
- [3] S.N. Paul., (1867) rapid environmental impact assessment and environmental management plan.
- [4] Directorate of Economics & statistics(2010) .Bhubaneswar Orissa
- [5] CHILIKA DEVELOPMENT AUTHORITY state of Orissa(2010)
- [6] http://www.iiasa.ac.at/Admin/INF/OPT/Summer99/guenther_fischer.htm
- [7] <http://www.gocbse.com/posts/show/914257.htm>
- [8] www.vasundharaorissa.org
- [9] <http://unesdoc.unesco.org/images/0014/001449/144996m.pdf>
- [10] http://www.iiasa.ac.at/Admin/INF/OPT/Summer99/guenther_fischer.htm

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An Ethnographic Profile of Dhulis of Cachar, Assam

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Abstract- The Dhulis in Barak valley are the depressed section of society who occupy a very degraded social status in the social ladder of caste hierarchy. They are known as duglas or dhulis, or Shabdakar or badyakar. The main occupation of the community is beating dhools or drums, a musical instrument made up of wood and skin. Most of the dhulis write surname das. The dhulis or duglas of the district consists of mainly two groups of populations, one being migrated from the then East Bengal and other from West Bengal mainly from its Birbhum district. The dhulis of Cachar is highly dominated by the migrants from west Bengal in terms of its number¹.

I. WHY ETHNOGRAPHY?

The depressed community of the Indian society not only do not have any visibility in the development map of the society but also they are hardly known to the engineers of development. Very less is known about their culture, knowledge, religious practices, beliefs, ideology, outlook, worldview and the ethnomethodology of their life. The literature on this society is either hollow or blank if some one turns over the pages on their ways of producing and reproducing their social structure..

Barring a few, who are dominant numerically or a better of in terms of bargaining for their status, most of these are not known to academic community or development planners. This is highly evident in case of the community of Dhulis who have migrated from West Bengal. This made it necessary to get a holistic view of the life and living of this community. Hence is an ethnographic approach.

II. THE MIGRATION OF THE COMMUNITY

The community came to this region out of a deal at the time of British rule. A group of Dhuli people came to this region only. It seems that the people count five generations in this valley. It is known that the community was in a precarious living condition which led them to migrate to this region in search of their livelihood, i.e. working in the tea garden. As narrated by one member of the community, there was a story of their migration. The story says that the British told these people to come to Assam, where the money plant are sown and any one can avail the chance to collect money from that plant, once they come to Assam. A sincere thought tells the fact. This plant was nothing but the tea plant which is also known as the green gold of Assam. Important to mention here is that the Dhuli came to this part of assam in a period when a number of communities many of whom being tribals, have migrated to the state in hordes in different phases. All of them migrated to work as labourer in the state. The British could keep the profit margin high paying abominably low wages to the laborers brought almost as slaves from the poverty

stickmen areas of Bengal, Bihar, Orissa and Madras presidency. By 1905-06 the adult laborer on the plantations in Assam rose to 417,262 of which only a few thousand were local. By 1911, the tea garden laborer population exceeded 13 million. The tea garden labourers in Assam thus became an important demographic component of Assam.

Population

The population of this community was 4013 which was 0.44 percent of total SCs of Assam in 1971. The literacy percentage of this community in the same year was 15.02 percent of total SC population. According to 2001 census total population of Dhuli community is 6,364, which is 0.3 percent of total SC population in Assam.

Geographic distribution

Around 1514 Dhuli families are settled in different parts of the district, numbering around 8581 member in its totality. As the main reason for the migration of this community was to work in the tea gardens of Assam, all the clusters of dhulis are settled in the vicinity of tea gardens of the district. They are highly concentrated in Dharamkhal, Dudh patil, Punichhera etc. The Dhuli distribution can be assessed from the following:

- Dharamkhal : 293 families
- Dudh Patil : 92 families
- Panichhera : 158 families
- Binodnagar Tea garden : 52 families
- Bhubandor : 63 families
- Jaroiltola : 62 families
- Chenkuri Bagan : 58 families
- Dakhin Tilla : 13 families
- Bishnupur : 37 families
- Sicooree bagan 10 families
- Sicooree camp 7 families
- Dormikhal 38 families
- Dikhush 78 families

The social organization of the dhulis

The Dhuli community belongs to the depressed section of the lower castes of the Hindu society. Barring a few, all the dhulis of the district use surname Das as is used by the many lower caste groups like Koiborto, Patni, Namasudra etc. The community keeps its traditional values and caste rule intact despite the change of occupation of most of the community members.

The entire community is divided into clan or gosthis. The size of a gosthi varies from few to 200 members depending on the willingness of the members to continue with such large groups. All the members of a clan has to follow different types of rites and rituals pertaining to marriage and death and also other

programs related to the members. An example can be given that if a member of the *gosthi* dies then each member of the clan become polluted and has to go through a ritual process of purification before the main ritual of the funeral.

The organizational structure of the caste administrative body is as follows:

Bongeswar
Poramanik
Dalal
Murol
Srimukhyo
Mukhyo
Kole (man)

The *Dhulis* have their own *Shasan* or rule which they assert is more stronger and older than the Constitution of India. No one knows when this system of administration was established, but consider it to be practiced from the time of their forefather. The *shasan* of *Bongeswar* is spreaded through out all the *Dhulis* in different parts of Barak valley where *Dhuli* settlements are observed.

Each status is ascribed. The son of *Bongeswar* only becomes *Bongeswar*. If there is no son of *Bongeswar* the position goes to the next male member of the family or larger kin unit of *Bongeswar*. Similar is the case with other positions. All *Dhulis* believe in that and is very much aware of the status and role of each member of their administrative unit. In each village there is one *Murol* and the successive positions.

The role of *Gyati* is well understood from the felicitation of the *gyati* members at the time of marriage and funerals. The whole body of *gyati* is invited by the host of the program and a permission of *gyati* is taken before the feast is started. The very ritual does not start until the caste body gives blessing in a particular way. Even at the time of marriage not only the bride is blessed in a ritualistic way by the caste body, but also the newly arrived groom is also blessed by the *gyati* members.

The caste in practice

The role of caste *panchayat* is very much observed among the members of the community. Each activity within the community must follow the dictat of caste *panchayat*. Most of the important decisions about the community is taken through a meeting called *baisha*. There are two kinds of meeting : *baisha* and *chourashi* . The people are still not clear what does a *chourashi* mean yet they can make out the difference only in terms of size of the population that attend the meeting.

An understanding of the rule of caste *panchayat* can be made from the writing of G S Gurhye 2

Some of the affairs that the body looks into are:

- 1) Eating, drinking or similar practice with the community with which such social intercourse is restricted.
- 2) Marrying a member of another caste or community.
- 3) Seduction or adultery with married women
- 4) Refusal to keep promises of marriage
- 5) Non-payment of debts

6) Petty assaults

7) Defying the customs of caste regarding feasts etc. during marriage and other ceremonies.

The governing body of caste performs all the functions that a caste *panchayat* does. The violation of caste rule is punished by the body. This takes place in the form of 1) out-casting either temporarily or permanently 2) impositions of fines 3) feasts to be given to the caste man 4) apolosing to the members of the caste in public. This kind of practice can be understood from two recent incidents of such violation of custom and rule. The first incidence was the defying the customs of the caste regarding feast . It was informed that the host of the marriage party did not invite the caste member according to caste norm.. As a result the *bongeswar* and other members of *sashan* did not attend the marriage party, This also resulted in non attendance of the party by other members of the caste. The marriage party remained almost unattended. This resulted not only an environment of unease and unhappyness of the family members of the host but also led to an enormous wastage of food items accounting to an waste of a couple of lakhs of rupees. The host learned a lesson from the incident and went to *Bongeswar* to forgive him. The member was accepted by the fellow members for which he had to vow in front of the community that he will not repeat such mistake.

Another instance of such violation was the elopement of a girl of the community with a different caste member from Bihar. This caused to resentment of the members of the community. A *baisha* was called on the request of the family members of the girl. The *baisha* suggested that since the marriage has taken place so , there is no point to take further action .The *baisha* asked ntimated the girl's parents not to keep any further contact with the girl and the family of her husband .

The caste exogamy is so highly prohibited that the violation of this rule may not only lead to the ostracisation of the immediate family of the defier but also the immediate kins of the kin members

Religion

As is known, the *Dhulis* are the believer of Hindu religion. Along with the worship of the other Hindu Gods and goddesses, the *Dhulis* consider *Gandheswari*, a form of Goddess *Durga* as their community god. Though no reason behind this could be explored, the community considers that there can not be any *dhuli* who do not worship *Gandheswari*.

The members of the community are again follower of different sects. Some are the follower of lord Ramakrishna, some follow the path shown by Anukul Thakur, some follow Swarupananda , again some follow the path shown by the pundits who come from Benaras.

As the community came to the region to work in the tea garden, the settlement of *dhulis* developed along with the settlement of other laborers migrated from different parts of the country mainly Orissa, Madhya Pradesh, Bihar, Uttar Pradesh, Rajasthan, West Bengal etc. this has an impact not only in their language, food habits etc but also in their religious practices. Very often the rituals are performed by the priests of the *Hindustani* community. As is the practice, the priest of one linguistic community is usually from the same community, an

unusual case is observed with this community which actually belong to Bengali community, but about 50 percent of the rituals are performed by the *Hindustani* priests. An admixture of Bengali and Hindustani ritual is observed in such cases when the mantras are chanted according to the Hindustani style but certain customs are followed according Bengali tradition. The calling of priest from other community may be the cause of lack availability of Bengali priests in the immediate locality and the growth of a tea garden culture due to a process of acculturation or cultural homogenization that is very often observed by the scholars³.

Family, marriage and kinship

The family of the *dhulis* are generally nuclear in type, sometimes extended family is also observed. The descent follows male line. Marriage takes place mostly through negotiation. The residential pattern follows patrilocal type.

The community has a deep sense of kinship. The community is highly divided into clan or *gosthi*. In one of the settlement of Dhulis, namely Dharmakhal, there are near about 25 *gosthis*. The size of the *gosthi* varies from few to even 200. Very often the *gosthi* gets separated when the size becomes very big and it becomes difficult for the members to follow the rules of *gosthi*. This separation or break up takes place through a ritual known as *gua kata*. It is observed that betal nut plays an important role in any ritual. The invitation to clan members follow a symbolic gesture of sending betal nut along with invitation letter. So when a breach or separation of *gosthi* takes place it involves ritual where few betal nut are taken and separated in the name of two *gosthis* in the presence of *Bongeswar* who is the head of all *gosthi*.

Occupation

The actual occupation of the dhuli community is to play *dhools* and make *dhools* or drums. It must be remembered that the community came to this region in horde in search of life and livelihood. The community is unable to estimate how many members of the community came to this region at the time of their migration. Many families are settled there for four or five generations. After their migration most of the forefathers of the present dhuli population started working in tea garden. As a result they were given a land entitlement and wages besides some facilities to get certain item of daily need (rice, oil etc) in subsidized rate. But it has been observed that due to increase of its population and gradual deterioration of the economic condition of the tea garden many of these dhuli community have left the tea laborer's job and started being engaged in different occupations. Thus occupational mobility of this community makes an interesting observation. There was a first generation of change to occupation of labourer. The third generation shows a major change where around 15 to 20 percent of them are engaged in tea garden. Around 20 percent of them are engaged in business and a major portion of them are engaged as day laborer in nearby township or areas. A handful of them are found to be engaged in government services. Around 5-7 percent of the members practice their traditional age old occupation. The rest of the population are engaged in agricultural activities.

The present generation of the community do not show much interest in their age old occupation as most of them consider that unrewarding in terms of money and status. It is only a handful of dhulis who continue with their traditional occupation, due to the fact of lack of any other source of earning.

Social upliftment and positive discrimination

The community is yet to hit the strike in so far as the absorbing of the benefits of positive discrimination is concerned. The community is yet to count ten graduates from its entire set of population. As is informed by the Muro of dhuli community of Binodnagar garden, the ninety families settled over there can count only a single matriculate of its total population in that garden. The Dharamkhal tea estate which hosts more than 300 families, is yet to count 10 graduates from its total population settled over there. The picture is same with all the other Dhuli constellations.

In so far as the accessibility to job opportunity is concerned, the community is yet to avail it. Out of the total Dhuli population there is hardly one percent of the Dhulis who could avail the job opportunity provided by government of India to the underprivileged section of the society.

A spatial mobility followed by occupational mobility in the new settlement in Cachar thus could not bring much change in their lot and social standing in its starting of new life and livelihood in the region. Some noticeable changes are also observed in the community. The community witnesses few graduates and few have started climbing up. A few are uplifting their social status by engaging in business. The changes though appear microscopic but the trend gives some hope for a better future. Though the present scenario of social upliftment is grim, the future seems to be better to the community as is envisioned by the members of the community.

REFERENCES

- [1] Das, Bhakta 1986 A Glimpse of the Scheduled Caste and their Socio-Economic Development in Assam Omsons Publication new Delhi and Guwahati
- [2] Ghurye, G S 1992 Features of Caste System in Dipankar Gupta Social Stratification Oxford University Press
- [3] Biswas, Roma Prasad 1413 (Bengali year) Borak Upatyakay Cha Shramiker Sanskritik Parisar Srijan Graphics and Publishing House 1413, p 19

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Water Pollution and Public Health Issues in Kolhapur City in Maharashtra

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Abstract- Present paper is a micro level case study of Kolhapur city in Maharashtra. This study is based on secondary sources of data from different government reports, research articles from journals and books and internet sources. In this paper, an attempt has been made to understand the problem of water pollution of *Panchganga* river due to urbanization and industrialization and its impact on public health in Kolhapur city and measures to be taken to deal with this problem effectively. Researches have proved that, water pollution is one of the most leading causes of public health issues and mortality. Water pollution is the outcome of urbanization and overpopulation. Water pollution is caused due to over utilization of fertilizers by farmers, sewage from hotels, hospitals and homes and industries in the city. The polluted water of *Panchganga* has led to spread some dangerous infectious diseases like Diarrhea, jaundice, gastro and fever etc. in Kolhapur city. Therefore; there is a need of government intervention with the help of active peoples' participation.

Index Terms- Water pollution, Public Health, Case study and Government Intervention.

I. INTRODUCTION

India has been undergoing industrial revolution in a big way during the last three decades. With the recent liberalization of industrial policy, it has got a further boost. Economic conditions of the common man will improve, prosperity will prevail. This is all provability 'one side of the coin.' The other side of coin is not very bright. The industries spend solid, liquid and gaseous substances in to the environment. Unless such substances are effectively managed, our environment may get damaged irreparably. The scientific and technological advancements and mismanagement of natural resources have given rise to numerous environmental problems such as pollution of water, soil, air radiation and noise, with consequent adverse effects flora, fauna, human health and well-being (Shastri S.C. 2002, P.137).

The environment is under more sustained threat from human activity in the 21st century than at any other time in the history with extensive potential social and health consequences. Human health broadly defined, encompassing physical, mental and spiritual dimensions, is highly dependent on the context in which we live. Any threat to our environmental certainties, therefore, has a significant impact on human well-being.

In this present era of globalization has put before us some chronic public health issues due to the industrialization and urbanization. Multinational corporations (MNCs) have been spread all over the world. The environmental issues are more affecting to the urban areas than rural. Studies show that, today,

the quality of health is decreasing due to global warming, climate change and pollution. The industrialization has produced the challenge of water pollution and it is affecting the public health at large.

II. REVIEW OF RELEVANT LITERATURE

Water sustains life. An adequate supply of fresh water is needed for domestic as well as industrial processes. Water bodies have become both resources for fresh water and receptacles for domestic and industrial wastes leading to "water pollution". According to Chapman (1996:6), "Pollution of the aquatic environment refers to the introduction by man, directly or indirectly, of substances or energy which results in such deleterious effects as harm to living resources, hazards to human health, hindrance to aquatic activities including fishing, impairment of water quality with respect to its use in agricultural, industrial and often economic activities, and reduction of amenities.

Water pollution affects water quality. Water quality refers to the overall quality of the aquatic environment (Chapman, 1996). The description of the quality of the aquatic environment can be carried out through a variety of ways. It can be achieved through quantitative measurements such as physico-chemical determinations (in the water, particulate material, or biological tissues) and biochemical/biological tests (BOD 16 measurement, toxicity tests) or through semi-quantitative and qualitative descriptions such as biotic indices, visual aspects, species inventories, odor, etc. These determinants are carried out in the field and in the laboratory and produce various types of data which lend themselves to different techniques (Chapman, 1996:7). The quality of freshwater at any point on a landscape reflects the combined effects of many processes along water pathways and both quantity and quality of water are affected by human activity on all spatial scales (Peters and Meybeck, 2000). The Yamuna River in New Delhi had 7,500 coliform bacteria per 100 ml (thirty-seven times the level considered safe for swimming in the United States) before entering the city. The coliform count increased to 24 million cells per 100 ml as the river picked 20 million liters of industrial effluents every day from New Delhi. Mortality rates were thus high and life expectancy low in those areas (Cunningham and Saigo, 1999). Man's health to a large extent is dependent on access to clean potable water. Unfortunately, not everyone on the planet has access to this precious resource. Some persons have access to water but such water is polluted. Polluted water could be a carrier of many diseases and when it is ingested into the human system, it could have negative implications for human health. Persons

who use polluted water are in danger of contracting water-borne, water-hygiene, and water-contact or water-habitat vector diseases. Water borne infectious diseases are those in which the pathogen is present in water and ingested when the water is consumed.

Water-habitat vector diseases are transmitted by insect vectors that spend all or part of their lives in or near water. Examples include malaria and filariasis as well as onchocerciasis which has the aquatic fly as its vector (Bartram and Balance, 1996). According to UNDP estimates, more than 1 billion people are denied the right to clean water and 2.6 billion people lack access to adequate sanitation (UNDP, 2006: v). In Sub-Saharan Africa, it is estimated that 42 per cent of the population is without improved water (WHO, 2004:2). The absence of improved water sources puts people's health at risk and may force them to extract water from alternative, unsafe sources, exposing them to diseases such as diarrhea, dysentery, cholera, typhoid and schistosomiasis (WHO, 2001). The WHO estimates that as many as 80 percent of all infectious diseases in the world are associated with insufficient and unsafe water (Smet and Van Wijk, 2002: 16). Furthermore in less developed countries (LDCs), it is estimated that 25 million people per year die from contaminated water; three-fifth of whom are children and worldwide, every hour 1,000 children die from diarrhea related diseases (Kaufman and Franz, 1996).

According to Wolff (1999), when significant improvements in the quality and quantity of water are made in less developed countries, there would be about 2 million fewer deaths from diarrhea among children. In addition, research showed that access to safe water reduced child death rates by more than 20 percent in Cameroon and Uganda whilst in Egypt and Peru, the presence of flush toilets in the house reduced the risk of infant death by more the 30 percent (UNDP, 2006).

It has been estimated that 50,000 people die daily worldwide as a result of water-related diseases (Nevondo and Cloete 1999). A large number of people in developing countries lack access to adequate water supply. In South Africa, it has been estimated that more than 12 million people do not have access to an adequate supply of potable water (Nevondo and Cloete 1999). Polluted water also contains viruses, bacteria, intestinal parasites and other harmful microorganisms, which can cause waterborne diseases such as diarrhea, dysentery, and typhoid. Due to water pollution, the entire ecosystem gets disturbed. Unsafe drinking water, along with poor sanitation and hygiene, are the main contributors to an estimated 4 billion cases of diarrhoeal disease annually, causing more than 1.5 million deaths, mostly among children under 5 years of age (WHO 2005). Contaminated drinking water is also a major source of hepatitis, typhoid and opportunistic infections that attack the immuno-compromised, especially persons living with HIV/AIDS (UNICEF 2011). Almost 1 billion people lack access to safe and improved water supply. More than 50 countries still report cholera to WHO (World Health Organization). Millions are exposed to unsafe levels of naturally occurring arsenic and fluoride in drinking water which leads to cancer and tooth/skeletal damage. An estimated 260 million people are infected with schistosomiasis (WHO 2004).

III. OBJECTIVES OF THE STUDY

1. To understand the connection between water pollution and public health.
2. To discuss how polluted water of *Panchaganga* is affecting the public health in Kolhapur city.

IV. METHODOLOGY

This study is a case study of Kolhapur city. It is a micro level study. Kolhapur city is located at 16° 42' N and 74° 14' E, having mean sea level of 570 m, stands on rising ground on the south bank of the river Panchaganga. The river Bhogawati is renamed as Panchaganga from Prayag Chikhali, after the confluence with 5 rivers namely Kumbhi, Kasari, Tulshi, Dhamani and Bhogawati. The river flows towards south-north side and meets river Krishna at Narsinhwadi, Tal: Shirol, Dist: Kolhapur. The entire catchment area of Panchaganga river lies in Kolhapur district (*Study Report on Panchaganga River*).

Kolhapur city is subjected to recurring outbreaks of water borne diseases and epidemics like, hepatitis and gastrointestinal diseases. This is due to the fact that pollution of Panchaganga river is one of the most important and burning problem till date. Panchaganga river gets polluted by the discharge of the municipal and industrial wastewater through various nallahs viz. Jayanti nallah (49 MLD), Dudhali nallah (17 MLD), Bapat Camp nallah (10 MLD) and Line Bazaar nallah (6 MLD). There is no underground drainage in the city and drainage is mainly by surface drains. The drains are let into the Jayanti nallah and the Panchaganga river. Municipal water supply to Kolhapur city is through two sources viz, Balinga water works having a capacity of 41 MLD and Kasaba Bawada water works with a capacity of 36 MLD. This supply is augmented by 2

MLD from Kalamba water works as well as from ground water supply through private bore wells. Consequently residents of Kolhapur city are anguished by the constant threat of outbreaks of epidemics (*MPCB Report; 2005-06*). Thus it is worthwhile to assess the quality of the Panchaganga river water to study its possible environmental impacts.

The present paper is entirely depending on secondary sources of data which have been collected from various reports of the government apart from that; books, journals and internet were also used. The researcher has used recent data from various studies on this issue.

V. WATER POLLUTION AND PUBLIC HEALTH ISSUES

It is estimated that 75 to 80% of water pollution by volume is caused by domestic sewage. The remaining is industrial wastewater, which could be more toxic. The major industries causing water pollution include: distilleries, sugar, textile, electroplating, pesticides, pharmaceuticals, pulp & paper mills, tanneries, dyes and dye intermediates, petro-chemicals, steel plants etc. Nonpoint pollution sources such as fertilizer and pesticide run-offs in rural areas from the agricultural fields are also emerging as a major cause of concern. Only 60% of chemical fertilizers is utilized in soils and the balance is leached into soil polluting ground water. Excess phosphate run-off is leading to eutrophication in lakes and water bodies. Adverse

health outcomes are associated with ingestion of contaminated water, lack of access to sanitation, contact with unsafe water, and inadequate management of water resources and systems including in agriculture. Infectious diarrhea makes the largest single contribution to the burden of disease associated with unsafe water, sanitation and hygiene. Besides, the water borne diseases like cholera, jaundice and other gastrointestinal track infections are quite significant amongst the population. Certain diseases have also been encountered amongst the affected persons coming in contact with toxic effluent discharged in the water bodies by highly polluting industries.

'Water pollution is any chemicals, physical or biological that changes the quality of water and has harmful effects on any living organism that uses it.' It often has serious effects on public health.

The microorganism which is responsible for disease is known as a pathogen and the infected organism e.g. human being is called as host. Some pathogens like in the environment and are transmitted to humans directly. Pathogens are highly sensitive to their environment. There are two main reasons for this. First, their ability to survive and multiply depends on the availability of right climate and nutritional conditions; second, to cause new infections, local conditions must facilitate pathogen's spread to a susceptible host. Divert environmental factors, such as ambient climate and the presence or absence of overcrowding, clean water influence a pathogen's chances of flourishing and causing disease. Some pathogens thrive in warm and wet climates, while others only survive almost anywhere. Thus, some pathogens cause disease worldwide, while others are only found in well-defined areas where the local environment is favorable to their propagation. For example jaundice, gastro, malaria caused pathogens can thrive in polluted water. So, water pollution can affect public health.

Urbanization, Water Pollution and Public Health:

Urban population (285 million) constituted 27.8% of the total population in 2001 in India. Even at this relatively low level of urbanization, India still has the second largest urban population in the world. The Census of India has estimated that by 2026, urban population would rise to around 535 million or 38.2 percent of the total population. This means an addition of 250 million persons or near doubling of urban population in about two decades from now with reference to 2001. Similarly, the McKinsey Global Institute projects that India's urban population will be 590 million by 2030 which would be about 40 percent of the total population of the country and further estimates that by 2030, the number of million plus cities will increase to 68 of which 13 cities will have more than 4 million and six cities will have more than 10 million persons. By 2050, it is estimated that urban population will constitute nearly half of the total population in India.

The 65th round of the NSS reports that 11% of households had no latrines.

This implies that nearly three core people in urban areas defecate in open. 8% were using pit latrines and 77 percent of urban households were using either septic tanks or flush latrines. Further, according to 2001 Census, less than two-third of the urban households were connected to sewer system. The status in respect of treatment of sewage is worse. **As per CPCB report of**

2009, treatment capacity installed was only 30%. The actual treatment was estimated at 72.2 % in 2008 which implies that only about 20% sewage generated was treated before disposal in Class I cities and Class II towns (as per 2001 census). As per CPCB report brought out in 2005, about 1, 15,000 MT of Municipal Solid Waste is generated daily in the country. However, scientific disposal of the waste generated is almost non-existent.

Urbanization can affect infectious diseases positively or negatively. Overcrowding, poor housing, inadequate sanitation solid waste removal and unsafe drinking water are the causes of urban health problems. One quarter of the population living in urban area in developing world is vulnerable to diseases (WHO/UNICEF 2000).

Panchaganga River Pollution and Public Health Issues in Kolhapur City:

Report on panchganga river pollution 2009:

1. *Panchaganga* is one of the most polluted rivers in the world.
2. Every day 90 million liters/day waste water produce in Kolhapur.
3. It's capacity is only 25 million liters/day
4. The present drainage system is 30 years old and should be modified.
5. Industrial waste water, *jayanti* and *dudhali* nails, domestic waste water are the main sources of the *panchaganga* river pollution.
6. Due to huge amount of waste water KMC got 131 time notices.
7. 165 metric ton/day solid waste produce.
8. These solid waste directly go to the river because there is no solid waste management facility properly working at present in the city.
9. Besides *panchaganga* river eight MIDCs, seven sugar factories and 174 gram panchayat villages produce waste water which goes to the river.
10. The causes of *panchaganga* river pollution are industrial waste water, domestic waste water, solid waste, over utilization of fertilizers, hospitals and small businesses like hotels.

Kolhapur is blessed with the presence of *Panchaganga* river travelling along the city. However, water quality and quantity in the river is more cause of concern than pride.

The river is getting polluted due to:

- i) Mixing of untreated domestic sewage
- ii) Disposal of industrial effluent
- iii) Biomedical Sewage
- iv) Agrochemicals used in the field
- v) Mixing of Crematorium ash
- vi) Religious activities
- vii) Other sources like Hotels, Restaurants, etc.

Discharge of large amount of untreated domestic sewage from the city :

The river is getting polluted due to discharge of large amount of sewage carried out by four major sewers in the city such as Jayanti nullah, Dudhali nullah, Line Bazaar nullah and

Bapat Camp nullah. Since most of the sewage is untreated, it increases the organic load of the river water. The river water becomes highly polluted due to toxicants, bacterial contamination, plastic litters, solid waste, etc.

Panchaganga River	Total Population of Kolhapur city (2001 Census)	Water Usage (per day)	Waste water without treatment (per day)
	4.93 lakhs	120 Million Liters	100 Million Liters

(Panchganga Basin Pollution study MPCB report, 2009)

Disposal of industrial effluent

Panchaganga River Basin	Total No. of Industries	Total waste water without treatment
	2953	18.59302 Million Liter per day

The industrial effluent coming from different small industrial units, foundries spray painting units in Udyamnagar and Tanneries from Jawahar Nagar alters the quality of river water. The ground water quality also changes due to the industrial effluent.

Sewage from different hospitals, pathological laboratories:

There are total 498 hospitals and dispensaries (governmental, semi-governmental and private) and 31 pathological laboratories in Kolhapur city. Only one hospital i.e. Chhtrapati. Pramilaraje Hospital is planning for STP whereas none of the hospitals in Kolhapur city treat its waste water. The untreated sewage about 1,00,000 liters per day mixes in to the river through nullahs which is highly dangerous to the riverine ecosystem.

Effluent from other sources:

There are about 49 servicing stations in the city which generates 49,000 liters of waste water. The quality of water alters due to oil and grease content, various petrochemicals colors, etc. The waste water coming from slaughter houses and fish markets are having high organic load which is directly discharged into the nearby sewer which finally ends into the river through nullahs. The sources like hotels, restaurants, hawkers, etc. also contribute for water pollution.

Other sources of river pollution:

Sources	Total No.	Total amount of waste generated
Servicing Stations	41	2,00,000 liters/ day
Hotels, restaurants and hawkers	1044	1,49,400 liters / day
Slaughter houses waste	02	800 Kg / day
Meat shops and fish	76	1000 Kg / day

markets waste		
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Agrochemicals used in the field:

Large quantities of agrochemicals are used in the agricultural sector in the upstream as well as in surrounding areas of the river. The residues of these chemicals mix in to the river due to excess use, flooding, heavy rainfall, excess irrigation, etc. Many pesticides and chemicals when dissolved in the river water enter in the food chain. Studies have shown that many vegetables and fruits contain harmful residue of agrochemicals.

Sr. No.	Type of agrochemical	Solid state (per year)	Liquid State (per year)
1	Chemical fertilizers	78,244 Tones	-----
2	Pesticides	1,41,764 Tones	22,068 liters
3	Weedicides	34,995 Tones	21,664 liters
4	Fungicides	6771 Tones	1828 liters

Crematorium ash:

Crematorium ash is becoming one of the reasons of water pollution. There are about four crematorium sites present in the city. Each year approximately 130 tones of crematorium ash pollutes the river water. The crematorium which is most affecting the quality of river water is Vaishvadhram Crematorium located near Prince Shivaji Bridge and Bapat Camp crematorium. After burning of the dead bodies, as a ritual, the ash is disposed in the river water, which forms a layer on water surface. It traps the sunlight and prevents mixing of oxygen into the water. There is change in the physicochemical parameters of the water body. The amount of total solids, total dissolved solids, toxic heavy metals, phosphate and nitrate level increases. At the same time, amount of dissolved oxygen decreases. The aquatic ecosystem gets harmed as well as water becomes unsuitable for drinking purpose. The downstream areas of the river also get affected as well as the aesthetic beauty of the site decreases.

Religious activities:

Various religious activities during festivals produce solid waste in the form of nirmalya and idols. The idols made up of Plaster of Paris changes the physicochemical composition of water body. There are 12 sites in the city where the Nirmanlya and idols are disposed.

Sr. No.	Components Amount per year	Amount per90 Tones
1	Nirmalya	90 Tones
2	Idols (domestic)	27000
3	Idols (Sarvajanic)	600

The idols are made up of Plaster of Paris or Shadoo and coloured with chemicals. When these idols immersed in water the chemicals dissolve in water body altering water quality. The

paints are having heavy metals such as copper, zinc, lead, chromium and iron. The other constituents of the idol like bamboo, flowers, cotton, clothes and other pollutants such as eatables like prasada, coir, plastic, etc increase the nutrients in the lake and lead to eutrophication. The water column is disturbed completely during idol immersion.

Discharge of nullahs in the river basin:

There are four nullahs in the city viz. Jayanti Nullah, Dudhali Nullah, Line Bazaar nullah and Bapat Camp Nullah. Jayanti nullah starts flowing from eastern part of the city. During its course through the heart of the city, it receives waste water from tanneries from Jawahar Nagar, domestic waste from the city, effluent from fabrication units, spray painting units and foundries from Udyamnagar. Jayanti nullah basin covers 2357 ha of the city.

Patients suffering from waterborne diseases:

Year	Jaundice	Diarrhea	Dysentery	Gastro	other
2005-06	146	221	48	223	15
2006-07	85	298	84	132	23
2007-08	103	320	94	51	10
2008-09	139	241	79	79	7
Total	473	1090	305	485	55

[Source- Isolation Hospi., Kop., Apr-2006 to Apr-2009]

Water Treatment Plants:

At present water is supplied to Kolhapur city through water treatment plants:-

Kolhapur Municipal Corporation has provided four water treatment plants for serving potable and safe drinking water to the citizens. These are namely; Kalamba water treatment plant, Puikhadi water treatment plant, Bawda water treatment plant and Balinga water treatment plant.

- **Kalamba water treatment plant:** - It is the oldest water treatment plant and started in pre independence days. An earthen dam about 4300 ft. long and 27 ft. high was constructed during 1881- 83 on the southern side of the city. The treatment plant is of 8 MLD capacity. The water of the Kalamba tank is pure and wholesome and is filtered and chlorinated. Kalamba water is available only to a portion of the city i.e to B ward .

- **Puikhadi water treatment plant:** - This treatment plant is located at Puikhadi, 14 km. away from the Shingnapur pumping station. This plant is recent plant established by KMC and started functioning in the year 2001. The capacity of this plant is 50 MLD.

- **Bawada water treatment plant:** - This water works is commissioned in the year 1978. It is located 5 km away from Bawada pumping station. Initially the treated water from this plant was served to E ward and to 6 villages of eastern outskirts of city. The capacity of this plant is 36 MLD and presently this supplies water to E ward only.

- **Balinga water treatment plant:-** This water works commissioned in the year 1949 with the capacity of 10.90 MLD which was increased by providing augmentation schemes. Now the total capacity of this plant is 41 MLD and the source of the water from Bhogawati river.

Analysis report of Water Treatment Plants (WTP) of Kolhapur city

Parameter	Kalamba WTP		Puikhadi WTP		Bawada WTP		Balinga WTP		WHO standards
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet	
pH	7.78	7.74	7.31	7.36	7.2	7.08	7.02	7.10	6.5-8.5
Turbidity (NTU)	20.3	4.4	21.6	4.6	26.6	4.3	24.31	4.9	5-25
Hardness	154	124	76	60	68	52	84	60	100-500
Chloride	25.7	17.04	25.56	20.1	51.12	30.1	48.2	19.22	20-500
TDS	200	110	245	135	505	100	400	100	500-1000
MPN	1600>	nil	1600>	nil	1600>	nil	1600>	nil	0/100 ml

(Dept. of Environmental Science, SUK) (All the parameters except pH, MPN and turbidity are expressed in mg/l)

The results of the treated drinking water in the WTP are within the standard limits but further analysis of piped water shows presence of coli form bacteria due to leakages in the system.

VI. CONCLUSION

Increased developmental activities due to urbanization and industrialization are greatly responsible for water pollution in Kolhapur city. There are many causes of water pollution such as sewage disposal, excess use of agrochemicals in the field,

discharge of industrial effluents without treatment, disposal of urban solid waste, agricultural runoffs etc. The polluted water of *panchaganga* is creating some serious public health issues in the city. Kolhapur city is one of the developed cities in the state Maharashtra. Thousands of people are coming to Kolhapur for seeking employment from across the India. The industrial sector is growing very rapidly. This city is also characterized as a famous religious place; therefore plenty of pilgrims visit it every year. The population of this city is increasing so fast due to educational facilities, employment and service. Today and probably in the future; due to the rapid growth in population, urbanization and industrialization; public health issues will be a great challenge before the planners, administrators and politicians. The river as a drinking source is becoming polluted and the capacity of treatment plants is not enough to stop the pollution and reduce the damage on public health. The capacity of these plants needs to be increased. Therefore; there is a need to wake up as early as possible to be prepared to tackle the growing issue of water pollution to promote public health. There is a need of government intervention with active peoples' participation.

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REFERENCES

- [1] Assessment of Impact of Environmental Pollution on Human health in the city of Jodhpur, Rajasthan - R.C. Sharma, Vinod Joshi, A.K. Dixit, S.P.Yadav, R. Fotedar, P.K. Anand, H.S. Rumana and P.C. Sharma http://www.icmr.nic.in/annual/2004-05/dmrc/ar45_4e.pdf
- [2] Environment in Indian Society- Problems and Prospects: R.B. Patil, A Mittal Publication, New Delhi (India), 2009, pp. (45-52).
- [3] Social Work and Global Health Inequalities- Practice and policy development, Health and Environment: Margaret Alstone: Edted by Paul Bywaters, Eileen Mcleod and Lindsey Napier, Published by policy press, University of Bristol, UK, 2009, pp. 51-62
- [4] State of Environment Report: Maharashtra, Indira Gandhi Institute of Development Research Mumbai-400065 (India), Sponsored by Maharashtra Pollution Control Board Ministry of Environment and Forests, Govt. of India Prepared by Indira Gandhi Institute of Development Research, Mumbai.
- [5] THE CAUSES AND HEALTH EFFECTS OF RIVER POLLUTION: A CASE STUDY OF THE ABOABO RIVER, KUMASI by Leslie Danquah (B.A., Social Science), a ph.d thesis, October, 2010, pp. 15-20
- [6] The Effects of Pollution on Health: The Economic Toll http://www.airimpacts.org/documents/local/poll_health.pdf
- [7] Water Pollution: Impact of Pollutants and New Promising Techniques inPurification Process, Ramandeep Singh Gambhir1*, Vinod Kapoor2, Ashutosh Nirola3, Raman Sohi4 and Vikram Bansal4, J Hum Ecol, 37(2): 103-109 (2012).
- [8] www.cpcb.nic.in Annual Report of Central Pollution Control Board 2008-09
- [9] www.mpcb.gov.in Annual Report of ministry of environment and forest 2009-10
- [10] www.mohfw.nic.in Annual Report of ministry of health and family welfare 2009-10
- [11] www.kolhapurcorporation.gov.in

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Embedded Web Server with Data Security for Wireless Sensor Networks

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Abstract- Sensor network has quick installation, dynamic configuration features. Security of the data in the wireless sensor network has become a critical issue. As the applications are increasing, privacy preservation is an important issue in wireless sensor network. Depending on the nature of the installment of the network and the data that is exchanged between two nodes, steps taken to secure the data have to be decided. Security mechanisms like authentication and encryption play a vital role. The existing encryption algorithms cannot be applied directly to WSN. Care has to be taken to modify these algorithms to fit into WSN, as these modifications may lead to additional computations which consume additional energy and additional communication. This paper aims at implementing one such encryption algorithm which is easy to develop using common programming language like C and easy to port across different processors varying in processing speed, computations and operating word size.

I. INTRODUCTION

A. Statement of the problem
Security of the data collected by a sensor node realized using an 8 bit microcontroller should be achieved by encrypting the data using a standard encryption algorithm. This encrypted data when received by 32 bit central node; it should decrypt the same and display the actual value on the webpage hosted by the embedded web server residing on the central node.

B. Objective of the project

- This project realizes an embedded web server, which enables data acquisition and status monitoring with the help of standard web browser.
- An efficient Encryption algorithm is implemented so that the data packets obtained from heat and temperature sensors are encrypted and sent to the base station. The base station will receive the data packets and decrypt them. The base station is also the center node with the functionality of the embedded web server.
- User can monitor remote temperature and heat information remotely through web browser.

C. Scope of the Project

- Implement a sensor node with PIC16F877A as a processing unit, LM35 as a temperature sensor, CC2500 transceiver for data transmission and LCD interface for user interface.
- The data read from the sensor is encrypted by Tiny Encryption algorithm by the sensor node before transmitting it to the central node.

- Central node is realized on a Mini2440 Friendly ARM board. Transceiver CC2500 is used for data reception. Embedded web server is implemented on this board.
- The encrypted data received from sensor node through CC2500 is decrypted using the same Tiny encryption algorithm and the value is displayed on the webpage.

II. IMPLEMENTATION

The implementation of the project “Implementation of Embedded Web Server with Data Security for Wireless Sensor network” is divided into two modules. One module is the PIC module and the other is the ARM module. The two modules are connected through wireless media.

A. System Architecture

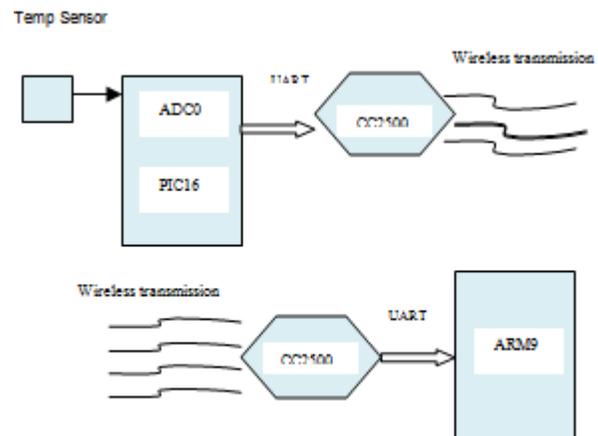


Fig.1. System Block Diagram

B. Diagram Software Design

PIC16F877A which realizes the sensor node with temperature sensor to sense the environmental temperature. The main task of the PIC module is to encrypt the data received from sensor through ADC module and send it to the CC2500 module to transmit it via wireless medium. When the power is ON, the first thing the controller has to do is to initialize the internal and the peripheral modules. So the ADC, UART and the LCD modules are initialized with proper settings, and the port numbers that are treated as either input or output by the respective peripheral. In an infinite loop the value of temperature is read into the registers of the ADC module. This value is multiplied by 0.48 to get the reading in the convention form. This value is written to the register which writes the data on the LCD, at the same time encoded calling encode_data method. The encoded data is written to UART register to send it through transceiver.

The ARM module is the one on which the central node is realized. This module collects the encrypted data sent by the sensor node. The encrypted data is read through transceiver connected to the arm board. The data is decrypted and displayed on the webpage. The embedded web server is also implemented here.

ARM is OS based system and software development process for OS based system includes the establishment of the cross-compiler, the transplant of the boot loader, transplant of the embedded Linux, development of the web server and decryption algorithm.

An embedded web server like any general purpose web server accomplishes tasks like receiving the request from client, processing that request and responding to those requests and finally returning the results to the client. This system works in B/S mode in which the client need not be programmed specifically for this application. The client PC is connected to the Internet through a browser can get access to the embedded Web server. The user can perform remote login view the web pages and perform required operation. Hence this mode is simple to use, convenient to maintain, and easy to extend as compared to traditional C/S mode. The static web pages are saved in the system file system and they get displayed on the browser of the client system.

The programming on ARM includes creating a thread so that one thread takes care of serving the web requests, and the main process does the processing of the data read from transceiver. This process in a forever loop reads the data from serial port, once the data is read call the decryption method to decode and get the actual value.

The child process opens a socket, bind to the port and listen on that port. Whenever there is a request from the client, it identifies the page requested by client and the same is sent to the client through socket connection. Appropriate error pages and data pages are displayed.

III. RESULTS

A. Hardware Connections

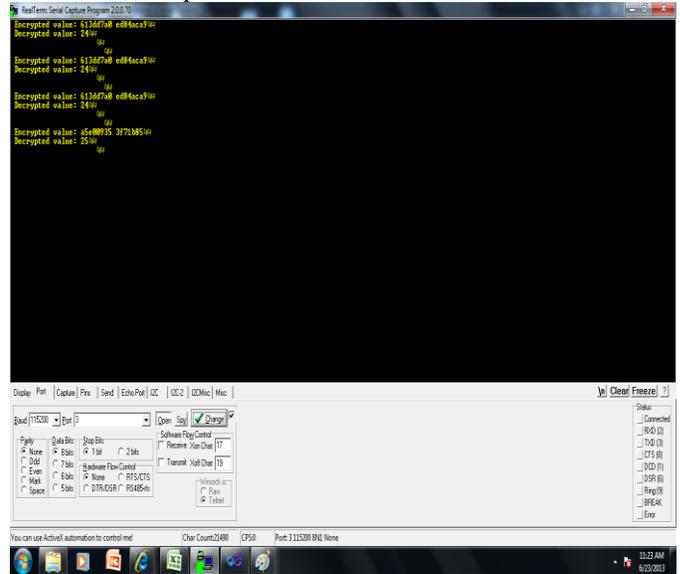
The overall connection of the modules together looks like



The data encrypted is sent by the wireless module of PIC. Since the data is sent through the serial interface, we can capture the data at the serial interface of the ARM 9 module. To view the encrypted data, I have used serial to USB converter from USB port of the laptop to the serial port of ARM. Real Term is the tool

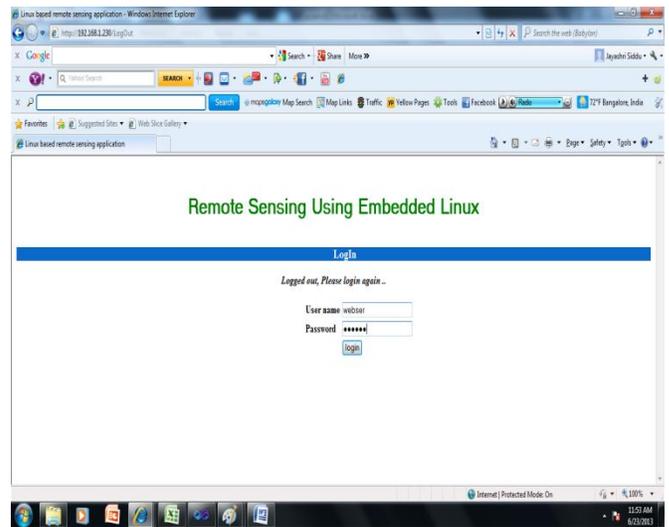
to capture the data on the serial link. It should be configured with proper port number (usually the OS does a auto detect) and baud rate. We can also specify the file name where the captured data can be saved.

B. Data Captured

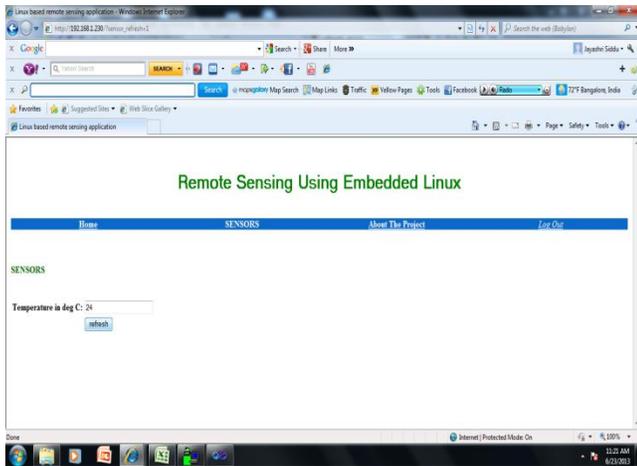


C. User Interface

The main login page which asks for username and password from the user looks like. The operator needs to authenticate himself by providing the username and password. If he is the right operator he will be allowed to view the sensor page.



The sensor page displays the decoded value on the box specified. This page gets refreshed every two seconds, and any variation in the temperature will be captured automatically when the page gets refreshed. There is also option for refreshing the page manually whenever the operator feels like.



IV. CONCLUSIONS

This project has demonstrated how to get fully functional embedded product developed from scratch. This included working on two different controllers, cross compilation and deployment of essential libraries, the configuration of embedded Linux and the development of embedded web server.

It was a great learning in implementing this project. I started this project keeping in mind lot of features to implement on the web server side and the security algorithm was a bit unclear. I could not implement the full set of requirements that were set out before the commencement of this project. However I have implemented at least the minimum. The original requirement list was not possible to accomplish so a re-scope was necessary.

Finally I would like to say that this paper explains an end to end deployable embedded product.

V. FUTURE WORK

- To achieve higher security the cipher key used for encryption and decryption can be generated in the PIC module using rand() function. The generated key can be used for encryption in PIC module and the same needs to be transmitted to arm module before transmitting the encoded data. The arm module can use this key to decrypt the data.
- The current project is tested with a single client node, the same can be enhanced with multiple client nodes, and then the client should send a identifier to the server so that it can display the correct data on web page for each client node.
- The embedded web server is currently supporting single user login, it can be enhanced to multiple user login with different user privileges.
- The SNMP support on ARM can be enabled to send email alerts to configured user email ids which correspond to client nodes.

REFERENCES

- [1] Fundamentals of Wireless Sensor Networks by Wiley Series on Wireless Communications and Mobile Computing.

- [2] First Step Toward Internet Based Embedded Control System Eka Suwartadi, Candra Gunawan, Ary Setijadi P, Carmadi Machbub Laboratory for Control and Computer Systems Department Of Electrical Engineering Bandung Institute Of Technology, Indonesia
- [3] Design and development of embedded web server based on Arm9 and Linux Deepa.Chekkal*and Ravi Kanth2 World Journal of Science and Technology 2012, 2(10):94-97 ISSN: 2231 – 2587
- [4] Design and Implementation of Embedded Web Server Based on ARM and Linux Yakun Liu Xiaodong Cheng College of Electronic Information Engineering Inner Mongolia University Hohhot, P.R. China
- [5] Design and Development of ARM Processor Based Web Server V.Billy Rakesh Roy1, Sanket Dessai1, and S. G.Shiva Prasad Yadav 1 I M S Ramaiah School of Advanced Studies in Collaboration with Coventry University (UK)/Embedded Design Centre,
- [6] Embedded Web Server Based on DAC System Using ARM S.A.N.Sandeep, P.Malyadri / International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 2, Issue 4, July-August 2012, pp.
- [7] Security in cognitive wireless sensor networks. Challenges and open problems Araujo et al. EURASIP Journal on Wireless Communications and Networking 2012, 2012:48
- [8] SECURITY IN WIRELESS SENSOR NETWORKS By ADRIAN PERRIG, JOHN STANKOVIC, and DAVID WAGNER
- [9] A review on security issues in wireless sensor network Rajeshwar Singh1, Singh D.K.2 and Lalan Kumar3 Journal of Information Systems and Communication, ISSN: 0976-8742 & E-ISSN: 0976-8750, Vol. 1, Issue 1, 2010, PP-01-07
- [10] Coverage and Connectivity Issues in Wireless Sensor Networks AMITABHA GHOSH and SAJAL K. DAS Department of Computer Science and Engineering, University of Texas at Arlington
- [11] Wireless Sensor Networks for Industrial Process Monitoring and Control: A Survey Network Protocols and Algorithms ISSN 1943-3581 2011, Vol. 3, No. 1
- [12] Performance evaluation of scalable encryption algorithm for wireless sensor networks Murat Çakıro_lu*, Cüneyt Bayilmi_, Ahmet Turan Özcerit and Özdemir Çetin
- [13] Energy Efficient Encryption Algorithm for Wireless Sensor Network A. Babu Karupiah1, Dr. S. Rajaram2 International Journal of Engineering Research & Technology (IJERT) Vol. 1 Issue 3, May - 2012 ISSN: 2278-0181 www.ijert.
- [14] Analyzing and Modeling Encryption Overhead for Sensor Network Nodes Prasanth Ganesan, Ramnath Venugopalan, Pushkin Peddabachagari, Alexander Dean, Frank Mueller, Mihail Sichitiu Center for Embedded Systems Research Departments of Electrical and Computer Engineering / Computer Science North Carolina State University, Raleigh, NC 27695
- [15] SPINS: Security Protocols for Sensor Networks 2009 International Conference on Machine Learning and Computing IPCSIT vol.3 (2011) © (2011) IACSIT Press, Singapore
- [16] Sensor Data Encryption Protocol for Wireless Network Security By Bharat Singh, Parvinder Singh & Dr. V.S. Dhaka Global Journal of Computer Science and Technology Volume 12 Issue 9 Version 1.0 April 2012 Type: Double Blind Peer Reviewed International Research Journal Publisher: Global Journals Inc. (USA) Online ISSN: 0975-4172 & Print ISSN: 0975-4350
- [17] WIRELESS SENSOR NETWORK SECURITY ANALYSIS Hemanta Kumar Kalita1 and Avijit Kar

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Multiple Foetal Parameters in Third Trimester Gestational Age Estimation

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Abstract-In a country like India where most women present late in third trimester and may not keep menstrual record properly, a method was needed which can help to estimate gestational age in third trimester. So this study was done on 100 pregnant women ranging from 28 to 42 weeks of gestation, attending the OPD of SIMS, Hyderabad, A.P, India, during the period July 2009 to Sep 2010. Patients with high risk factors affecting the growth of baby were excluded from the study. These women were subjected to single exposure of ultrasonography estimation of gestational age using multiple foetal parameters like BPD, FL, HC. Then a comparison was made between the actual gestational age (assessed by Dubowitz score within 24hrs of birth) with mean gestational age by ultrasonography. The foetal parameters taken for the study in determination of gestational age were compared for accuracy and reliability with each other by linear regression analysis¹. In this study 96% of cases had a difference of 2 weeks from actual age. Hence this study validates the concept of use of multiple foetal growth parameters to improve the accuracy and precision of foetal dating in third trimester of pregnancy.

Index Terms- AC, BPD, Dubowitz Score, EDD, FL, Gestational age

I. INTRODUCTION

Knowledge of gestational age is critically important in clinical obstetrics, primarily because it can significantly affect the obstetric management decision and neonatal outcome. By defining an acceptable time frame of 28-42 weeks for normal delivery, this knowledge should preclude the possibility of iatrogenic premature delivery in patients undergoing elective caesarean section. In patients with premature labor, knowledge of the gestational age will influence the use of tocolytic agents, the use of steroids to induce foetal lung maturity, the timing of amniocentesis for calculating lung maturity and the type of institute in which delivery should take place (eg; primary vs a tertiary care centre). Precise knowledge of gestational age should also help the obstetrician to avoid a pregnancy of post dates and its attendant risks to the foetus².

II. MATERIAL AND METHODS

In this prospective study of ultrasonographic estimation of gestational age by multiple foetal growth parameters in third trimester, 100 pregnant women were subjected to sonographic estimation of gestational age, using Biparietal diameter, Femur length and Abdominal circumference as foetal growth parameters³.

These were the patients who were either seen at antenatal clinics or admitted in labour room of SIMS. These women were registered in the study after taking history and after general and obstetric examination to exclude complications which can adversely affect foetal growth, like hypertension, pre-eclampsia, diabetes mellitus, multiple pregnancies, hydrocephalus etc;

A real time 2D ultrasound unit with a 3-5 MH convex sector transducer was used.

III. RESULTS

In the present study total of 100 pregnant women in their third trimester were recruited and were subjected to ultrasonography to determine gestational age. The actual gestational age was calculated by Dubowitz or New Ballard score within 24hrs of birth^{4,5}. Comparison was made between actual gestational age and ultrasonographically derived gestational age.

These cases were divided into three groups depending upon gestational age (Table I)

TABLE - I

S.No	Gestational Age (weeks)	No. Of Cases
1.	28 – 32	21
2.	33 – 36	40
3.	37 -- 42	39

Mean gestational age was derived from all three parameters BPD, FL, AC and its difference from actual gestational age was derived and expressed in nearest round figures in all the three groups which is tabulated as such in table II

TABLE-- II

MEAN DIFFERENCE IN WEEKS BETWEEN MEAN GESTATIONAL AGE
 AND ACTUAL GESTATIONAL AGE ACCORDING TO GROUPS

Difference From Age in weeks	Group -- I		Group -- II		Group -- III	
	No of cases	%	No of cases	%	No of cases	%
0	9	42.8	15	37.5	6	15.4
+1	9	42.8	16	40.0	20	51.3
+2	3	14.3	9	22.5	9	23.0
+3	---	---	---	---	4	10.2

Then the mean difference in weeks between mean gestational age and actual gestational age for all groups taken together is tabulated as such in Table III

TABLE III
MEAN DIFFERENCE IN WEKS BETWEEN MEAN GESTATIONAL AGE
AND ACTUAL GESTATIONAL AGE FOR ALL GROUPS

Mean difference from AGA (Weeks)	No Of Cases	Percentage
0	30	30%
+1	45	45%
+2	21	21%
+3	04	4%

Thus in our study, in 30% of patients the Mean gestational age coincided with actual gestational age with a difference of one week in 45% and 2 weeks in 25%. Thus using multiple parameters, total 965 of cases had a difference within 2 weeks from gestational age.

Then the Mean, standard deviation and Standard error for each parameter (BPD, FL, & AC) was taken, in which FL & AC have got least mean and less amount of variations as compared to BPD⁶.

The results of correlation coefficient between the selected parameters are highly interrelated and statistically significant ($P < 0.001$).

IV. DISCUSSION

In present study 100 pregnant women ranging from 28-42 weeks of gestational age were subjected to sonographic estimation of gestational age using multiple fetal growth parameters. These patients were selected after excluding any maternal or fetal factors affecting the foetal growth. Then the gestational age of the newborns was assessed by Dubowitz score within 24hrs.

A comparison was made between Dubowitz actual gestational age and sonographically derived gestational age from multiple foetal growth parameters, which revealed 96% cases within a difference of 2 weeks from actual age.

Previous articles evaluate accuracy of gestational age by ultrasound with gestational age by LMP or Delivery dates, but in present study gestational age from ultrasound was compared with actual gestational age obtained after birth by Dubowitz score which include eleven physical and ten neurological criteria and whose accuracy has been confirmed by different studies like Gandy G.M⁷.

Our study confirms that BPD cannot be relied upon for determination of gestational age after 26 weeks, though before 26 weeks BPD is a reliable parameter and statistically significant. With single USG examination and even multiple USG examination do not improve reliability after 34 weeks as in accordance with previous studies done by Sabbagha et al⁸. , who also shows similar result. Though Stuart Campbell & Berman⁹ show 84% accuracy of BPD.

In our study 92% patients had a difference of +2 weeks in late 3rd trimester when FL alone was used in accordance with Eagley et al. , Shale, S. Yageland Hill & Coworkers studies who also showed stronger correlation^{10,11,13}.

Our study shows AC better than BPD and almost equal to FL in determining gestational age. Hence AC and FL are most acceptable indicators of gestational age after 34 weeks as shown by Hadlock et al., studies¹⁴.

Using all four parameters (BPD, HC, AC, FL) Hadlock shows 96% of predicted ages were within 2 weeks of true menstrual age¹⁵. Once again in our study similar results were obtained. In our study also, using multiple parameters (BPD, FL, AC) 96% of cases had a difference of 2 weeks from actual gestational age.

V. CONCLUSION

The perinatal mortality and morbidity can be reduced by properly estimating gestational age. In our country where most of the women may not keep menstrual record properly and who present late in third trimester for the first time USG assessed gestational age by multiple foetal growth parameters can be of immense value.

In present study total 96% (30% coincided, 45% had a difference of +1week, 21% difference of +2weeks) cases had difference within 2 weeks. Hence its use not only increases the accuracy of foetal age determination by single examination but also gives observer choice to include only those parameters where technically satisfactory measurements have been obtained. These parameters (BPD,AC,FL) are also useful for foetal weight estimation.

Hence this study validates the concept of using multiple parameters to improve the accuracy and precision of foetal dating in third trimester and provides a tool for better care and management of the mother and foetus in Indian condition.

REFERENCES

- [1] ACOG Practice bulletin no:98, ultrasonography in pregnancy, obst & gynecol 2008; 112:951.
- [2] Military Obstetrics & Gynecology, Brook side press, Estimation of gestational age 2006.
- [3] Benson. CB, Doubilet PM; ATR Amj Roentgenol 1991; 157:1275.
- [4] Dubowitz L.M.S, et al.; Journal of Paediatrics 1970; 77
- [5] Ballard J.L; et al; J. Paediatrics 1991; 199:417.
- [6] M.R Modabber et al; Annuals of Biological Research 2012, 3(8); 38:3841.
- [7] A. Onasoga, et al; Archives of Applied science Research 2012, 4(1); 447:453.
- [8] Recca EA; Gabnelli.S; Obstet and Gyn Survey 1989; 544:45
- [9] Gandy G.M; TB Neonatology Churchill Livingstone 1992; 209:213.
- [10] Sapre S; Joshi.V; Ind J Obst & Gynaecol 1997; 47(1): 23:28.
- [11] Sabbagha E et al; Ultrasonography in Obstetrics & Gynaecology Text Book.
- [12] Campbell S. et al; Journal of Obstetrics and Gynaecology of British Common Health 1969; 76:60.
- [13] Hill L.M; et al; Am. J. Obstet. Gynecol, 1992; 16:551.
- [14] S.Yagel et al; British journal of OBG, 1986 Vol 93 (109-115)
- [15] Hadlock F.P et al; AJR; 1982; 139:367-370.

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On The Homogeneous Bi-quadratic Equation with Five Unknowns $x^4 - y^4 = 8(z + w)p^3$

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Abstract-The biquadratic equation with 5 unknown given by $x^4 - y^4 = 8(z + w)p^3$ is analyzed for its patterns of non – zero distinct integral solutions. A few interesting relations between the solutions and special polygonal numbers are exhibited.

Index Terms- Bi-quadratic equation with 5 unknowns, Homogeneous biquadratic, Integer solutions, Special polygonal numbers, Centered polygonal number

I. INTRODUCTION

Biquadratic diophantine equations, homogeneous and non- homogeneous, have aroused the interest of numerous Mathematicians since antiquity as can be seen from [1-7]. In the context one may refer [8-24] for varieties of problems on the diophantine equations with two, three and four variables. This communication concerns with the problem of determining non-zero integral solutions of yet another biquadratic equation in 5 unknowns represented by $x^4 - y^4 = 8(z + w)p^3$. A few interesting relations between the solutions and special polygonal numbers are presented.

II. NOTATIONS

$t_{m,n}$ - Polygonal number of rank n with size m .

$Ct_{m,n}$ - Centered polygonal number of rank n with size m .

gn_a - Gnomonic number of rank a

SO_n - Stella octangular number of rank n

$CP_{m,n}$ - Centered pyramidal number of rank n with size m

III. METHOD OF ANALYSIS

The diophantine equation representing the biquadratic equation with five unknowns under consideration is

$$x^4 - y^4 = 8(z + w)p^3 \tag{1}$$

The substitution of the transformations

$$x = u + v, y = u - v, z = ruv + 1, w = suv - 1 \tag{2}$$

in (1) leads to $u^2 + v^2 = (r + s)p^3 \tag{3}$

To solve (3), we apply the method of factorization. For this, choose r and s such that $r+s$ is expressed as the product of complex conjugates. A few illustrations are presented below.

A. Illustration 1

Assume $p = a^2 + b^2 \tag{4}$

Take $r=7, s=3$

so that $r + s = 10 = (3 + i)(3 - i) \tag{5}$

Using (4) & (5) in (3) and employing the method of factorization, define

$$(u + iv) = (3 + i)(a + ib)^3$$

Equating the real and imaginary parts, we have

$$u = u(a, b) = 3a^3 - 9ab^2 - 3a^2b + b^3$$

$$v = v(a, b) = a^3 - 3ab^2 + 9a^2b - 3b^3$$

Hence in view of (2), the corresponding solutions of (1) are given by

$$x = x(a, b) = 4a^3 - 12ab^2 + 6a^2b - 2b^3$$

$$y = y(a, b) = 2a^3 - 6ab^2 - 12a^2b + 4b^3$$

$$z = z(a, b) = 7[(3a^3 - 9ab^2 - 3a^2b + b^3)(a^3 - 3ab^2 + 9a^2b - 3b^3)] + 1$$

$$w = w(a, b) = 3[(3a^3 - 9ab^2 - 3a^2b + b^3)(a^3 - 3ab^2 + 9a^2b - 3b^3)] - 1$$

$$p = p(a, b) = a^2 + b^2$$

A few interesting properties observed are as follows:

1. $2x(a, a) - y(a, a) - 5s_{0a} \equiv 0 \pmod{25}$
2. $z(a, b) - w(a, b) = x^2(a, b) - y^2(a, b) + 2$
3. $z(a, b) + w(a, b) = \frac{5}{2}[x^2(a, b) - y^2(a, b)]$
4. $30[x(a, a) - 2y(a, a) + p(a, a) - 2t_{4,a}]$ is a nasty number:
5. $50\{x(a, a) - 2y(a, a)\}$ is a cubical integer.

B. Illustration 2

The choice $r=20$, $s=5$

$$\text{so that } r + s = 25 = (1 + 2i)^2(1 - 2i)^2$$

Following a similar procedure as in illustration-1, the corresponding solutions of (3) are found to be

$$u = u(a, b) = -3a^3 + 9ab^2 - 12a^2b + 4b^3$$

$$v = v(a, b) = 4a^3 - 12ab^2 - 9a^2b + 3b^3$$

Hence in view of (2), the corresponding solutions of (1) are given by

$$x = x(a, b) = a^3 - 3ab^2 - 21a^2b + 7b^3$$

$$y = y(a, b) = -7a^3 + 21ab^2 - 3a^2b + b^3$$

$$z = z(a, b) = 20[(-3a^3 + 9ab^2 - 12a^2b + 4b^3)(4a^3 - 12ab^2 - 9a^2b + 3b^3)] + 1$$

$$w = w(a, b) = 3[(-3a^3 + 9ab^2 - 12a^2b + 4b^3)(4a^3 - 12ab^2 - 9a^2b + 3b^3)] - 1$$

$$p = p(a, b) = a^2 + b^2$$

A few interesting properties observed are as follows:

1. $7x(a, b) + y(a, b) \equiv 0 \pmod{50b}$
2. $z(a, b) - w(a, b) - 4[x^2(a, b) - y^2(a, b)] \equiv 2 \pmod{uv}$
3. $z(a, b) - 4w(a, b) \equiv 0 \pmod{5}$

4. $-7x(a,1) - y(a,1) + 50$ is a nasty number.
5. $20\{7x(1,b) + y(1,b) + 75(gn_b - 1)\}$ is a cubical integer.

C. Illustration 3

Let $r=6, s=2$

so that $r + s = 8 = (1+i)^3(1-i)^3$

Following a similar procedure as in illustration-2, the corresponding solutions of (3) are as follows

$$u = u(a, b) = -2a^3 + 6ab^2 - 6a^2b + 2b^3$$

$$v = v(a, b) = 2a^3 - 6ab^2 - 6a^2b + 2b^3$$

Hence in view of (2), the corresponding solutions of (1) are given by

$$x = x(a, b) = 4b^3 - 12a^2b$$

$$y = y(a, b) = -4a^3 + 12ab^2$$

$$z = z(a, b) = 6[(2a^3 - 6a^2b)^2 - (2a^3 - 6ab^2)^2] + 1$$

$$w = w(a, b) = 2[(2a^3 - 6a^2b)^2 - (2a^3 - 6ab^2)^2] - 1$$

$$p = p(a, b) = a^2 + b^2$$

A few interesting properties observed are as follows:

1. $x(a, a) + y(a, a) = 0$
2. $2z(a, b) = 2 + 3[x^2(a, b) - y^2(a, b)]$
3. $2w(a, b) = -2 + x^2 - y^2$
4. $3\{z(a, b) + w(a, b) + 2y^2(a, b)\}$ is a nasty number:
5. $4\{y(a, a) - x(a, a)\}$ is a cubical integer.

D. Illustration 4

Let $r=13, s=3$

so that $r + s = 16 = (1+i)^4(1-i)^4$

Following a similar procedure as in illustration-1, the corresponding solutions of (3) are as follows

$$u = u(a, b) = -4a^3 + 12ab^2$$

$$v = v(a, b) = -12a^2b + 4b^3$$

Hence in view of (2), the corresponding non-zero integral solutions of (1) are given by

$$x = x(a, b) = -4a^3 + 12ab^2 - 12a^2b + 4b^3$$

$$y = y(a, b) = -4a^3 + 12ab^2 + 12a^2b - 4b^3$$

$$z = z(a, b) = 13(12ab^2 - 4a^3)(4b^3 - 12a^2b) + 1$$

$$w = w(a, b) = 3(12ab^2 - 4a^3)(4b^3 - 12a^2b) - 1$$

$$p = p(a, b) = a^2 + b^2$$

A few interesting properties observed are as follows:

1. $x(a, a) + y(a, a) + 4s o_a = 10(gn_a - 1)$
2. $2[z(a, b) - w(a, b) = 4 + 5[x^2(a, b) - y^2(a, b)]$
3. $z(a, b) + w(a, b) = -4(x^2(a, b) - y^2(a, b))$
4. $2p(a, a)$ is a nasty number.
5. $-x(a, a) + y(a, a) + 3CP_{3,a}$ is a cubical integer.

E. Illustration 5

Take $r=1, s=3$

$$\text{so that } r + s = 4 = \frac{(1+i)^{2n+2}(1-i)^{2n+2}}{2^{2n}}$$

Employing the method of factorization, define

$$(u + iv) = \frac{(1+i)^{2n+2}}{2^n} (a + ib)^3$$

$$(u + iv) = 2[\cos(2n + 2)\frac{\pi}{4} + i \sin(2n + 2)\frac{\pi}{4}](a + ib)^3$$

Equating the real and imaginary parts, we have

$$u = u(a, b) = 2[(a^3 - 3ab^2) \cos(2n + 2)\frac{\pi}{4} - (3a^2b - b^3) \sin(2n + 2)\frac{\pi}{4}]$$

$$v = v(a, b) = 2[(a^3 - 3ab^2) \sin(2n + 2)\frac{\pi}{4} - (3a^2b - b^3) \cos(2n + 2)\frac{\pi}{4}]$$

Hence in view of (2), the corresponding solutions of (1) are given

$$x = x(a, b) = 2\{(a^3 - 3ab^2)[\cos(2n + 2)\frac{\pi}{4} + \sin(2n + 2)\frac{\pi}{4}] + (3a^2b - b^3)[\cos(2n + 2)\frac{\pi}{4} - \sin(2n + 2)\frac{\pi}{4}]\}$$

$$y = y(a, b) = 2\{(a^3 - 3ab^2)[\cos(2n + 2)\frac{\pi}{4} - \sin(2n + 2)\frac{\pi}{4}] - (3a^2b - b^3)[\cos(2n + 2)\frac{\pi}{4} + \sin(2n + 2)\frac{\pi}{4}]\}$$

$$z = z(a, b) = 4\{(a^3 - 3ab^2)^2[\cos(2n + 2)\frac{\pi}{4} \sin(2n + 2)\frac{\pi}{4}] + (a^3 - 3ab^2)(3a^2b - b^3) *$$

$$\text{by } [\cos^2(2n + 2)\frac{\pi}{4} - \sin^2(2n + 2)\frac{\pi}{4}] - (3a^2b - b^3)^2[\cos(2n + 2)\frac{\pi}{4} \sin(2n + 2)\frac{\pi}{4}]\} + 1$$

$$w = w(a, b) = 12\{(a^3 - 3ab^2)^2[\cos(2n + 2)\frac{\pi}{4} \sin(2n + 2)\frac{\pi}{4}] + (a^3 - 3ab^2)(3a^2b - b^3) *$$

$$[\cos^2(2n + 2)\frac{\pi}{4} - \sin^2(2n + 2)\frac{\pi}{4}] - (3a^2b - b^3)^2[\cos(2n + 2)\frac{\pi}{4} \sin(2n + 2)\frac{\pi}{4}]\} - 1$$

$$p = p(a, b) = a^2 + b^2$$

REFERENCES

- [1] L.E.Dickson, "History of Theory of numbers", vol.2, Diophantine Analysis, New York, Dover, 2005.
- [2] L.J.Mordell, "Diophantine Equations", Academic press, London ,1969.
- [3] R.D.Carmichael, "The theory of numbers and Diophantine Analysis", NewYork, Dover,1959.
- [4] S.Lang, " Algebraic N.T.", Second ed. Newyork: Chelsea, 1999.
- [5] H.Weyl, "Algebraic theory of numbers", Princeton, NJ: Princeton University press, 1998.
- [6] Oistein Ore, "Number theory and its History", NewYork , Dover, 1988.
- [7] T.Nagell, "Introduction to Number theory", Chelsea,Newyork, 1981.
- [8] J.H.E.Cohn, "The Diophantine equation $y(y+1)(y+2)(y+3) = 2x(x+1)(x+2)(x+3)$ ", Pacific J.Math. 37, 1971, 331-335.
- [9] W.J.Leabeay and D.F.Hsu, "The Diophantine equation $y^4 = x^3 + x^2 + 1$ ", Rocky Mountain J.Math. Vol.6, 1976, 141-153.
- [10] Mihailov, "On the equation $x(x+1) = y(y+1)z^2$ ", Gaz. Mat. Sec.A 78, 28-30, 1973.
- [11] M.A.Gopalan and R.Anbuselvi, "Integral Solutions of ternary quadratic equation $x^2 + y^2 = z^4$ ", ActaCienalIndica, Vol XXXIV M, No. 1, 2008, 297-300.
- [12] M.A.Gopalan, ManjuSomanath and N.Vanitha, "Parametric integral solutions of $x^2 + y^3 = z^4$ ", ActaCienalIndica, Vol XXXIII M, No. 4, 2007, 1261-1265.
- [13] J.T.Cross, "In the Gaussian Integers $\alpha^4 + \beta^4 \neq \gamma^4$ ", Math, Magazine,66,1993, 105-108.
- [14] Sandorszobo, "Some fourth degree Diophantine equation in Gaussian integers", Electronic Journal of combinatorial Number theory, Vol .4, 2004, 1-17.
- [15] M.A.Gopalan, A.Vijayasankar and ManjuSomanath, "Integral solutions of Note on the Diophantine equation $x^2 - y^2 = z^4$ ", Impact J.Sci Tech; Vol 2(4) ,2008, 149-157.
- [16] M.A.Gopalan and V.Pandichelvi, "On the solutions of the Biquadratic equation $(x^2 - y^2)^2 = (z^2 - 1)^2 + W^4$ ", International Conference on Mathematical Methods and Computations, Trichirapalli, July 2009, 24-25,.
- [17] M.A.Gopalanand G.Janaki, "Integral Solutions of Ternary quadratic equations $x^2 - y^2 + xy = z^4$ " Impact Journal Vol 2(2) ,2008, 71-76.
- [18] M.A.Gopalanand V.Pandichelvi, "On ternary quadratic Diophantine equation $x^2 + ky^3 = z^4$ ", Pacific Asian Journal of Mathematics, Vol 2, No 1-2 ,Jan-Dec. 2008, 57-62.
- [19] M.A.Gopalanand J.Kaligarani, "On quadratic equation in 5 unknowns $x^4 - y^4 = 2(z^2 - W^2)p^2$ ", Bulletin of pure and applied sciences , Vol 28E, 2009, No 2,305-311.
- [20] M.A.Gopalan,S.Vidhyalakshmi andS.Devibala, " Ternary Quartic Diophantine Equation $2^{n+2}(x^2 - y^2) = z^4$ ", Impact Journal of Science and Technology,4(1),2010,57-60.
- [21] M.A.Gopalanand J.Kaligarani, "On Quadratic Equation In Five Unknowns $x^4 - y^4 = (z + W)p^3$ ", Bessel J Math , 1(1) ,2011, 49-57.
- [22] M.A.Gopalanand P.Shanmuganandham., "On the biquadratic equation $x^4 + y^4 + (x + y)z^3 = 2(k^2 + 3)^{2n} w^4$ " Bessel J Math ,2(2) , 2012,87-91.
- [23] M.A.Gopalanand B.Sivakami., "Integral solutions of quartic equation with four unknowns $x^3 + y^3 + z^3 = 3xyz + 2(x + y)w^3$," Antarctica J.Math.,10(2) ,2013,151-159.

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Relationship between Physical Fitness and Academic Achievement: The Case of Model School Students at Haramaya University, Ethiopia

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Abstract- The main objective of this study was to investigate the relationship between physical fitness and academic achievement among Model School students of Haramaya University. For this purpose Grade six students' physical fitness levels were compared to their academic achievement based on the idea that health related physical fitness had an impact on the ability to achieve academically. The pre and post tests on selected health related physical fitness parameters were administered for two groups (experimental group and control group). For academic achievement the first semester GPAs (grade point average) was taken as pre test and Second Semester GPAs was taken as post test for both groups. The GPAs of the groups was determined by calculating an average of all subjects. Data was collected from 20 students (10 boys and 10 girls) grade six sections A and B with aged 11-13 years old, during the 2012-2013 school year by using the health related Physical Fitness Tests and (GPA's). The training schedules were for twelve weeks for physical fitness exercises and it was arranged between the first semester final exam and Second Semester final- Exam. The intensity for exercises were low to moderate, for three days per week (Monday, Wednesday and Saturday) after their regular classes for experimental group. Data was analyzed using computerized statistical package software (SPSS) T-test and correlation was used to analyze the data. The physical fitness and academic results showed that experimental group's was greatly improved from first to second semester. But control group's decreased the mean value of GAPs from first to second semester. As exhibited in the results the correlation coefficient of experimental group on muscular strength, and flexibility showed moderate significant positive correlation with academic performance. On the other hand body composition had moderate significant negative correlation. With the exception of the cardiovascular endurance and muscular endurance results showed very high significant positive correlations with academic performance among the experimental group. This study proved that there is a significant relationship between physical fitness and academic achievement.

Index Terms- Physical fitness; Academic achievement.

I. INTRODUCTION

Physical activity during every school day is essential for numerous reasons. Physical fitness, mental health and social interaction. Regular physical activity increases the amount of

oxygen delivered to the brain, which increases children's capacity to learn. In addition to these benefits of physical fitness, researchers have found relationships between physical fitness and cognitive functioning. Brain Gym exercises and balanced movements have been proven to reduce anxiety and stress [8] Physical fitness has also been linked to higher levels of self-esteem, which are associated with higher academic performance in the classroom [1].

Research has been conducted concerning physical fitness benefits. The most commonly researched use for physical fitness is certainly for the purpose of physical exercise directly impacting the body. The correlation between physical fitness and health has been researched including the importance of cardiac, muscle, joint, and pulmonary functioning and even psychological functioning [4]). Regular physical has been physical fitness proven to have a positive relationship with the healthy functioning of all of these areas [7].

In addition to the physical benefits of physical fitness, researchers have found relationships between physical fitness and cognitive functioning [2]. Past literature consistently supports participation in movement and exercise, which leads to the reduction of stress, improvement of emotional state, and helps one to function comfortably. Brain Gym exercises and balanced movements have been proven to reduce anxiety [8]. Physical fitness has also been linked to higher levels of self-esteem and lower levels of anxiety, which are associated with higher academic performance in the classroom [8][1][3]. The relationship between physical fitness and academic achievement has received attention because of the increasing number of children who are unhealthy and physically unfit. Also, schools are feeling the pressure to meet academic standards [5].

Unfortunately, students are not receiving ample amount of physical activities at school. At school level the communities like parents and teachers are giving more attention to academic areas than physical fitness activity. Understanding the relationship between physical fitness and academic success is crucial. That is why it is needed to conduct this research. Thus, this research was conducted to investigate the relationship between physical fitness and academic achievement.

II. MATERIALS AND METHODS

2.1 Description of the Study Area and Period

The study was conducted at Haramaya University Model School which is found in Haramaya University main campus. The School is located at 09° 24' 27" latitudes north and 42° 02' 05" longitudes east. The mean annual rainfall, mean maximum and minimum temperature, is, 780.00 mm, 24.4 °C and 8.25 °C, respectively, (HARC 1996). The experiment was conducted in the months of March, April and May 2013. The data were taken from the designed parameters (Physical Fitness test) and academic achievement in term of their GPA's. The GPA's for the students were collected from Haramaya University Model School record office. The source of population was Model School grade sixth students. The total number of student in grade six was 63. The subjects were from different family background, homogeneous in their academic activities and at the same age level (11-13yrs).

2.2 The Study Design

The experiment design was used for this study. The training schedule was for twelve weeks for physical fitness exercises and it was arranged between the first semester final exam and Second Semester final- Exam. The intensity for exercises were low to moderate, for three days per week (Monday, Wednesday and Saturday) after their regular classes for experimental group. There was no training schedule for control group but tests were conducted for them.

2.3 Sample Size and Sampling Techniques

For this study, the stratified random sampling technique was used to select the sample from 63 students. The total size of the

sample was 20 (10 female and 10 male) from six grade (section A and B) students. For experimental and control group allotment of the students were done by random method. Thus, there were total two groups, one experimental and one control group. In group one 5 female and 5 male and in group two 5 female and 5 male.

2.4 Data Collecting Instrument

The quantitative data was collected through five health related physical tests. Experimental materials such as Weight machine,, exercise mats, stopwatch, jumping ropes, wood ruler and whistle were used during training as well as for the tests in this study. For this study, the stratified random sampling technique was used to select 20 samples of subjects from 63 students

2.5 Methods and Procedures of Data Collection

Quantitative data was collected through physical fitness parameters' and GPAS The data was recorded with the help of two assistance data recorders who had been Sport Science teachers at Model School. The experimental field tests and exercise procedures were strictly administered and standardized in terms of administration, organization and implementation conditions.

2.6 Physical Fitness Test Analysis

The changes in the following physical fitness variable parameters were recorded especially before and after training in terms of pre test and post test

Fitness test	Health related physical fitness
Nine meter running /walking test	Cardio vascular endurance
Ninety degree push up test	Muscular strength
Trunk lift test	Muscular strength
Sit and reach test	Flexibility
BMI	Body composition

2.7 Method of Data Analysis

Academic data was collected from Grade Point Averages. GPAs were taken from first and Second Semester final-- Exam of the 2012/ 2013 school year from HUMs record office. Data was analyzed using computerized statistical package software (SPSS) for descriptive statistics mean, standard deviation, maximum and minimum values, while the relationships between the variables were determined by linear correlation coefficients. degree of relationship is expressed by coefficient which range from correlation (-1 < r > +1) and the standard significant value p < 0.05.

III. RESULTS AND DISCUSSIONS

The variables selected for the study were cardiovascular endurance, muscular strength, flexibility and BMI. For academic achievement first and second semester final exam were taken for both group. The participation rate was 100%, i.e. there was no dropout due to physical or psychological problem Demographic Characteristics and the results of the study are given in the following tables.

Table 1: Distribution of participants by age and sex

Sex	Age	Number of students(N)	Percent (%)
Male	11-13	10	50%
Female	11-13	10	50%

Total	20	100%
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Table 1 showed the distribution of participants by age and sex. The distribution of student by sex group was 50% of boys and 50% girls were with the age of 11-13

Table2: The comparative mean and Standard deviation values of physical fitness parameters of experimental group and control group

PARAM	EG			CG		
	Mean ± SD			Mean ± SD		
	PT	DT	PoT	PT	DT	PoT
PUT	6.9 ± 2.5	7.8 ± 2.52	11.3 ± 2.94	7.3 ± 2.	8.1 ± 2.84	8.4 ± 2.71
NMRT	9.52±187.65	10.50 ± 194.8	11.23 ±195.65	10.06 ±131.90	10.36 ± 144.4	10.26 ± 150.34
TLT	37.30± 4.27	38.60 ± 4.22	41.68 ± 3.34	38.30 ± 5.27	38.75 ± 3.02	38.38 ± 4.08
SRT	5.6±1.99	6.95±1.72	9.72±1.28	7.50±1.58	8.14±1.53	8.19±1.74
BMI	18.80±2.269	19.29±2.38	19.56 ±2.266	19.32 ±2.18	19.33±2.022	19.25±03

Values are mean ± Standard deviation, EG=experimental group, CG= control group, PT= pre- test, DT= during test, PoT= post-test, PUT= push up test, NMRT= nine meter running test, and TLT= trunk lift test, SRT= sit and reach test and BMI= body mass index, PARAM= parameters

The table 2 showed that there was an improvement of push up, trunk lift, nine meter running and sits and reach test for experimental group as compared to control group. The mean difference revealed that there was an improvement in the performance of fitness parameters due to exercise in which they were engaged in. The mean value of push up of experimental group was increased from pre to post test, in pre test push up performance was 6.9 but after 12 weeks it was recorded as 11.3.

Alike push up, nine meter running test, and trunk lift performance was increased from 9.52 to 11.23 and 37.03 to 41.68 respectively, in the same way the improvement was observed in sit and reach (5.6 to 9.72), body mass index (18.80 to 19.56) test from pre to post test. The rationale behind the improvement in physical fitness performance was due to the

exercise that they took in the training schedule. The results clearly showed that exercise can have great effect on their physical fitness.

As indicated in table 2 the control group decreased on their physical fitness parameters. In BMI the control group decreased from 19.32 to 19.25 and nine meter running increased from 10.06 to 10.26 from pre to post tests respectively, but in other parameters slight improvements had been observed. The push up, trunk lift and sit and reach performance were increased by 7.3 to 8.4, 38.30 to 38.38 and 7.50 to 8.19 respectively. The result showed that the experimental group improved more than control group in all health related physical fitness components.

Table 2: The mean value difference and significance results between experimental and control groups from pre to post test

Variables Test	EGMD	EGS (p)	CGMD	CGS (p)
Push up test	4.4	0.000	1.1	0.12
Nine meter run test	1.71	0.000	0.20	0.451
Trunk lift test	4.38	0.000	0.08	0.902
Sit & Reach test	4.12	0.000	0.69	0.94
Body mass index test	0.76	0.000	0.07	0.519

EGMD=Experimental Group Mean Difference EGS=Experimental Group Significance, CGMD=Control Group Mean Difference CGS=Control Group Significance

As data (table 3) indicated that there was significant difference in experimental group performance as compare to the control group. The experimental group showed big change on physical fitness after 12 weeks of exercise schedule as compared to control group. The mean value difference of pre to post test among experimental group for pushups, nine meters run test, trunk lift test, sit and reach test and BMI was 4.4,1.71,4.38,4.12 and 0.76, respectively, whereas, for control group the mean differences were 1.1,2.01,0.08,0.69 and 0.07 for each physical fitness parameters, respectively.

The mean value difference of experimental group showed that their muscular strength was improved higher than control group. In the same way the mean value difference of nine meter running was 1.71 for experimental group and 0.20 for control

group. This showed experimental group increased their cardiovascular endurance than control group. Alike other parameters experimental group showed great mean values difference on trunk lift and sit and reach test, the recorded mean difference was 4.38 and 4.12 for experimental group and 0.08 and 0.69 for control group. This proved that the experimental group showed that a great improvement on flexibility and muscular endurance than control group. The mean value difference of experimental group BMI was 0.76 and control group was 0.07. This mean difference value showed that experimental group higher improved their body mass index than control group.

Table 3: The measured and calculated mean values of academic achievement of experimental group and control group, 2012\2013 school year.

Academic Test Variables	Experimental Group			Control Group		
	Mean ± SD	P	Mean ± SD	Mean ± SD	Mean ± SD	P
GAPS	FSGPA	-	SSGPA	FSGPA	SSGPA	-
	79.77 ±11.27	0.000	83.16 ± 11.32	78.44 ± 5.87	77.49 ± 5.65	0.14

GAPs=grade average points, FSGAP = first semester grade average point, SSGAP = second semester grade average point, SD= standard deviation.

As indicated in Table 4, the experimental group's GAPs mean value was increased from the first to the second semester (79.77→83.16). The rationale behind this improvement might be

the exercise in which the students engaged in. Whereas, the control group participants decreased their GAPs mean value of from first to second semester (78.44 →77.49).

Table 5 Correlation coefficients and significant of academic measurements with physical fitness parameters among experimental and control groups of Model School of Haramaya University

No	Variables	N	Experimental Group		Control Group	
			correlation	Significant	correlation	Significant
1	PUPRT & FSGAP	10	0.566	0.0207	0.271	-0.300
2	PUPOT & SSGAP	10	0.614	0.0183	-0.314	-0.106
3	NMRPRT & FSGAP	10	0.705	0.0137	0.151	-0.039
4	NMRPOT & SSGAP	10	0.981	0.009	0.312	-0.164
5	TLPRT & FSGAP	10	0.894	0.049	0.374	0.356
6	TLPOT & SSGAP	10	0.967	-0.015	0.314	0.316
7	SRPRT & FSGAP	10	0.418	0.0457	0.015	0.235
8	SRPOT & SSGAP	10	0.685	0.0289	0.274	0.147
9	BMIPRT & FSGAP	10	0.399	-0.0350	0.122	-0.256
10	BMIPOT & SSGAP	10	0.825	-0.0300	0.267	-0.380

FSGAPS =first semester grade average points, SSGAPS =second semester grade average points, PUPRT =push up pre test, PUPOT=push up post test, NMRPRT=nine meter run pre test, NMRPOT= nine meter run post test TLPRT=trunk lift pre test, TLPOT=trunk lift post test, SRPRT=sit and reach pre test, SRPOT=sit and reach post test, BMIPRT=body mass index pre test, BMIPOT=body mass index post test, EG= experimental group, CG=control group the degree of relationship is expressed by coefficient which range from correlation (-1 < r > +1) and the standard significant value $p < 0.05$.

The results showed that there was an improvement of push up, trunk lift, nine meter running and sit and reach test for experimental group when it was compared from pre to post test measurements. The control group also improved in some aspects but it was not that much. The academic results showed that experimental group's GAPs were greatly improved from first to second semester. But in control group the mean value of GAPs from first to second semester was decreased. The significance results showed that experimental group improved academic achievement (GPAs) due to participation of physical activities. In other hand the results indicated that there was slight improvement had been observed on their physical fitness except BMI .

The correlation coefficient of experimental group on muscular strength and flexibility showed moderate significant positive correlation with academic performance. And body composition had moderate significant negative correlation. With the exception of the cardiovascular endurance and muscular endurance results showed very high significant positive correlations with academic performance among the experimental group.

IV. CONCLUSIONS

Regular participation in physical activity had a significant effect on the improvement and enhancement of physical fitness performance and improved academic achievements. The school participants, who took part in the regular physical activity had improve their physical fitness and academic achievement as compared to control group. Participation in regular exercises is very important for school children for overall development. There was a strong correlation between academic achievement and physical fitness. The improvements in academic achievements and physical fitness were clearly shown during pre and post test of the study

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REFERENCES

- [1] Ekeland, E., F. Heian, K. Hagen, B. Abbott, and L. Nordheim, 2004. Exercise to improve self-esteem in children and young people. The Cochrane Database of Systematic Reviews. (1);, CD003683.
- [2] Emery, C., R. Shermer and E. Hauck, 2003. Cognitive and psychological outcomes of exercise in a 1-year follow-up study of patients with chronic obstructive 129 pulmonary diseases. *Health Psychology*, 22: 598-604.
- [3] Flook, L., Repetti, R. L., and Ullman, J. B., (2005). Classroom social experiences as predictors of academic performance. *Developmental Psychology*, 41 (2):319-327.
- [4] Hansen, C., L. Stevens and J. Coast, 2001. Exercise duration and mood state: how much is enough to feel better? *Health Psychology*, 20: 267-275.
- [5] Maeda, J.K. and N.M. Murata, 2004. Collaborating with classroom teachers to increase daily physical activity: The GEAR program. *JOPERD.*, 17(5): 42-46.
- [6] Shephard, R., 1983 . Physical activity and the healthy mind. *Canadian Medical Association Journal*, 128: 525-530.
- [7] Schneider, K., B. Spring, S. Pagoto and L. Sherry, 2007. Affective benefits of exercise while quitting smoking: Influence of smoking-specific weight concern. *Psychology of Addictive Behaviors*, 21:255-260.
- [8] Wolfson, C., 2002. Increasing behavioral skills and level of understanding in adults: A brief method of integrating Dennison's Brain Gym balance with Piaget's reflective processes. *Journal of Adult Development*, 9(3):

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Socio-cultural and Religious plants used by BODO tribes of BTC, Assam, India

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Abstract- *Bodos* are the major tribe inhabiting in BTC. The *Bodos* have rich cultural and social heritage. They have their own religion and language. Since *Bodos* are living around the forest and nature; they have some traditional believes and knowledge in plants and forests. Perhaps the availability and richness of forest and plants of the areas where they inhabit may be the important reasons how they get influence with plants and forests in their socio-cultural and religious life. The Scientific documentation of the plant species which are used in socio-cultural and religious activities will definitely give encouragement to the community tribal people. The preservation of their indigenous knowledge with plant and forest may be important tools for conservation of these plant species. In this paper, a total of 48 plant species from 36 different families are documented.

Index Terms- Socio-cultural and religious plant, Traditional, *Bodo* tribe, Assam

V. INTRODUCTION

The state of Assam is constituent unit of Eastern Himalayan Biodiversity region. Assam (89°50' E to 96°10' E and 24°30' N to 28°10' N), a North Eastern state of India, is rich in biological diversity [8]. The total geographical area of the state is 78438 sq. km. out of which 28761 sq. km. is covered by forest. Assam has been endowed with a variety of forest type on account of its unique geographical terrain. The array of floristic richness has permitted many scholars to describe Assam as the 'Biological Gateway' of North East India

The Bodoland Territorial Council (BTC) occurs in lower Assam. It covers 3539.95 sq. km. area of forest which is located along the international boundary with Bhutan. The entire northern belt of the forest is situated in sub Himalayan alluvial tract of typical formation known as Bhabar tract. The demography of BTC is dominated by Bodos, an aboriginal tribal community of Assam and has distinct culture and heritage. The Bodos in the course of time have synthesized a vast knowledge in respect of acquiring and gathering knowledge of herbal medicines out of wild plants for healing and curing of ailments and they are culturally and socially intertwined with forest around them [9]. They worship their God near 'Bathou Gudi' i.e. the usual sacred place. This type of sacred place is found in every countryyard in the north-east side of its followers. When this place is taken for social gathering in a field, it is called 'Bathou Shalee'. The supreme God of the Bathouists is 'Anan Gosai' or 'Bathoubari' or 'Sibrai'. 'Sibrai' is called by more names also. 'Shiva' is his Hindu counterpart [10]. The socio-cultural and religious activity of Bodos has served the purpose of conserving their traditional heritage with plants since the time immemorial. Though Bodos have their own traditional religions the modern Bodos follows different religions like Bathou-Kherai, Brahma, Hinduism, and Christianity.

I. MATERIALS AND METHOD

The present study was carried out among the Bodo Tribe inhabiting in four districts viz. Kokrajhar, Chirang, Baksa and Udalguri district of BTC, Assam, India. The information regarding the utility of different plants in different religious and socio-cultural activities was collected from elderly person and religious headman. The survey was carried out among local population and the community people was met in their residential areas. The visit was repeated for several times as requisite information for proposed work until was completed. Data was collected by questionnaire, interviews and discussion among local headman in their local language.

The knowledgeable person was engaged with us to the location site where they have seen the plants. The collected plant specimens were carefully identified with the help of experts and by referring relevant scientific literatures [1,4-7]. The specimens have been preserved at Department of Botany, Science College, Kokrajhar. Few of the plant species were photographed during field study and sample collection.

II. RESULT AND DISCUSSION

The present study could document 48 plant species from 36 families which are associated with the socio-cultural and religious beliefs among the Bodo tribe of BTC. These plant species are used regularly by them in various socio-cultural and religious

activities. The plant species of the present study are arranged in alphabetically with their Botanical name, family, Bodo name and uses as shown in **Table 1**. A total of 49 photographs of 49 plant species are also presented in this paper.

Table 1. List of plant species used by Bodo tribe in socio-cultural and religious activities.				
Sl.no	Scientific name	Family	Bodo name	Uses
1	<i>Aegle marmelos</i> (L) Corr. Serr.	Rutaceae	Bel	Leaves are used in offering to please Lord Shiva. This plant is considered as plant of 'Bwrai Bathou' (Lord Shiva).
2	<i>Allium sativum</i> L.	Amaryllidaceae.	Sambram gupur	Plant is used to drive away the evil spirits.
3	<i>Alpina allughas</i> Rose.	Zingiberaceae	Tarai	Used in 'Gwka-gwkwi' a kind of social curry prepared during 'Bwisagu' the Assam new year.
4	<i>Ananas comosus</i> (L.) Merr.	Bromeliaceae	Anaros	Young leaves are used in the preparation of 'Amao' the starter cake for 'Jwo' a kind of country made rice beer which is cultural and social drinks of Bodos.
5	<i>Anthocephalus cadamba</i> (Roxb.) Miq.	Rubiaceae	Kwdwm	The plant is believed as a plant of Lord Krishna.
6	<i>Antidesma diandrum</i> (Roxb.)	Phyllanthaceae	Lapasaiko	Used in Gwka-gwkwi a kind of social curry prepared during 'Bwisagu' the Assam new year.
7	<i>Aquilaria agallocha</i> Roxb.	Thymelaeaceae	Agru	Agru aroma is used as fragrance during worship. This aroma is believed as fragrance of heaven.
8	<i>Areca catechu</i> L.	Arecaceae	Goi	It considered as holy fruits and used in offering to God and Goddess.
9	<i>Bambusa tulda</i> Roxb.	Poaceae	Owa	Bamboo plant has relation from birth to death of Bodo people. Sharp bamboo stick is used to cut the nari() of new born baby. They also use bamboo shang (carriage) which is prepared by tying with rope of cane (raidwng) strictly to carry the death soul.
10	<i>Benincasa hispida</i> Thunb.	Cucurbitaceae	Kumbra	Mature enough fruits called 'kunbra bwrai' are used in preparation of 'Napam' a fermented fish. 'Napam' is a traditional heritage and social dish of Bodos.
11	<i>Bixa orellana</i> Linn	Bixaceae.	Sindur bipang	The red dyes over the seed coat are used during worship.
12	<i>Brassica compestris</i> L.	Brassicaceae	Besor	Seeds are used to drive away the evil spirits. Seed oil is used to lighten the lamp during worship.
13	<i>Clerodendum infortunatum</i> Gaertn.	Verbenaceae	Lwkwna	Twig of flowers are used in celebration of 'Bwisagu' the

				Assam new year. Young leaves are used in the preparation of 'Amao' the starter cake for 'Jwo' a kind of country made rice beer which is cultural and social drinks of Bodos.
14	<i>Calamus latifolius</i> Roxb.	Arecaceae	Raidwng	The plant is used as rope to tie during preparation of many social and cultural articles of Bodos. Young tendered shoot-apex is used in 'Gwka-gwkwi' a kind of social curry prepared during Assam new year.
15	<i>Curcuma amarissima</i> L.Roscoe.	Zingiberaceae	Katri bipang	Twig of flowers are used in celebration of 'Bwisagu' the Assam new year. Leaves are used as traditional packaging materials.
16	<i>Cannabis sativa</i> L.	Cannabaceae	Ganja	Used during worship of Lord Shiva.
17	<i>Costus speciosus</i> Koen ex.Retz.	Costaceae	Buritokon	Young shoots are used in celebration of 'Bwisagu' the Assam new year. Used in Gwka-gwkwi a kind of social curry prepared during 'Bwisagu' the Assam new year.
18	<i>Canna indica</i> L.	Cannaceae	Pajati	The flower of this plant is believed as flower of heaven.
19	<i>Canarium bengalensis</i> Roxb.	Burseraceae	Dhuna	The brownish clear resin of this plant is use as fragrance during worship.
20	<i>Catharanthus roseus</i> (L.)G.Don	Apocynaceae	Parvati pul	Flower is used to offer Goddess 'Parvati'.
21	<i>Curcuma longa</i> L.	Zingiberaceae	Haldwi	This plant is regarded as holy plant. Bathing with rhizome extract before doing any sacred work is seen among the Bodos.
22	<i>Cocos nucifera</i> L.	Arecaceae	Narengkol	It is considered as holy fruits and used in offering to God and Goddess.
23	<i>Colocasia esculenta</i> (L.)Schott.	Araceae	Taso	Used in preparation of 'Napam' a fermented fish. 'Napam' is a traditional heritage and social dish of Bodos.
24	<i>Corchorus capsularis</i> L.	Malvaceae	Patw (Narji)	Dry leaves are used in preparation of a social curry 'narji wngkri'. Dry leaves are also used in ritual believes of Bodos to cut off relation with departed soul.
25	<i>Cynodon dactylon</i> (L)Pers.	Poaceae	Dubri hagra	The twigs of leaves are used in holy water (Dwi Santi) during worship.
26	<i>Datura stramonium</i> L.	Solanaceae	Datura	Used during worship of Lord Shiva.
27	<i>Dillenia indica</i> L.	Dilleniaceae	Taigir	The persistent calyx (false fruit) is used in lightning during Kartik gasa i.e. lamp of 'Kartik' the Assam month. The five

				persistent calyx of this plant is significantly mentioned in 'Bathou' prayer.
28	<i>Eleocarpus ganitrus</i> (Roxb.)	Eleocarpaceae	Undurmala	The beaded chain prepared from the seeds of this plant is used during the worship of 'Bwrai Bathou' (Lord Shiva).
29	Erianthus spp.	Poaceae	Engkwr	Plants are used in 'Bathou' the altar of <i>Bodos</i> . This plant is also use in construction of traditional kutch house of <i>Bodos</i> .
30	<i>Euphorbia nerifolia</i> Linn.	Euphorbiaceae	Sejou	In the preparation of 'Bathou' the alther of <i>Bodos</i> this plant is surrounded by a round fence of five bamboo strips. This plant is regarded as plants of 'Bwrai Bathou' (Lord Shiva).
31	Entada gigas (L)Fawc&Rendle	Fabaceae	Gila	Seeds are used in indigenous sports 'Gila gelenai'.
32	<i>Ficus religiosa</i> Linn.	Moraceae	Pakri	<i>Bodos</i> worship their God under this tree. It is believed as a plant of Lord Krishna. They have ritual of offering drinking water to death soul with leaves of this plant.
33	<i>Ficus bengalensis</i> L.	Moraceae	Dhob	This plant is considered as devils plant.
34	<i>Hibiscus rosa sinensis</i> L.	Malvaceae	Joba pul	This flower is used for offering to God and Goddess.
35	<i>Imperata cylindrical</i> (L)P.Beauv.	Poaceae	Turi	The plant is used as tacht for rooping for a kutch house. <i>Bodos</i> have their own traditionally design kutch house.
36	<i>Justicia gendarussa</i> Burm.f.	Acanthaceae	Jatras	The twig of leaves is used in holy water (Dwi Santi) during worship.
37	<i>Leucas aspera</i> (Willd.)Linn.	Lamiaceae	Kansingsa	The flower of this plant is specially used in offering to please the Lord Shiva.
38	<i>Laportea crenulata</i> Goud	Urticaceae	Koma	The leaves with stinging hairs of this plant are used for irritating the guilty person as a social punishment.
39	<i>Musa paradisiacal</i> L.	Musaceae	Tailir	Whole parts of the plant are used in social and religious activities. Fruits are used for offering. Portion of leave apex called 'lajwo' and portion of petiole called laikong are used as article for offering.
40	<i>Maranta sp.</i>	Marantaceae	Laihulai	Used in making of 'Kopri' a traditional and cultural bamboo article. <i>Bodos</i> are use Kopri as umbrella in rain.
41	<i>Mangifera indica</i> L.	Anacardiaceae	Taijwo	Leaves are used in offering.

42	<i>Nephrودیum cucallatum</i> (Blume) Baker.	Dryopteridaceae	Saldaokumwi	This plant is used to keep away of evil spirit from ill soul of humans.
43	<i>Ocimum sanctum</i> Linn.	Lamiaceae	Tulsi	The twig of leaves is used in holy water (Dwi Santi) during worship.
	<i>Oryza sativa</i>	Poaceae	Mai	Seeds are used in many religious occasion of Bodos.
44	Piper betle L.	Piperaceae	Patwi	Leaves are used in offering. Bodos have rituals of ‘Patwi lai bisinai’ i.e. teacing of betel leaves during divorce.
45	<i>Ricinus communis</i> Linn.	Euphorbiaceae	Indi bipang	Leaves are used as food plant for eri-silk. The rearing of eri-silk worm is traditional heritage of Bodo women.
46	<i>Scoparia dulcis</i> L.	Plantaginaceae	Bongpang rakeb	Young leaves are used in the preparation of ‘Amao’ the starter cake for ‘Jwo’ a country made rice beer which is cultural and social drinks of Bodos.
47	<i>Sesamum indicum</i> L.	Pedaliaceae	Sebeng	Seeds are used in preparation of rice cake (pitha) a social cake during festival “Domasi”.
48	<i>Tabernaemontana divaricata</i> R.Br. ex Roem & Schult.	Apocynaceae	Pul daodwi	This flower is used in offering God and Goddess.



Daemonorops angustifolia



Hibiscus rosa sinensis L.
(Giff) Mart.



Ocimum sanctum Linn



Canna indica L.



Piper bittle L.



Dillenia indica L.



Alpina allughas Rose



Ficus religiosa Linn



Justicia gendarussa Burm.f.



Ficus bengalensis L



Aegle marmelos (L) Corr. Serr.



Datura stramonium L.



Ricinus communis Linn.

Nephrodium cucullatum

Leucas aspera (Willd.) Linn.
(Blume) Baker.



Laportea crenulata Goud

Imperata cylindrical (L) P. Beauv.

Sesum indicum L.



Bambusa tulda Roxb.



Eleocarpus ganitrus (Roxb).



Clerodendum infortunatum Gaertn.



Curcuma longa L.



Cocos nucifera L.



Euphorbia neriiifolia Linn.



Cynodon dactylon (L) Pers

Ananas comosus (L) Merr

Musa paradisiacal L.



Scoparia dulcis L.

Mangifera indica L.

Tabernaemontana divaricata
R.Br.ex Roem & Schult.



Brassica campestris L.

Cannabis sativa L.

Allium sativum L.



Corchorus capsularis L.

Colocasia esculanta (L) Schott.

Anyhocephalus cadamba
(Roxb) Miq.



Oryza sativa L.



Areca catechu L.



Benincasa hispida Thunb.

III. CONCLUSION

These studies of socio-cultural and religious plant of Bodos make us understand that how plants are important in human life. Though we frequently talk about some commercial species which are used in Food, medicine, cloth and shelters, but there are plants which are less known to us and without of which the socio-cultural and religious heritage of human kind is incomplete.

On the other hand these studies make us understand how community people are contributing in conservation of plants and forest of their own interest to check their inherent socio-culture and religious activities. These activities of conserving and using of plant species in the name of socio-cultural and religion has significance in today's crisis of biodiversity conservation.

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REFERENCES

- [1] H. Narzary, S. Brahma, S. Basumatary; Wild Edible Vegetables Consumed by Bodo Tribe of Kokrajhar District (Assam), North- East India , Arch. Appl. Sci. Res.,2013,5(5): 182-190.
- [2] Vijay Shirma and B.D. Joshi; Role of Sacred Plants in Religion and Health-care system of local people of Almora district of Uttarakhand State (India)., Academic Arena, 2010;2(6).
- [3] Ahirwar J.R.; Socio-Religious Importance of Plants in Bundelkhand Region of India; Res. J. Recent Sci., Vol. 2(ISC-2012), 1-4 (2013) .
- [4] J.D. Hooker; The Flora of British India, L.Reeve & Co., London, 1872-1897, Vol. 1-7.
- [5] B. Patiri, A. Borah; Wild edible plants of Assam, Director, Forest communication, Forest Department, Assam, 2007.
- [6] U.N.Kanjilal et.al.; Flora of Assam, Govt. of Assam, Shillong, 1934-1940, Vol 1-4.

- [7] H. Hara; The Flora of Eastern Himalaya, Reports I&II, Tokyo University, Tokyo, 1966.
- [8] S.Basumatary, J.Chem.Bio. Phy. Sci., 2012-2013, 3(1), 551-558.
- [9] BTC Forest Department, Profile on Forest and Wildlife of Bodoland Territorial Council.
- [10] L. Brahma, Religion and dances of the Bodos., 1993

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FREON LEAKAGE

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Abstract - All types of Freon, including those that do not contain chlorine and are not considered Ozone-depleting substances, have negative effects to the environment because they contribute to global warming. As a result of the harmful effects Freon has upon the environment, numerous research studies of existing refrigeration systems have been carried out. Some of those studies were related to the quantity of Freon that leaks out into the atmosphere, while others were related to what causes Freon to leak. The results of a research on quantity of Freon emissions from refrigerating systems in Serbia are shown in this paper. These findings are important since they represent the starting point when defining measures aimed at reducing Freon emissions and leakage from refrigeration and air conditioning systems.

Index terms - Global warming, F-Gas Regulation, Freon leak, refrigeration systems.

I. INTRODUCTION

Serbia has ratified both the Montreal and the Kyoto Protocol treaties, except that regulations of these protocols are not the same for Serbia and developed countries. Serbia has not signed the F-Gas Regulation yet and still lags behind developed countries in this respect. This paper presents the results of a research on the quantity of Freon leaked out of the refrigeration systems in supermarkets and describes what measures, in accordance to the EU legislations, are taken when installing refrigeration systems using Freon.

The amount of Freon currently released to the environment needs to be established in order to take appropriate measures for reducing Freon leakage.

Freon is widely used in refrigeration and air conditioning systems in foodservice facilities (such as petrol stations, convenience stores, grocery stores and supermarkets), cold storages for cooling and freezing food and transportation vehicles. Refrigeration systems in super- and hypermarkets contain the largest quantity of refrigerant which is proportional to their size. Moreover, refrigeration systems in these facilities use numerous branch circuits and consist of long pipelines containing large amounts of refrigerant, so pipes tend to burst more often. This can be potentially harmful to the environment and therefore more attention is being paid to refrigeration systems in super- and hypermarkets as well as to refrigerants.

Small convenience stores, mostly, do not have refrigeration system with central cooling units, yet cooling units are located in cooling display cabinets (as household refrigerators). Regarding refrigerant leakage, the aforesaid convenience stores are less dangerous than super – and hypermarkets because refrigerant is found in the cooling units of their cooling display cabinets.

Unlike EU countries, the South East European countries have far greater number of small convenience stores than supermarkets [1] . The situation in Serbia is the same, even though the trend in the world today is decreasing number of small stores and increasing number of supermarkets. The retail industry in Serbia is undergoing a transformation where key trends are showing tendency towards declining significance of small stores that will certainly not be eliminated in the future, but their number will be reduced.

It often happens that a large quantity of refrigerant leaks out into the environment due to refrigeration system failures and repair service interventions. For this reason, it is very important to take this problem into consideration when selecting refrigerants because of their negative environmental impact.

A major part of refrigeration systems in foodservice facilities utilize Freon. CFC refrigerants are also banned in Serbia and cannot be used not even for the purpose of equipment servicing, which implies that refrigeration systems using these refrigerants do not exist in Serbia. HCFCs are being phased out, but there is still great number of refrigeration systems that utilize HCFC refrigerants.

As a result of the Montreal Protocol regulations, the number of refrigeration systems with HCFCs is being gradually reduced. HFC refrigerants are mainly used in new refrigeration systems and the same thing is being also practiced in Serbia. In most countries HFCs are not banned, however, developed countries have started imposing stricter regulatory measures on the use of HFCs since they are categorised as having a high global warming potential (GWP).

Over the past three years, 2010, 2011 and 2012, the records of the quantity of Freon used during maintenance and equipment repair service at 26 supermarkets in Serbia have been kept. The data for all three years (2010, 2011 and 2012,) were collected in collaboration with company Soko Engineering. This company maintains refrigeration installations in 26 supermarkets that are the subject of research.

All supermarkets had two types of refrigeration systems. The first one is the Medium Temperature system (MT) and it serves to achieve temperature from +2 to +6°C in cold rooms and cooling display cabinets. The other one is the Low Temperature system (LT) which serves to achieve temperature from -22 to -18 °C in cold rooms and cooling display cabinets. Determining Freon leakage rate in both refrigeration systems has also been included in this research. The amount of refrigerant should always be the same in the refrigeration system; hence it is important that the quantity of refrigerant recharge correspond to the quantity of refrigerant that has leaked out.

II. RESEARCH ELABORATIONS

1.1. Research results in 2010.

Table 1 shows research results for 26 supermarkets in Serbia regarding Freon leakage rate in 2010.

Table 1: Freon leakage rate for supermarkets – 2010

Supermarket	First installation of refrigeration system	The amount of refrigerant in the installation (kg)	Refill freon in the system (kg)	Leakage (%)
1	2007	330	66	20,0
2	2004	157	0	0,0
3	2004	140	66	47,1
4	2007	157	0	0,0
5	2007	151	77	51,0
6	2007	136	66	48,5
7	2008	137	33	24,1
8	2008	108	0	0,0
9	2008	370	66	17,8
10	2006	602	231	38,4
11	2008	153	55	35,9
12	2009	95	11	11,6
13	2009	186	44	23,7
14	2004	123	33	26,8
15	2004	102	0	0,0

16	2006	234	55	23,5
17	2006	125	0	0,0
18	2004	125	25	20,0
19	2007	146	33	22,6
20	2006	159	0	0,0
21	2006	146	55	37,7
22	2004	154	63	40,9
23	2004	126	55	43,7
24	2007	82	33	40,2
25	2008	85	0	0
26	2008	70	3	4,3
Average freon leakage rate in 26 supermarkets - 2010 [%]				22,2

1.2. Research results in 2011.

Table 2 shows research results for 26 supermarkets in Serbia regarding Freon leakage rate in 2011.

Table 2: Freon leakage rate for supermarkets – 2011

Supermarket	First installation of refrigeration system	The amount of refrigerant in the installation (kg)	Refill freon in the system (kg)	Leakage (%)
1	2007	330	117,6	35,6
2	2004	157	11	7,0
3	2004	140	0	0,0
4	2007	157	66	42,0
5	2007	151	20	13,2
6	2007	136	10	7,4
7	2008	137	55	40,1
8	2008	108	22	20,4
9	2008	370	45	12,2
10	2006	602	164	27,2
11	2008	153	33	21,6
12	2009	95	33	34,7
13	2009	186	110	59,1
14	2004	123	35	28,5
15	2004	102	5	4,9
16	2006	234	77	32,9
17	2006	125	0	0,0
18	2004	125	66	52,8
19	2007	146	60	41,1
20	2006	159	11	6,9
21	2006	146	91	62,3

22	2004	154	73	47,4
23	2004	126	6	4,8
24	2007	82	0	0,0
25	2008	85	0	0
26	2008	70	5	3,5
Average freon leakage rate in 26 supermarkets - 2011 [%]				23,3

1.3. Research results in 2012.

Table 3 shows research results for 26 supermarkets in Serbia regarding Freon leakage rate in 2012.

Table 3. Freon leakage rate for supermarkets – 2012.

Supermarket	First installation of refrigeration system	The amount of refrigerant in the installation (kg)	Refill freon in the system (kg)	Leakage (%)
1	2007	330	56	17,0
2	2004	157	20	12,7
3	2004	140	10	7,1
4	2007	157	32	20,4
5	2007	151	10	6,6
6	2007	136	11	8,1
7	2008	137	11	8,0
8	2008	108	0	0,0
9	2008	370	44	11,9
10	2006	602	66	11,0
11	2008	153	22	14,4
12	2009	95	56	58,9
13	2009	186	11	5,9
14	2004	123	26	21,1
15	2004	102	18	17,6
16	2006	234	30	12,8
17	2006	125	11	8,8
18	2004	125	12	9,6
19	2007	146	16	11,0
20	2006	159	36	22,6
21	2006	146	6	4,1
22	2004	154	56	36,4
23	2004	126	16	12,7
24	2007	82	38	46,3
25	2008	85	40	47,1
26	2008	70	0	0,0

Average freon leakage rate in 26 supermarkets - 2012 [%]	16,6
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III. RESULTS OF FINDING

1.4. Comment and comparison with research results obtained in other countries

The research conducted in 2010 showed that annual Freon leakage rate was 22.2% out of the total operating charge. The excessive Freon loss in the event of a catastrophic leak was taken into account as well. Regardless of all the precautionary measures, catastrophic leaks occur and they have been taken into account in this research because it is the only way to get a real insight into the amount of Freon that leaks out into the environment.

The average Freon leakage rate at 26 supermarkets in 2011 was 23.3% out of the total operating charge. Refrigeration systems of these 26 supermarkets were relatively new which started operating between 2004 and 2009, so the leakage rate is lower than the one in older refrigeration systems. Old and worn components, joints and devices within refrigeration systems can cause increased Freon leakage.

In the first half of 2012 all filters with flared joints were replaced with filters with welded joints. All valves (solenoid, stop valves...) were also replaced with valves with welded joint. That resulted in Freon leakage reduction, therefore the average Freon leakage rate in 2012 at 26 supermarkets was 16.6%. Replacing flared joints with welded joints led to significant reduction of Freon leakage compared with the years 2010 and 2011.

Refrigerant leakage is typical for all refrigeration systems and depends on the complexity of the system, working conditions, maintenance methods and many other factors. In recent years research studies on Freon leakage has been carried out mostly all over Europe and in the United States.

A study conducted in Germany reported annual Freon leakage rate for supermarket central refrigeration systems of between 5% and 10% [2]. In 2006, another research conducted at 21 supermarkets in the United States indicated refrigerant leakage rate of around 8% [2]. Freon leakage in refrigeration systems that are 1 to 4 years old is below this level.

In Sweden, between 1996 and 2003 a research carried out at 450 supermarkets indicated Freon leakage rate of around 12% [3]. According to the EIA (Environmental Investigation Agency), UK supermarkets are reported an 11% annualised refrigerant charge loss. Furthermore, the agency reported leakage rates in other countries of between 5% and 22%.

Methods of installing central refrigeration systems in Serbia and in other countries around the world are not so different with respect to installed components and implemented regulations and measures, especially in large supermarket chains. Serbia does not have manufacturing companies of refrigeration system components (such as compressors, air cooled condensers, evaporators, oil separators, receivers, valves, etc.), so all these components are being imported mainly from Italy, Germany and some from France. Although the same principles, installation methods and the same quality of installed components are being respected, there are other factors as well affecting the quality of refrigeration systems and thereby Freon leakage.

The aforesaid factors, comparing with other countries, are caused by inadequate education of contractors, service technicians and service and maintenance engineers. Installing the Freon leak detector in the supermarket machine room, retail space and storage rooms where cooling chambers are located can considerably contribute to Freon leakage reduction. Nowadays in most European countries installation of the Freon leak detector is mandatory and stipulated by the F-Gas Regulation. The number of detectors to be installed is based on the size of a machine room. Freon leak detector is simple device, very inexpensive in comparison to the price of supermarket refrigeration system and long-term cost-effective for an investor himself because it will prevent Freon loss.

Freon price increase in the world and in Serbia will compel both installers and investors to take appropriate measures in order to reduce Freon emissions. Refrigeration systems usually have 1 year limited warranty, so the interest of installation companies is to have as less Freon leakage as possible within that period, in order to avoid greater costs by charging the refrigeration system with

additional amounts of Freon. After the limited warranty expires the costs are defrayed by the investor, i.e. the purchaser. Until 2007 Freon prices were low, so speaking from this point of view, the problem of Freon emissions and leakage was not even considered.

In order to reduce Freon emissions many research aimed at detecting the most common causes of refrigerant leakage has been conducted. For that purpose the Forshungsrat Kältetechnik investigated the causes of Freon leakage at 62 commercial refrigeration systems in Germany which were installed between 1990 and 1999 [4] . The results showed that out of these 62 refrigeration systems, 19 were with central cooling units, 43 were decentralised systems, and refrigerant charge was of between 0, 7 and 360 kg. It was determined that 83% of the total refrigerant loss was through joints. Empirical data obtained in Serbia is very similar to this research conducted in Germany.

Figure 1 shows research results of the most common refrigerant leak points at 62 commercial refrigeration systems in Germany.

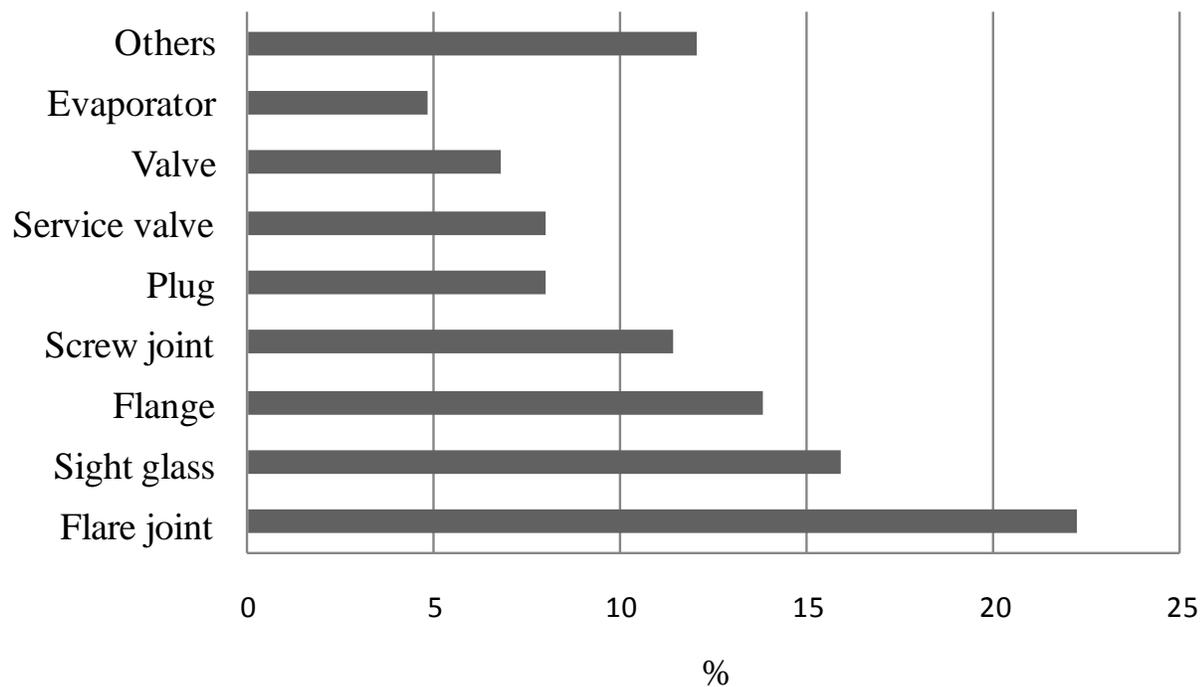


Fig. 1. Refrigerant leak points (according to the number of leaks, not the quantity) at 62 commercial refrigeration systems in Germany [4]

Since the great portion of leaks occurred at flared joints, the number of flared joints at refrigeration systems with central cooling units was considerably reduced, and special attention was given to the points where pipe bursting occurs due to vibrations. A lot of effort has been put into improving the quality of welded joints where Freon leak most often occurs (afore-mentioned research refers to the number of leaks, and not to the amount of Freon that leaks out). The same measures are applied in Serbia as well when installing refrigeration systems.

Figure 2 shows the most common causes that lead to refrigerant leakage, according to the research presented at the International Congress of Refrigeration in China. 86% of refrigerant leaks are caused by mechanical wear-and-tear on the system and vibration, as shown in the graph. The major portion of refrigerant leaks within mechanical wear-and-tear is related to flared joints. These findings are important because they indicate that considerable leak reduction can be accomplished by improving the design of cooling units, piping installation methods that would reduce vibrations and the quality of components and joints.

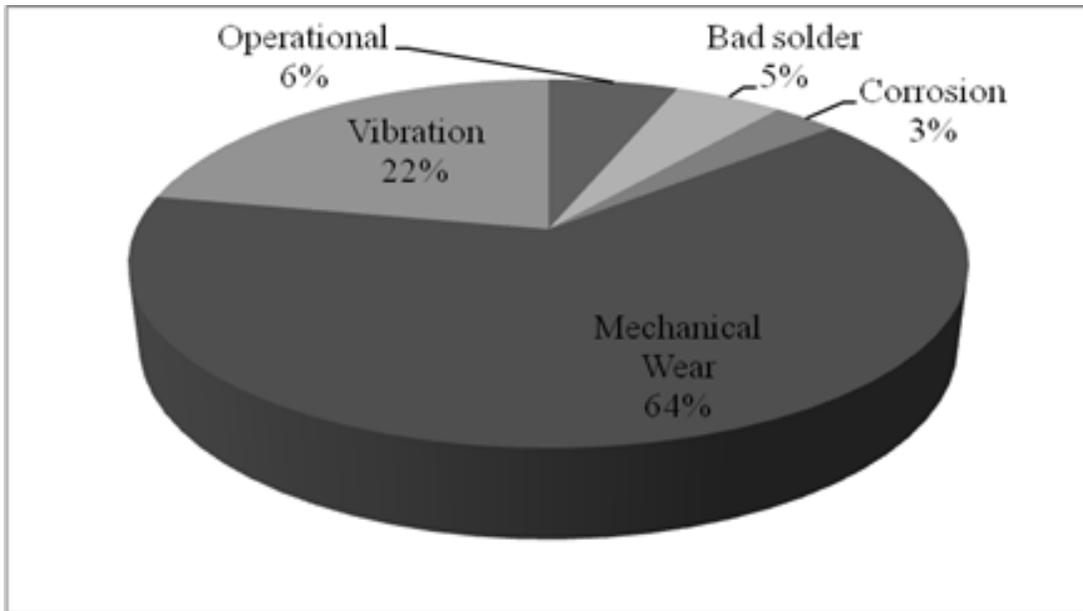


Fig. 2. Most common causes of refrigerant leakage from the system [5]

1.5. Measures implemented in Serbia to reduce Freon leakage

Leakage reduction can be achieved by improving the quality of components, joints and installation methods. The use of anti-vibration rubber feet or spring mounts under refrigeration compressors reduces vibration which causes 22% of Freon leaks. Figure 3 shows the anti-vibration rubber feet and spring mounts that are installed under the refrigeration compressors.



Fig. 3. Anti-vibration rubber feet and spring mounts for refrigeration compressors

Besides compressor, the matching anti-vibration feet are also installed under the central cooling unit for levelling and vibration control. Figure 4 shows the anti-vibration rubber feet used for cooling units.



Fig. 4. Anti-vibration rubber feet for cooling units

To avoid vibration, the anti-vibration flexible hoses should be installed in the suction and discharge lines of the refrigeration compressor. At cooling units these anti-vibration hoses are mounted in all incoming and outgoing pipes. Figure 5 shows the anti-vibration flexible hose for refrigeration systems.



Fig. 5. Anti-vibration flexible hose for refrigeration systems

Reduction of refrigerant charge can result in reduced refrigerant leakage. Arranging the refrigeration equipment in only one section of the super-or hypermarket and installing the machine room closer to the cooling display cabinets and cooling rooms can contribute to refrigerant charge reduction. Technical solutions such as this should be carried out during architectural design process phase when good cooperation between architectural and mechanical engineers has to be established. Mechanical engineers, whose role is to give guidance or instructions and to oversee the mechanical equipment installation, ought to take into account that the short-length pipeline would result in reduced amount of refrigerant in the system.

Apart from afore-mentioned, reduction of the quantity of Freon in the refrigeration system can be accomplished by various technical solutions. One of them is to use water-cooled instead of air-cooled condensers in order to reduce the amount of refrigerant charge. In this manner the system would not have external units (air-cooled condensers) but water-cooled condensers placed in the machine room next to the cooling units. Accordingly, the length of the pipeline between cooling unit and condenser is shorter, which leads to reduced amount of refrigerant in the system [6].

Another efficient method to reduce the refrigerant charge is to use certain type of heat exchangers. If the air-cooled condensers in the system are needed due to deficiency of clean water, then the optimum choice would be to use micro channel condensers. The volume of these condensers is a few times less than the volume of standard air-cooled condensers of the same capacity which are made of copper tubes with aluminium fins. The use of water-cooled or air-cooled micro channel condensers enables easier compliance with the F-Gas Regulation and contributes to a real reduction in refrigerant leakage [6].

It should be mentioned as well that according to the F-Gas Regulation the frequency of leak testing depends on the amount of Freon in the system, thereby leak checking needs to be done more frequently at systems containing larger amount of Freon.

Apart from the Montreal and Kyoto Protocol requirements, additional measures to reduce greenhouse gas emissions are being applied in developed European countries. Denmark, Netherlands, Norway, Austria and Sweden have introduced regulations that prohibit the use of HFC refrigerants, which do not deplete the Ozone layer but have a high global warming potential (GWP). The tax on refrigerants has not being yet introduced in Serbia and the only regulations put into effect are the Montreal and Kyoto Protocols.

Even though Serbia has not still signed the F-Gas Regulation, we should be working towards system upgrades and better training of mechanical engineers, service and maintenance engineers and service companies because the opportunities to reduce refrigerant emissions are most likely to be associated with improvements to service and maintenance regimes and procedures.

IV. CONCLUSION

In comparison with other developed countries, Freon leakage rate in Serbia is significantly higher.

Freon leak reduction can be accomplished in many ways. One way is replacement of flared with welded joints and the use of flexible hose and anti-vibration feet under compressors. Decisive factor providing reduced amount of refrigerant charge in the system is the choice of the machine room location and position of cooling devices in order to shorten the length of the pipeline.

In existing systems Freon leakage can be reduced by installing the leak detector, keeping records of service interventions and providing training of engineers.

REFERENCES

- [1] Kaufeld M., (2009), *Market Summary-Model Technologies, In: Comparative Assessment of the Climate Relevance of Supermarket refrigeration Systems and Equipment*, Rhiemeier J.-M., Dr Harnisch J., Ters C., Kaufeld M., Leisewitz A., Federal Environment Agency (Umweltbundesamt), Germany, 30.
- [2] Kaufeld M., (2009), *Market Summary-Model Technologies, In: Comparative Assessment of the Climate Relevance of Supermarket refrigeration Systems and Equipment*, Rhiemeier J.-M., Harnisch J., Ters C., Kaufeld M., Leisewitz A., Federal Environment Agency (Umweltbundesamt), Germany, 112.
- [3] Arias J., (2005), *Energy Usage in Supermarkets – Modeling and Field Measurements*, PhD Thesis, Royale Institute of Technology, Stockholm, Sweden.
- [4] Kaufeld M., (2009), *Market Summary-Model Technologies, In: Comparative Assessment of the Climate Relevance of Supermarket refrigeration Systems and Equipment*, Rhiemeier J.-M., Harnisch J., Ters C., Kaufeld M., Leisewitz A., Federal Environment Agency (Umweltbundesamt), Germany, 111.
- [5] Høglund R., (2006), *Supermarket refrigerant leak reduction taskforce*, FMI Energy and Technical Services Conference, USA.
- [6] Vukovic Z., (2012), *Reducing the quantity of freon in cooling systems for supermarkets*, Proceedings of the 43rd International Congress on Heating, Refrigerating and Air-Conditioning, Belgrade, Serbia, 5-7.12.2012., 123.

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Distribution of digestive enzymes in the gut of American cockroach, *Periplaneta americana* (L.)

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Abstract- Adult male and female cockroaches, *Periplaneta americana* (L.) were assayed for the presence of digestive enzymes in the fore-, mid- and hindgut regions. Activities of α -amylase, β -amylase, γ -amylase, proteinase and lipase were detected in the three gut regions except for the absence of γ -amylase and lipase in female hindgut. The presence of these enzymes partly explains the polyphagous feeding habit of *P. americana*, enabling the insect species to digest a wide variety of food substances. In some instances, significant differences in enzyme activities were observed between sexes and among gut regions. Generally, enzyme activity was highest in the midgut followed by the fore- and hindgut in descending order. Despite this trend, a considerable level of proteinase and male lipase was observed in the hindgut suggesting that it might be necessary to give extra attention to hindgut activities in future studies.

Index Terms- Digestive enzymes, Foregut, Hindgut, Midgut, *Periplaneta americana*.

I. INTRODUCTION

Cockroaches (Blattodea) are among the most primitive and successful insects. Their omnivorous, detritophagous feeding habit and association with symbiotic bacteria (Cruden and Markovetz, 1987) obviously contributed to their survival for at least 350 million years (Thorne and Carpenter, 1992). Many modern species have retained the omnivorous nature of their ancestors and this has no doubt contributed to their success as obnoxious pests of humanity (Cruden and Markovetz, 1987). Today there are 3,500 species of cockroaches found on every continent except Antarctica. Truly representing the diversity of insects, the cockroach family provides excellent models for anatomical and physiological investigations. The American cockroach, *Periplaneta americana* (L.) (Blattidae), is the largest of the cockroaches measuring an average 4 cm in length. Adults are reddish-brown in appearance with a pale-brown or yellow band around the edge of the pronotum. The cockroach is easily, albeit unintentionally and regretfully, spread by human commerce and the species is currently cosmopolitan in distribution. It is found mainly in basements, sewers, steam tunnels and drainage systems (Rust *et al.*, 1991) making it difficult to control. *Periplaneta americana* is a voracious omnivore that feasts on almost anything such as paper, boots, hair, bread, fish, fruit, peanuts, old rice, the soft part on the inside of animal hides, dead insects and cloth, thereby causing economic loss (Bell and Adiyodi, 1981). American cockroaches can become a public health problem due to their association with human waste and disease, and their ability to move from sewers

into homes and commercial establishments. At least 22 species of pathogenic human bacteria, virus, fungi, and protozoans, as well as five species of helminthic worms, have been isolated from field-collected cockroaches (Rust *et al.*, 1991).

The digestive system functions to break down and absorb nutrients for maintenance, survival and reproduction in insects. The long and somewhat coiled digestive tube in *P. americana* could be divided into three regions: the foregut which includes the mouth, salivary glands, esophagus, crop, and the proventriculus or the gizzard; the midgut which includes the ventriculus, gastric caeca and malpighian tubules; and the hindgut comprising ileum, colon and rectum. The occurrence of a multitude of digestive enzymes in the gut of cockroaches is consistent with their omnivory and feeding adaptability. Digestive tract of *P. americana* harbours xylanase, laminaribiase, cellobiase, maltase, sucrase, α - and β -glucosidase, α - and β -glycosidase, β -fucosidase, chitinase and N-acetyl- β -glucosaminidase that attack various polysaccharides including those in the plant and fungal cell walls (Scrivener *et al.*, 1998; Genta *et al.*, 2003). Similar versatility in the digestion of proteinaceous substrates is indicated by the presence of 11 proteinases in the gut of *P. americana* (Hivrale *et al.*, 2005). Vinokurov *et al.* (2007) recorded high proteolytic and amylolytic activities in the midgut of *P. americana* with a moderate activity in the crop. Cockroaches have been the most popular group of insects for studies of lipid digestion, and a number of early studies indicated lipolytic activity in the fore- and midgut. It was also demonstrated that lipase originates in the epithelial cells of the midgut and caecae. Thus the presence of lipolytic activity in the foregut results from regurgitation of midgut contents into the foregut (Downer, 1978).

A large number of previous studies have been devoted to determining enzyme activity in the fore- and midgut. This has been as a result of the assumption that little or no digestion (but absorption) takes place in the hindgut. The present work was, therefore, designed to quantify activities of enzymes in the three gut regions of adult male and female *P. americana*. Enzymes hydrolyzing three major classes of food (carbohydrate [α -amylase, β -amylase, γ -amylase], protein [proteinases] and fat [lipases]) were assayed. Information about digestive enzymes is of fundamental importance in understanding the digestive processes, food and feeding habits of insects. Such information could also assist in formulating sustainable and effective control strategies.

II. MATERIALS AND METHODS

1. Reagents

Casein (1% w/v), Trichloroacetic acid, Lowry's reagent C, starch solution, Folin-Ciocalteu's phenol reagent, iodine mixture, Dinitrosalicylic acid and olive oil emulsion were purchased from Sigma Chemical Company, St. Louis, MO., USA. Phosphate and sodium acetate buffer, and Tris buffer were obtained from Fluka (Buchs, Switzerland). Distilled water was prepared in the laboratory. All other reagents were of analytical grade and they were obtained from either Sigma or BDH.

2. Insect culture in the laboratory

A colony of *P. americana* was raised on white bread in the Insect Physiology Laboratory, Obafemi Awolowo University, Ile-Ife at $26 \pm 2^\circ\text{C}$ and $73 \pm 3\%$ RH. Newly emerged adults (1-3 days old) of both sexes were used for the experiment.

3. Enzyme bioassay

Separate bioassays were constituted for male and female cockroaches to determine activities of digestive enzymes in the foregut, midgut and hindgut. The assays were replicated three times.

A. Preparation of enzyme extract

Enzyme samples were prepared using the method described by Cohen (1993). The insects were starved for 24 h before dissection to standardize them and to allow the accumulation of digestive enzymes. The insects were placed at -20°C for 4 min and then dissected in ice-cold 0.9% NaCl solution under a dissecting microscope. The alimentary tract was removed by placing the scissors points between the junction of the third and second to the last tergites. Two incisions were made along each laterally arranged spiracle, continuing through to the thorax. Once the tergites were freed from the underlying connective tissue they can be removed in one piece. By grabbing the head with a forceps and cutting the surrounding neck chitin, the entire digestive tract was removed by gently lifting the head and freeing the attached tract moving caudally toward the anus. The extracted digestive tubes were separated into the foregut, midgut and hindgut, and each gut region was kept in 1 ml ice-cold sodium phosphate buffer (pH 7.1). The tissues were homogenized and ultra-centrifuged at 16,000 rpm for 10 min at 4°C . The supernatant was placed in a centrifuge tube and kept at 4°C .

B. Proteinase assay

Proteinase activity was quantified spectrophotometrically as described by Morihara and Tsuzuki (1977) with slight modification. The reaction mixture consisted of 1 ml 1% (w/v) casein and 0.5 ml of the enzyme preparation. This was incubated in a water bath at 35°C for 30 min. The reaction was terminated by the addition of 3 ml cold 10% (w/v) Trichloroacetic acid (TCA). The mixture was allowed to stand at 4°C for 30 min, centrifuged at 3000 rpm for 10 min and the supernatant was collected for the determination of non-precipitated TCA protein. This was done following the Folin-Ciocalteu's phenol reagent

method of Lowry *et al.* (1951). One milliliter of the TCA protein was mixed with 5 ml of Lowry's reagent C, mixed thoroughly and incubated at room temperature for 10 min. Three fold diluted Folin-Ciocalteu's phenol reagent (0.5 ml) was added to the mixture with shaking, and incubated at room temperature for 30 min. The optical density of the mixture was read at 670 nm in a Cintra 101 spectrophotometer. The amount of non-precipitated TCA protein was estimated as tyrosine from a standard curve of known concentrations of tyrosine. One unit of protease activity is defined as the quantity that is required to produce $100\ \mu\text{g}$ of tyrosine in 1 ml of TCA filtrate under the above conditions.

C. α -Amylase assay

The assay method described by Fuwa (1954) was followed with slight modification. To 0.2 ml 1% (w/v) soluble starch solution was added 0.1 ml of enzyme solution with mixing and 0.7 ml of distilled water. The mixture was incubated at room temperature for 30 min in a water bath. The reaction was terminated by the addition of 1 ml Dinitrosalicylic acid (DNSA) and mixed thoroughly; 0.1 ml of iodine mixture was added to the mixture. The optical densities of both blank and experimental samples were read at 670 nm in the spectrophotometer. One unit of the α -amylase activity is defined as the amount of α -amylase which produced a 10% reduction in the intensity of the blue colour of starch-iodine complex under the specified condition.

D. β -Amylase assay

The assay method described by Abiose *et al.* (1988) was used. The reaction mixture consisted of 0.2 ml 1% (w/v) soluble starch and 0.1 ml homogenate incubated for 5 min in a water bath at 37°C . The mixture was boiled at 100°C for 5 min and 8 ml of distilled water was added. The amount of reducing sugar produced from the hydrolysis was estimated following Somogyi-Nelson method (Somogyi, 1945). All tubes (experimental and control) were provided with 1 ml of combined Cu reagent and mixed thoroughly. They were incubated in a boiling water bath for 20 min, cooled in tap water for about 4 min, and then 1 ml of Arsenomolybdate colour reagent was added to each of them while shaken. Lastly, 7 ml of distilled water was added to each tube and mixed thoroughly. The optical densities of both blank and experimental samples were read at 540 nm in the spectrophotometer. One unit of the enzyme activity is defined as the amount of β -amylase which produced 1 mg of reducing sugar expressed as maltose under the experimental conditions.

E. γ -Amylase (amyloglucosidase) assay

The enzyme was assayed following the method described for β -amylase except that the reaction mixture was incubated at 60°C for 30 min. One unit of the amyloglucosidase activity is defined as the amount of enzyme that produced 1 mg of reducing sugar calculated as glucose under the above conditions.

F. Lipase assay

The assay method described by Shihabi and Bishop (1971) was used with little modification. 3.0 ml of olive oil emulsion was pipetted into a cuvette and warmed to 37°C . 0.1 ml of the homogenate was added and mixed by inverting the cuvette. The change in absorbance was recorded at 340 nm for 1-min intervals till it became consistent. Lipase activity (μmol triglyceride bonds

broken/min/litre of homogenate) was calculated by multiplying change in absorbance per minute ($\Delta A/\text{min}$) by the conversion factor (F). Based on olive oil being pure glyceryl trioleate (mol wt. 880), the value of F was 5400.

4. Statistical analyses

Activities of digestive enzymes were subjected to Analysis of Variance (SAS Institute, 2002) and mean values were shown as bar charts. For each sex, standard error bars (+ s.e.) were used to compare activities of each enzyme across the three gut regions. Enzyme activities were also separated between male and female cockroaches in each gut region.

III. RESULTS

Enzyme activities within each sex differed significantly among the gut regions except in female cockroaches where mean values for proteinase were comparable (Table 1). Hydrolytic activities between male and female cockroaches were compared in each gut region as presented in Table 2. Activities of lipase ($P \leq 0.01$) and α -amylase ($P \leq 0.05$) differed between male and female *P. americana* in two regions, the midgut and hindgut. Also, sexual effect was significant in β -amylase and proteinase activities only in the foregut ($P \leq 0.05$) while γ -amylase activities varied with sex ($P \leq 0.05$) only in the hindgut.

Digestive enzymes were detected in the fore-, mid- and hindgut of *P. americana* but generally, activities were lowest in the hindgut (Fig. 1). Activities of female α -amylase were higher than those of males in the mid- and hindgut. A similar trend was observed for proteinase activity in the foregut. On the other hand, activities in male cockroaches were higher for β - and γ -amylase in the foregut and hindgut, respectively. For lipases, activity was higher in females in the midgut whereas it was higher in males in the hindgut.

A. Proteinase activity

Proteinase activity was detected in the three gut regions of adult cockroaches. The midgut and hindgut of male cockroaches had significantly higher enzyme activities than the foregut while activities were not significantly different across the gut regions of female cockroaches.

B. α -Amylase activity

In male cockroaches, activity of α -amylase was significantly higher in the foregut followed by the midgut and hindgut in descending order. On the other hand, enzyme activity was comparable in the foregut and midgut of females but significantly lower in the hindgut.

C. β -Amylase activity

A similar trend was observed in the activities of β -amylase in male and female cockroaches. Activities recorded in the fore- and midgut were comparable but significantly higher than values obtained in the hindgut.

D. γ -Amylase activity

Amyloglucosidase was detected in all the gut regions except in the hindgut of female cockroaches. Activities in the foregut and midgut of each sex were statistically equal but significantly higher than in the hindgut.

E. Lipase activity

As in the case of γ -amylase, lipase was not detected in the hindgut of female cockroaches. Level of activity was low and comparable in the foregut and midgut of male insects but it increased significantly in the hindgut. On the contrary, enzyme activity was significantly higher in the midgut of females compared to the foregut.

Table 1: Mean square values of activities of each enzyme in the gut regions of male and female *Periplaneta americana*

Enzyme	Male		Female	
	Gut region	Replicate	Gut region	Replicate
	df = 2		df = 2	
α -Amylase	86.81*	1.34	86.64**	0.94
β -Amylase	91.54*	2.76	60.81*	3.88
γ -Amylase	104.99*	15.78	126.75*	1.91
Proteinase	0.15*	0.05	0.06	0.07
Lipase	2.62*	0.24	6.40*	0.30

*, ** Significant F-test at 0.05 and 0.01 levels of probability, respectively

Table 2: Mean square values of activities of each enzyme between sexes in the fore-, mid- and hindgut of *Periplaneta americana*

Enzyme	Foregut		Midgut		Hindgut	
	Sex	Replicate	Sex	Replicate	Sex	Replicate
α -Amylase	0.73	6.11	5.90*	0.05	0.20*	0.01
β -Amylase	5.34*	1.38	1.68	12.08	0.34	0.04
γ -Amylase	5.22	1.89	12.95	25.08	8.55*	0.03
Proteinase	0.33*	0.09	0.01	0.04	0.02	0.00046
Lipase	0.00076	0.000057	0.07**	0.01	0.07**	0.0017

*, ** Significant F-test at 0.05 and 0.01 levels of probability, respectively

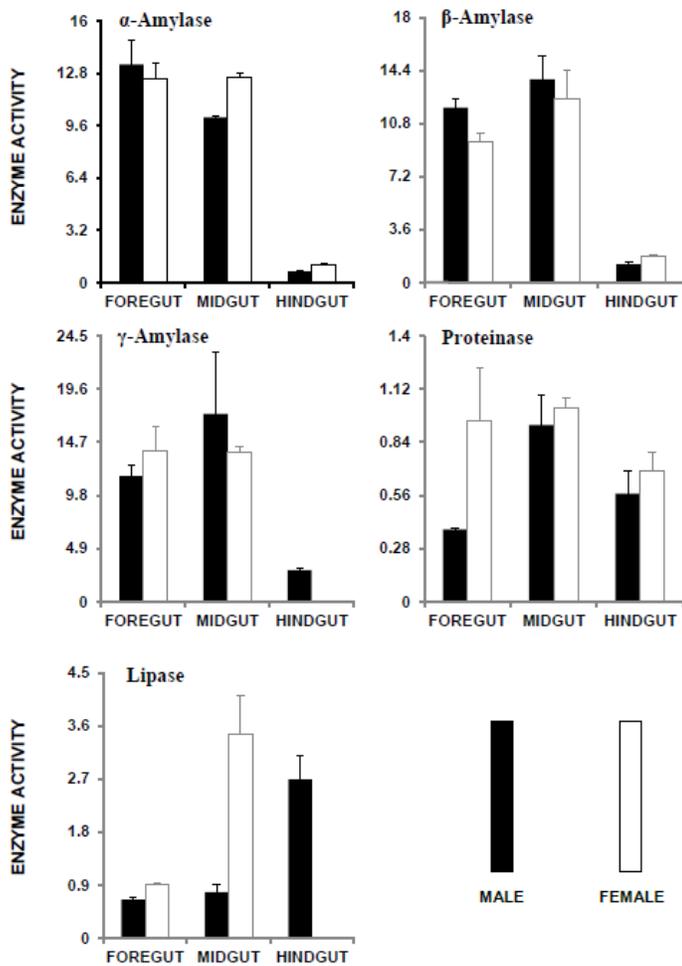


Figure 1: Activities of the amylases, proteinase and lipase in the fore-, mid- and hindgut regions of *Periplaneta americana*. Error bars compared activities within sex across the three gut regions. Lipase activity was measured in $\mu\text{mol/l/min}$ while other enzymes were measured in $\mu\text{g/ml/min}$

IV. DISCUSSION

Starch consists of two distinct fractions: amylose – linear α -1,4-linked glucans, and amylopectin – linear α -1,4-linked glucans branched with α -1,6 linkages (Ball *et al.*, 1996; Mouille *et al.*, 1996), and the enzymes responsible for hydrolysis of starch and related saccharides are called amylolytic enzymes or simply amylases. The three most known amylases (α -amylase, β -amylase and γ -amylase) were detected in the present study. This is an addition to a number of carbohydrases that had been reported earlier in *P. americana* (Scrivener *et al.*, 1998; Genta *et al.*, 2003). Unlike α - and γ -amylases, β -amylase is not produced by animals although it may be present in microorganisms contained within the digestive tract (Adachi *et al.*, 1998; Mikami *et al.*, 1999). The detection of β -amylase in the present study indicates that some symbiotic microorganisms are resident in the fore-, mid- and hindgut of *P. americana*. Zurek and Keddie (1996) reported that gut bacteria in *P. americana* played a functional role in the development and survival of the insect species. Cruden and Markovetz (1987) also reported a stoppage in the biosynthesis of cysteine and methionine and subsequent

reduction in fecundity when gut bacteria were eliminated from *P. americana*. The detection of these amylases, proteinase and lipase in the digestive tract of *P. americana* shows that the species is well equipped for polyphagous feeding habit.

The absence of lipase activity in the hindgut of females was preceded by a dramatic increase in the midgut. It is possible that female wasps made maximum use of lipase substrate in the midgut in order to meet specific reproductive requirements. Lipids, mostly triacylglycerol (TAG), and smaller amounts of phospholipids (PL) and cholesterol, make up 30-40% of the dry weight of the insect oocyte (Kawooya and Law, 1988; Briegel, 1990). Also, lipids are the main sources of energy for the developing embryo (Beenackers *et al.*, 1981) and the PL is needed for the formation of membranes. Insect oocytes synthesize TAG using fatty acids (FA) (Lubzens *et al.*, 1981; Ferenz, 1985) but since the ability of oocytes to synthesize FA *de novo* is very limited, Ziegler and Van Antwerpen (2006) concluded that nearly all the lipids must be imported, especially from ingested food. This requirement might have necessitated maximal digestion of lipase substrate in the female midgut.

Generally, enzymatic activities in each sex of *P. americana* were, more or less, higher in the midgut followed by the foregut and hindgut in descending order. This supports previous reports identifying midgut as the principal site for enzyme secretion and food digestion in insects (Klowden, 2007; Nation, 2008). However, activity of α -amylase was relatively higher in the foregut of *P. americana*. This may be due to the fact that α -amylase is secreted by the salivary glands which are situated in the anterior part of the foregut. Apart from the location of secretory organs, prevailing conditions in different regions of insect gut such as redox potential and pH may also have differential effects on digestive enzymes (Vinokurov *et al.*, 2007). This may explain in part why hydrolytic activity of each enzyme varied from one gut region to the other.

The general tendency of workers to pay little attention to the hindgut because of the assumption that negligible hydrolytic activities take place in the region may eventually rob the science world of some useful pieces of information. In the present work, a considerable level of proteinase and male lipase activities was detected in the hindgut of *P. americana*, underlying the potentials of digestive enzymes in this region. Workers are encouraged to give adequate consideration to activities in the insect hindgut in future studies.

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REFERENCES

- [1] Abiose, S.H., Atalabi, T.A., Ajayi, L.O., 1988. Fermentation of African locust beans: microbiological and biochemical studies. *Nigerian Journal of Biological Sciences* 1, 103–117.
- [2] Adachi, M., Mikami, B., Katsube, T., Utsumi, S., 1998. Crystal structure of recombinant soybean β -amylase complexed with β -cyclodextrin. *Journal of Biological Chemistry* 273, 19859–19865.
- [3] Ball, S., Guan, H.P., James, M., Myers, A., Keeling P., Mouille, G., Buléon, A., Colonna, P., Preiss, J., 1996. From glycogen to amylopectin: a model for the biogenesis of the plant starch granule. *Cell* 86, 349–352.

- [4] Beenackers, A.M.Th., Van der Horst, D.J., Van Marrewijk, W.J.A., 1981. Role of lipids in energy metabolism. In *Energy Metabolism in Insects*, Downer, R.G.H., Ed., Plenum, New York, pp. 53–100.
- [5] Bell, W.J., Adiyodi, K.G., 1981. *The American Cockroach*. Chapman and Hall, London. 525 pp.
- [6] Briegel, H., 1990. Metabolic relationship between female body size, reserves, and fecundity of *Aedes aegypti*. *Journal of Insect Physiology* 36, 165–172.
- [7] Cohen, A.C., 1993. Organization of digestion and preliminary characterization of salivary trypsin-like enzymes in a predaceous heteropteran, *Zelus renardii*. *Journal of Insect Physiology* 39, 823–829.
- [8] Cruden, D.L., Markovetz, A.J., 1987. Microbial ecology of the cockroach gut. *Annual Review of Microbiology* 41, 617–643.
- [9] Downer, R.C.H., 1978. Functional role of lipids in insects. In *Biochemistry of Insects*, Rockstein, M., Ed., Academic Press, USA, pp. 58–93.
- [10] Ferenz, H.J., 1985. Triacylglycerol synthesis in locust oocytes. *Naturwissenschaften* 72, 602–603.
- [11] Fuwa, H., 1954. A simple new method for microdetermination of amylase by the use of amylose as the substrate. *Journal of Biochemistry* 41, 583–603.
- [12] Genta, F.A., Terra, W.R., Ferreira, C., 2003. Action pattern, specificity, lytic activities, and physiological role of five digestive beta-glucanases isolated from *Periplaneta americana*. *Insect Biochemistry and Molecular Biology* 33, 1085–1097.
- [13] Hivrale, V.K., Chougule, N.P., Chhabda, P.J., Giri, A.P., Kachole, M.S., 2005. Unraveling biochemical properties of cockroach (*Periplaneta americana*) proteinases with a gel X-ray film contact print method. *Comparative Biochemistry and Physiology B* 141, 261–266.
- [14] Kawooya, J.K., Law, J.H., 1988. Role of lipophorin in lipid transport to the insect egg. *Journal of Biological Chemistry* 263, 8748–8753.
- [15] Klowden, M.J., 2007. *Physiological Systems in Insects*, 2nd Edition. Academic Press, USA. 688 pp.
- [16] Lowry, O.H., Rosebrough, N.J., Farr, A.L., Randall, R.J., 1951. Protein measurement with the Folin phenol reagent. *Journal of Biological Chemistry* 193, 265–275.
- [17] Lubzens, E., Tietz, A., Pines, M., Applebaum, S.W., 1981. Lipid accumulation in oocytes of *Locusta migratoria migratorioides*. *Insect Biochemistry* 11, 323–329.
- [18] Mikami, B., Adachi, M., Kage, T., Sarikaya, E., Nanmori, T., Shinke, R., Utsumi, S., 1999. Structure of raw starch-digesting *Bacillus cereus* β -amylase complexed with maltose. *Biochemistry* 38, 7050–7061.
- [19] Morihara, K., Tsuzuki, H., 1977. Production of protease and elastase by *Pseudomonas aeruginosa* strains isolated from patients. *Infection and Immunity* 15, 679–685.
- [20] Mouille, G., Maddelein, M.L., Libessart, N., Talaga, P., Decq, A., Delrue, B., Ball, S., 1996. Preamylopectin processing: A mandatory step for starch biosynthesis in plants. *Plant Cell* 8, 1353–1366.
- [21] Nation, J.L., 2008. *Insect Physiology and Biochemistry*. 2nd Edition. CRC Press Boca Raton, USA, 544 pp.
- [22] Rust, M.K., Reiersen, D.A., Hansgen, K.H., 1991. Control of American cockroaches (Dictyoptera: Blattellidae) in sewers. *Journal of Medical Entomology* 28, 210–213.
- [23] SAS Institute, 2002. *SAS/STAT User's Guide* Release v. 9.1 SAS Cary, NC, USA.
- [24] Scrivener, A.M., Watanabe, H., Noda, H., 1998. Properties of digestive carbohydrase activities secreted by two cockroaches, *Panesthia cribrata* and *Periplaneta americana*. *Comparative Biochemistry and Physiology B* 119, 273–282.
- [25] Shihabi, Z.K., Bishop, C., 1971. Simplified turbidimetric assay for lipase activity. *Clinical Chemistry* 17, 1150–1153.
- [26] Somogyi, M., 1945. A new reagent for the determination of sugars. *Journal of Biological Chemistry* 160, 61–68.
- [27] Thorne B.L., Carpenter J.M., 1992. Phylogeny of the dictyoptera. *Systematic Entomology* 17, 253–268.
- [28] Vinokurov, K., Taranushenko, Y., Krishnan, N., Sehnal, F., 2007. Proteinase, amylase, and proteinase-inhibitor activities in the gut of six cockroach species. *Journal of Insect Physiology* 53, 794–802.
- [29] Ziegler, R., Van Antwerpen, R., 2006. Lipid uptake by insect oocytes. *Insect Biochemistry and Molecular Biology* 36, 264–272.
- [30] Zurek, L., Keddie, B.A., 1996. Contribution of the colon and colonic bacterial flora to metabolism and development of the American cockroach *Periplaneta americana* L. *Journal of Insect Physiology* 42, 743–748.

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Improved Cook Stoves and Green House Gas Reduction in Uganda

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Abstract- Globally, around 2.6 billion people still rely on traditional biomass fuels for their cooking. This biomass burning produces green house gases and black carbon, which contributes to climate change. Uganda's low level of income as shown by a low per capita income (approx. US\$300) and its heavy dependence on rain-fed agriculture make it very vulnerable to climate change. Uganda like other countries in the least developed Countries (LDC) group, through its energy policies emphasizes the importance of access to sustainable energy and affordable energy efficient technologies in order to adapt to climate change. Although climate change and its effects have taken root in most part of the country, there is limited knowledge about climate change and its impact. Mitigation and adaptive measures taken by Uganda include but are not limited to creating a mix of renewable and low carbon technologies, implementation of reduce emission from deforestation and desertification (REDD) strategy and widespread implementation of energy efficient measures such as the dissemination of improved cook stoves to households.

Index Terms- Improved cook stove (ICS), Water Boiling Test (WBT), climate change, Clean Development Mechanism (CDM) Emission Reduction (ER)

I. INTRODUCTION

Energy is arguably one of the major challenges the world faces today, touching all aspects of our lives. For those living in extreme poverty, a lack of access to modern energy services dramatically affects health and limits opportunities. The vulnerability of the poor is only worsened with recent challenges from climate change, a global financial crisis, and volatile energy prices [1]. Energy is vital to economic growth in Uganda. The majority of Ugandans are not aware of the resulting environmental problems or of the need to use modern, affordable and energy-efficient technologies [2]. Climate change is one of the most critical issues of our time. Global warming, the gradual increase in the average temperature on the earth, affects every sector of development [3]. Its predicted effects including adverse ecosystem impacts, rising sea levels, increased frequency of storms, floods, and droughts, and adverse impacts on human health and agricultural production are expected to cause potentially major environmental and economic dislocations across the globe. Many of these impacts are likely to impinge most severely on the world's poorest countries, which are least able to cope and adapt [4].

Climate change is a global issue that has brought about noticeable weather change in the past decades in Uganda. Human induced climate change is likely to increase average temperatures in Uganda by up to 1.5 °C in the next 20 years and by up to 4.3 °C by the 2080s [5]. Ice caps on mount Rwenzori are retreating. A recent study carried out by researchers suggests that all glaciers on Rwenzori Mountains will disappear in the next two decades. The severe drought in year 2005 contributed to the reduction of Nile river level with serious impacts on power generation leading to power rationing in the domestic and commercial sectors, floods cause pollution of drinking water leading to spread of waterborne diseases. The International Climate Risk Report identifies Uganda as one of the most unprepared and vulnerable countries in the world [6].

Fuel wood provides more than 90% of Uganda's energy needs [7]. An estimated forest surface of 115 football fields is used for cooking every day either in form of firewood or charcoal [8]. Population increase has brought about deforestation because of increase in demand for food and fuel. Increased electricity tariff lead to increased demand for firewood and charcoal leading to increased soil erosion, damage to vital water shed and flooding. By virtue of being a party to the United Nations Framework Convention on Climate Change (UNFCCC), the government of Uganda recognizes and supports the need to address climate change. Under CDM, projects that reduce greenhouse gas emissions and contribute to sustainable development can generate Certified Emission Reductions (CERs), a tradable commodity in international carbon markets. Climate change mitigation through the Clean Development Mechanism and Voluntary Carbon Markets has had a limited impact in Uganda, although it is thought that there is potential for Uganda to benefit from these in the future.

1.1 Country Background

Once known as the "pearl of Africa", Uganda lies in the heart of sub Saharan Africa. It is located in east Africa and lies across the equator about, 800 kilometres inland from the Indian Ocean. The country is land locked bordered by Kenya in the East, Sudan in the North, Democratic Republic of Congo in the West and Tanzania in the South. It has an area of 241,038sqkm [9]. In most parts of the country, mean annual temperatures range between 16°C and 30°C. Most of the country receives between 750 mm and 2100 mm of rainfall annually [9]. It has varying vegetation with semi arid vegetation in the North. The economy of Uganda is primarily based on the agricultural sector with over 70% of the working population being employed by the sector. Agricultural export accounts for over 45% of total export earnings with coffee, tobacco and fish being the main export.

II. ENERGY USE PATTERN

Uganda has a population of about 30.7 million people who mostly depend on biomass energy for cooking with 85% of its population living in the rural area. It has 6.2 million households with an average household size of 5 [10]. The household sector represents over 85% of the national energy consumption [11]. 70% and 15% of urban households use charcoal and firewood respectively while in the rural areas, 86% use firewood and 10% use charcoal [12]. Over 80% of households use firewood as the main source of fuel for cooking and about 15% use charcoal. The implication is that more than 95% of households in Uganda depend on fuel from wood for their cooking [13]. Emissions from burning solid fuels in open and traditional stoves have significant global warming effects, due to incomplete combustion of fuel carbon. Interventions that improve combustion efficiency and reduce emissions can also mitigate climate change. The Ministry of Energy initially set (ICS) adoption targets of 2.45 million households, but technology limitations and a lack of resources prevented the government from achieving this target but the bulk of the population (91%) is still using traditional biomass [14]. The German cooperation in Uganda has distributed 220,000 ICS to households with the objective of improving access to modern energy [15].

III. METHODOLOGY

This report is based mainly on current, publicly accessible documents, as well as energy access data made available by Uganda Bureau of statistics (UBOS), Aprovecho Research Centre and United Nations Framework Convention for Climate Change (UNFCCC). WBT protocol version 4.2.2 [16] was used to determine the efficiency of the ICS. Data from baseline study on energy use carried out by the centre for integrated research and community development unit (CIRCODU) were used in the analysis.

IV. RESULT OF ANALYSIS

Emission reduction that can be achieved by using an improved cook stove (e.g Okelo Kuc Stove). The ER can be calculated from equation (1) [17]

$$ER_y = B_{y,savings} \times f_{RNB,y} \times NCV_{Biomass} \times EF_{projected\textit{fossilfuel}}$$

(1)

Where:

ER_y Is emission reduction during the year in tonnes of carbon dioxide equivalent (tCO_2e)

$B_{y,savings}$ Is the quantity of woody biomass saved in tonnes

$f_{RNB,y}$ Is the fraction of woody biomass saved during the year that can be established as non-renewable biomass

$NCV_{Biomass}$ Is the net calorific value of the non-renewable biomass

$EF_{projected\textit{fossilfuel}}$ Is the emission factor for the substitution of non-renewable biomass

The quantity of woody biomass saved can be taken as the difference between the quantity of wood consumed while using the three stone fire and the quantity of wood used while employing the improved cook stove.

$$B_{y,savings} = B_{old} - B_{y,new}$$

(2)

Biomass saved can also be calculated from

$$B_{y,savings} = B_{old} \times \left(1 - \frac{\eta_{old}}{\eta_{new}}\right)$$

(3)

Where

B_{old} Is the biomass consumed while using the three stone fire (Baseline situation)

$B_{y,new}$ Is the biomass consumed with the use of ICS

η_{old} Is the efficiency of the three stone fire

η_{new} Is the efficiency of the improved cook stove

For the ICS (Okelo Kuc Stove), the efficiency was found to be 0.35 (WBT protocol) and 0.1 is the efficiency of the three stone fire (UNFCCC default values). (Spreadsheet for WBT is available on request). There are 6.2 million households in Uganda (95% rely on biomass) with the households using either an open fire or a segiri (local charcoal stove). For the three stone fire, annual fire wood consumption is 3.285 tonnes/stove and 0.87 tonnes/stove for charcoal consumption [18]

The baseline biomass consumption is

$$B_{old} = 3.2 \times 5.9 \times 10^6$$

= 18.9 million tonnes of biomass

Biomass saved from the use of ICS is

$$B_{y,savings} = 3.2 \times 5.9 \times 10^6 \left(1 - \frac{0.1}{0.35}\right) = 13.5 \text{ million tonnes of biomass}$$

Emission reduction that can be achieved is calculated from:

$$ER_y = B_{y,savings} \times f_{RNB,y} \times NCV_{Biomass} \times EF_{projected\textit{fossilfuel}}$$

$$f_{RNB,y} = 0.82 \text{ [19]}$$

$$NCV_{Biomass} = 0.015 \text{ TJ/tonne (15MJ/kg) [19]}$$

$$EF_{projected\textit{fossilfuel}} = 81.6 \text{ tCO}_2\text{TJ} \text{ [19]}$$

$$ER_y = 3.2 \times 5.9 \times 10^6 \left(1 - \frac{0.1}{0.35}\right) \times 0.82 \times 0.015 \times 81.6 = 13.54 \times 10^6 \text{ tCO}_2\text{e}$$

This achievable ER of about 13.5 million tonnes of carbon dioxide equivalent is estimated as being equal to offsetting the

emissions of approximately 2.85 million passenger cars in the United States.

V. CONCLUSION

Climate change is an emerging issue of enormous magnitude that needs to be adequately addressed as it affects the economy of Uganda. There is an opportunity for Uganda to build on the strength of its government actions through the climate change unit to drive up the adoption of high quality ICS. This is possible through comprehensive market research into consumer attitude towards ICS, build demand through cross sector awareness and campaign and supporting businesses in testing, developing and producing at scale to drive up the quality of ICS in the market. These possible ERs can be traded in the carbon markets (provided approved methodologies, monitoring and verification procedures have been adopted) thereby achieving sustainable development through carbon finance whilst mitigating climate change.

REFERENCES

- [1] The energy access situation in developing countries (2009) http://content.undp.org/go/cms-service/stream/asset/?asset_id=2205620 retrieved 30 March 2013
- [2] Promotion of Renewable Energy and Energy Efficiency Programme <http://www.giz.de/Themen/en/16464.htm> retrieved 3 April 2013
- [3] Assessing impacts and strategies for mitigation and adaptation to climate change in Uganda <http://www.ccu.go.ug/index.php/resources-publications> retrieved 27 March 2013
- [4] The Clean Development Mechanism An Assessment of Progress (2006) http://assets.mediaglobal.org/documents/UNDP_Environment_and_Energy_Group_Report_The_Clean_Development_Mechanism.pdf retrieved 19 February 2013
- [5] Department for International Development Uganda: Climate change scoping mission LTS International Ltd www.ltsi.co.uk retrieved 28 Feb 2013
- [6] Climate change: A current and future threat to the socio economic development of Uganda (2010) http://ccu.go.ug/images/Publications/Policy_Brief_No.1-2010.pdf retrieved 2 March 2013
- [7] Uganda's ban of fire wood may be unrealistic <http://www.wenatcheeworld.com/news/2012/apr/01/ugandas-ban-on-firewood-may-be-unrealistic/>
- [8] Energy saving stoves <http://www.energyprogramme.or.ug/energy-saving-stoves/> retrieved 3 May 2013
- [9] Country pasture/Forage resource profile Uganda <http://www.fao.org/ag/agp/AGPC/doc/Counprof/Uganda/uganda.htm> retrieved 21 March 2013
- [10] Uganda Bureau of statistics (UBOS) <http://www.ubos.org/onlinefiles/uploads/ubos/UNHS0910/UNHS%20SOCIO%20FINDINGS.pdf>
- [11] Sebitt, A. Bebett, K. & Higenyi, J. (2004): Household Energy Demand Perspectives for Uganda in 2025 http://timetable.cput.ac.za/_other_web_files/_cue/DUE/2004/PDF/20_A_Sebitt.pdf retrieved 6 March 2013.
- [12] Uganda National Household survey Report http://www.ubos.org/UNHS0910/chapter9_Domestic%20Energy%20Resources.html retrieved 28 May 2013
- [13] Uganda efficient wood cook stoves http://www.climatecare.org/media/documents/pdf/PIN_Uganda_0015B_Wood%20Stoves.pdf retrieved 16 April 2013
- [14] Uganda Bureau of Statistics (UBOS) Household survey, 2009/2010
- [15] Energy Efficiency: Energy Programme Uganda (2012) <http://www.energyprogramme.or.ug/energy-efficiency/> retrieved 15 March 2013
- [16] Aprovecho Research Centre www.aprovecho.org/lab/pubs/testing retrieved 12 Jan 2013
- [17] Energy efficiency measures in thermal applications of non renewable biomass (AMS II.G version 4.0) <http://cdm.unfccc.int/methodologies/DB/REQC2MYZJJ617BC9SKCS32T2K87AOW>. Retrieved 2 Dec 2012
- [18] Final Report on Baseline fuel consumption in Households in Gulu, Mbarara and Kampala (2010). Centre for Integrated Research and Community Development Uganda (CIRCODU)
- [19] Default values of fraction of non-renewable biomass <http://cdm.unfccc.int/DNA/fNRB/index.html> retrieved 17 Jan 2013

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A REVIEW OF THE ENERGY SITUATION IN UGANDA

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Abstract: This paper reviews the energy sector of Uganda. As is typical of East Africa, it is characterized by excessive use of Biomass to provide over 90% of the energy needs. Uganda is one of the least developed countries in the region. Hydropower provides over 90% of the total electricity generated in the country while wind, solar and geothermal are under developed. Energy policies are geared towards the use of modern, clean and energy efficient technologies. This is stimulating public private partnerships, attracting multilateral and bilateral agencies to provide funding, grants and technical assistance in renewable energy projects. The Clean Development Mechanism (CDM) of the United Nations avail project developers the opportunity to obtain carbon finance. Several challenges hindering the development in the energy sector and utilization of renewable energy resources have been identified. Strategies for achieving the United Nations Sustainable Energy for All Initiative have been presented.

Index Terms: Renewable Energy; Energy consumption; Sustainable Energy

I. INTRODUCTION

Energy is the engine for economic growth and development for any society or country. With a projected population of 34.1 million in mid2012, Uganda is richly endowed with abundant energy resources that are fairly distributed throughout the country [1]. These include hydro, biomass, solar, geothermal, peat and fossil fuels. Uganda's energy matrix is dominated by biomass based energy sources contributing about 95% to the total primary energy consumption. Electricity and petroleum products contribute 4% and 1 % respectively [2]. With a per capita energy consumption of 0.3TOE or 12.72 GJ, Uganda's energy consumption is among the lowest in the world [3]. It is amongst the countries with lowest levels of electricity development as well as lowest per capita electricity consumption of 72 kWh [4]. Over 90% of the country's population is not connected to the national grid, much of the electricity network at present is poorly maintained and the country experiences frequent power cuts [5]. The energy resource potential of the country includes an estimated 2000 MW of hydro power, 450 MW of geothermal, 460 million tonnes of biomass standing stock with a sustainable annual yield of 50 million tons, an average of 5.1 kWh/m²/ day of solar energy, and about 250 million TOE of peat [6]. In addition, an unspecified amount of petroleum has been discovered in the western part of the country though all fossil fuels used in Uganda presently are imported with a petroleum import bill of about US\$ 120 million per year [3]. This constitutes about 8% of total national imports and represents

slightly above 20% of the country's total export earnings. Biomass constitutes 93% of energy consumption mainly in the traditional form. Wood fuel will continue to be the dominant source of energy in Uganda for the foreseeable future, even if the entire hydroelectric potential in Uganda was fully utilized, wood would supply more than 75% of the total energy consumption in year 2015 [7]. Ugandan Power Sector Investment Plan estimates that a cumulative investment of close to USD 9 billion (7.2 billion euros) in funding is needed between 2009 and 2030 to accommodate rising electricity demand and to achieve close to universal access to electricity [8].

II. ENERGY RESOURCES IN UGANDA

2.1 Hydro

Despite Uganda's vast hydropower potential, estimated at over 2000 MW, less than 10% is currently exploited [9]. Hydropower contributes only 1% to Uganda's energy supply [10]. Uganda has a hydropower-installed capacity of 683MW with current peak demand of 400MW [5]. This has been growing at an annual rate of 8% [5]. To meet this growth in demand about, 20 MW of new generating capacity needs to be added each year. Given the large and growing gap between electricity supply and demand in Uganda, large-scale hydroelectric development is the most economical way forward for the country in the short and medium term. Due to drought, only 135 MW is generated from the hydropower facility. The generation output might reduce to 80-90MW depending on the weather situation. 50 MW is obtained from a thermal power plant installed in May 2005 as a partial solution to the electricity supply problem.

The demand for electricity is 260 MW during the day and rising to 350MW in the evening. The evening peak is mainly due to the domestic users who constitute the bulk of Uganda power distribution company customers (UMEME). The current power shortage has adversely impacted on the industrial and commercial sectors. Production has been disrupted. As a result, the GDP, which was expected to grow at 6 – 6.5% in 2012, has dropped to 4.5% [1]. Uganda will require 2,000 Megawatts (MW) electricity by the year 2025 to run its industries and homes [3]. To provide access to electricity in the rural areas, the government with its development partners are constructing 10 mini hydro power plants with each power plant having 1-1.5MW generating capacity [11].

Table 1.0: Current State Of Power Generation In Uganda

Plant/Source	Capacity (MW)
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Kiira hydro power station	200
Nalubaale hydro power station	180
Bujagali hydro power station	250
Mpanga small hydro power plant	18
Bugoye small hydro power plant	13
Mobuku III hydro power plant	10.5
Tronder Ishasha hydro power plant	6.5
Nyagak III hydro power plant	3.5
Kakira Cogeneration plant	22
Kinyara cogeneration plant	8
Namanve thermal power plant	50
Electro maxx	20

Source: [21]

Table 2.0: Hydro Power Projects In The Pipeline

Plant/Source	Capacity (MW)
Karuma hydro project	600
Anyagu hydro project	600
Oriang hydro project	400
Isimba hydro project	188
Muzizi hydro project	52
Kigati hydro project	18
Nyagak III hydro project	4.4

Source: [21]

2.2 Biomass

Bioenergy, apart from hydropower, is considered to be the second significant pillar to secure energy supply, particularly in rural areas [7]. Biomass contributes over 90% of the total energy consumed in the country and provides almost all the energy used to meet basic energy needs for cooking and water heating in rural areas, most urban households, institutions, and commercial buildings. Biomass is the main source of energy for rural industries [12]. Biomass alone can produce an estimated 1, 650 megawatts of electricity if exploited [13]. Biomass cogeneration from agricultural wastes is seen to hold particular promise as a technology for the country. The total biomass based cogeneration capacity potential for Uganda is estimated to be 190 MW [14]. To date there are only three known cogeneration facilities, i.e in Kakira Sugar Works Ltd, Kinyara Sugar Works Ltd and Sugar Corporation of Uganda Ltd with total installed capacity of 30MW mainly for own consumption with about 5MW supplied to the grid. A significant peat resource also exists, of which approximately 25 million tonnes is feasibly available for power generation, equivalent to 800 MW of potential capacity for 50 years [9]. Trading in biomass especially charcoal contributes to the rural economy, in terms of rural incomes, tax revenue and employment [15]. Charcoal production and transportation is not properly regulated and the disposal of biomass waste by burning, without extracting the energy content, is a common practice countrywide [16]. The government of Uganda through the Africa Biogas Partnership Programme is promoting the use of biogas as an alternative source of energy. It is a 4 year project with a target of 20,000 digesters installed in households by the end of 2013. The biogas digesters are subsidized at approximately 200 euros of the plant cost [17].

Table 3.0 Biomass Energy Projections

Year	2006	2011	2016
Population	28,750,903	33,817,496	39,778,010
Consumption (tons/yr)	27,525,903	32,699,196	38,893,119
Sustainable supply (tons/yr)	27,698,231	28,227,662	28,136,254
Crop residues	4,400,000	4,730,000	5,084,750
Balances (tons/yr)	162,328	4,471,535	10,756,866
Balances (when residues are included)	4,238,000	256,365	5,672,116
Deficit/Surplus (%)	3.2	-13.7	-27.7
Deficit/Surplus (tons/person)	0.031	-0.132	-0.270

Source: [18]

2.3 Geothermal

Geothermal resources were estimated at about 450 MW in the Ugandan Rift System and three areas Katwe-Kikorongo (Katwe), Buranga and Kibiro identified as promising areas for geothermal exploration [12]. To utilize the geothermal resources, the government and the federal Institute of Geosciences and natural resources Germany, has initiated a project on the rift system. A model has been developed which suggests a possible drilling location. A 10 MW_e binary power plant might be feasible, which could allocate a local electricity supply in Bundibugyo district for more than 200,000 people [19].

2.4 Solar

The mean solar radiation is 5.1 kWh/m² per day, on a horizontal surface. This level of insolation is quite favorable, for the application of a number of solar technologies. An estimated 200 MW of potential electrical capacity are available in Uganda [20]. Solar energy is currently used primarily for off-grid electrification for rural communities, as well as for solar cooking, and providing water heating and power to public buildings [9].

III. CHALLENGES FACING THE UGANDA ENERGY SECTOR

The major challenge in the energy sector revolves around lack of a mix of energy sources in power generation, low level of access to modern energy, inadequate infrastructure for generation, transmission and distribution and low level of energy efficiency. Other challenges include:

- Lack of strong legislative framework, practical policy, legal and regulatory environment for the private sector to be attracted to investing in renewable energy development.
- The high upfront costs of investment in renewable energy technologies make them uncompetitive in the market.
- High cost of thermal power generation
- Securing financing for small-scale energy projects

IV. WAY FORWARD

- Aggressive reinforcement of the grid with the development of small hydro power plants.
- Constant review of Power Purchase Agreement (PPA) and Feed-in-Tariff. It mitigates financial risk through long-term income stream.

- Establish an appropriate financing and fiscal policy framework that will attract more investors to renewable energy and low carbon technologies.
- Women need to play a role in the provision and management of energy resources, since they are the most affected by inadequate energy supplies. The difference in interests, needs and priorities should be recognized in planning, implementation and monitoring of renewable energy projects.
- Campaign and launch the development, adoption and utilization of other modern fuels and technologies in order to achieve the objectives of emission reduction, protection of the environment and energy conservation.
- Uganda produces a lot of alcohol from sugar molasses, bananas etc containing 6-11% ethanol. This should be further processed using efficient technology to serve as a bio fuel rather than for drinking purposes.
- Promote research and development, technology transfer and international cooperation.
- Promote Renewable Energy and Energy Efficiency Programs (REEP) such as the distribution of improved cook stoves and compact fluorescent light bulbs to households.
- Develop the geothermal energy resource through donor assistance, bilateral funding etc.
- Cogeneration plants are under developed and generate below optimal capacity, plants need to be upgraded so as to sell power to the grid.
- Incorporate Clean Development Mechanism as a component of renewable energy projects for the purpose of getting carbon finance.

V. CONCLUSION

Uganda has long way to go if it has to key into the sustainable Energy for all Initiative of the United Nations (SE4ALL) and to also achieve the millennium development goals (MDG) by 2030.. Developing and harnessing of the country's renewable energy potential is still demanding if the country's energy needs are to be met. It has set its objectives in the Energy and Renewable energy policies as "to meet the energy needs of Uganda's population for socio and economic development in an environmentally sustainable manner and to increase the use of modern renewable energy sources from the current 4% to 61%" respectively. This is an ambitious target that should be backed up with capacity building activities in modern energy technologies and adequate financing.

REFERENCES

- [1] Uganda Bureau of statistics (UBOS) 2012 www.ubos.org retrieved 7 Feb 2013
- [2] Uganda Bureau of Statistics (UBOS) 2009 www.ubos.org retrieved 19 Nov. 2012
- [3] Energy Systems: Vulnerability- Adaptation- Resilience VAR (2009) <http://www.helio-international.org/uploads/VARUganda.En.pdf> retrieved 10 Dec 2012.
- [4] Improving Energy Resilience in Uganda <http://www.helio-international.org/Uganda.En.pdf> retrieved 17 March 2013
- [5] Karuma Hydropower Plant Executive summary http://www.nemaug.org/E_i_a_documents//Executive_summary.pdf retrieved 6 Nov. 2012.
- [6] https://energypedia.info/index.php/Uganda_Energy_Situation Retrieved 6 Nov. 2012.
- [7] National Biomass Energy Demand Strategy 2001-2010. <http://energyandminerals.go.ug/downloads/BEDSContents.pdf> retrieved 13 Jan. 2013
- [8] The Development of a Power Sector Investment Plan for Uganda – Final Report (Jan 2011), Ministry of Energy and Mineral Development.
- [9] Renewable Energy www.reegle.info/policy-and-regulatory-overviews/UG retrieved 25 Feb. 2013.
- [10] Renewable Energy policy for Uganda. Ministry of Energy and Mineral Development MEMD, 2007
- [11] Uganda Government to build 10 mini hydro plants. <http://allafrica.com/stories/201301230054.html> retrieved 10 Jan. 2013
- [12] Renewable Energy policy for Uganda, 2007.
- [13] The Biomass potential in Uganda <http://www.africanreview.com/energy-a-power/renewables/the-biomass-potential-in-uganda> retrieved 3 March 2013
- [14] The potential of Renewable Energies in East Africa (August 2007) http://www.renewableseastafrica.de/uploads/media/1313_Bio%20Energy.pdf retrieved 1 march 2013.
- [15] The Role and Potentials of Bioenergy in Uganda's Energy sector http://www.sucree-ethique.org/IMG/pdf/uganda_bioenergies.pdf. retrieved 4 March 2013
- [16] The Renewable Energy Policy for Uganda <http://www.rea.or.ug/userfiles/RENEWABLE%20ENERGY%20POLIC9-11-07.pdf> retrieved 18 Jan 2013
- [17] Africa Biogas Partnership Programme. <http://africabiogas.org/africa-biogas-partnership-programme/> retrieved 25 March 2013
- [18] Ministry of Energy and Minerals Development report. MEMD, 2005
- [19] Microearthquake survey at Buranga Geothermal prospect. http://www.bgr.bund.de/EN/Themen/Zusammenarbeit/TechnZusammenarb/Geotherm/Projects/Uganda/uganda_node_en.html. Retrieved 4 March 2013
- [20] Alternative Energy Sources Assessment Report, 2004.
- [21] Godfrey Ndawula (2012) Uganda Energy Sector Review: Public Sector Perspective. A paper presentation at the Energy Business Dialogue, Dec. 2012.

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The Factors that Influenced Consumptive Behavior: A Survey of University Students in Jakarta

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Abstract- Nowadays, in big cities the consumptive behaviors among university students become common. However this fact indicates a negative impact for financial performance because students have not found their money yet. This journal is conducted with a purpose, to know what the factors that affect people's consumptive behavior are. This research journal is conducted in Jakarta, Indonesia, and the respondents are students from several universities that are located in Jakarta. The method that we are using is a quantitative research by spreading questionnaires. The amount of samples that we took in this research is 270. From the research, the authors conclude that Product Usage and Purchasing Power, social status, prestige and satisfaction is related to people's tendency to have consumptive behavior. Therefore, by knowing these factors, hopefully people will be able to suppress their consumptive behavior or help the people in our surroundings not to be consumptive.

Index Terms- Behavior, Consumptive, Prestige, Saving.

I. INTRODUCTION

Consumptive behavior becomes one of the behaviors that cannot be separated from the daily life of the people not only in big country but also growing country such as Indonesia (Wahyuningtyas, 2011). Consumptive behavior affects the life style of the people especially in the growing country because people in growing country are usually the consumer of the goods that are produces in big countries. (Why do Nations Export, 2013)

This phenomenon also impacts the students' life in university, students in present days have some additional expense for students' life such as Internet provider, copy lesson materials or books, and moreover students nowadays have Smartphone that need credit to activate its services (Wahyuningtyas, 2011). University students, especially in big city like Jakarta also need to fulfill their desire and their social need (Campen, Gerlinger, & Reusswig, 2005) by hangout in café and going to the mall. All of these activities make students to be more consumptive and make saving to be a thing that is not in students' priority list. However, saving is very important for the future because future is full of uncertainty (Secrets of Mind and Reality, 2009). Unexpected expense will hit student hard if student don't have any saving. For example: if you are a student who come from outside java island and suddenly get sick, they have to pay the medication. If the student doesn't have any saving he or she will not be able to afford the treatment. It will affect his or her study activity in university.

By knowing this problem that is stated above, the Authors hope that it will give more knowledge about factors that influences the consumptive behavior. This research can also be used for parents to encourage their children not to have a consumptive behavior and start to have saving. In University life, students have to manage their own spending, different with the junior high or senior high students whose money still manage by Students' parents.

This research was limited only in Jakarta because:

1) Jakarta has many recreation infrastructures such as malls, cafes, restaurants, theme parks, and nowadays emerge a new entertainment place, the karaoke places. All of that places encourage students to spent more money.

2) Jakarta has a lot of universities, especially universities which located near an Entertainment places. We will get many respondents for our researches.

This research was conducted by using quantitative analysis. The questionnaires were spread to state and private universities in Jakarta to find the data used for the researches. The respondents were the university Students, which are randomly chosen without seeing the grade (1st year, 2nd year, so on).

This research paper separated in 4 parts. First one is the abstract and introduction of what is the consumptive behavior. The second part consists of the literature review of research topic. Third part contains the analytical review of the data from the questionnaire. Last part contains the conclusion of the research topic.

II. LITERATURE REVIEW

2.1. Independent Variables

Humans do the consumption activity everyday for living. Consumption is an activity using product or service to achieve maximum satisfaction. Human do consumption because they have their needs. Every person have their own needs. People usually make the products or ask for services to satisfy their needs. If they cannot produce their own products or ask another person to give them service, they cannot fulfill their needs. People from the old days trade their products in accordance to their needs by using the barter method. Nowadays, because all of our activities are related with money, people do not do barter anymore. People will have to purchase with money if they want to have a product or service to fulfill their needs. Therefore, indirectly the purchasing activity has become another consumption activity. (Waluyo, 2008)

In modern era, consumptive behavior among people grow quickly. People tend to buy more product than what they really

needs. Consumptive behavior happen because human have a lot of desire. There are some factors that the writer consider as the variables that caused human to have consumptive behavior, there are:

2.1.1 Fulfilling Desire

As been said in Oxford Advanced Learner's Dictionary, 2000, The desire itself is not only for physical. Desire can also come from our mental. There are four basic mental desire that everyone have, there are: the desire to be treated as human, desire to gain control, desire to be consistent, and desire to have high prestige. In this research, the authors will be focused on the Physical desire, and the desire to have high prestige because those factors are considered more relevant to the research that the authors conduct.

2.1.2 Purchasing Power

According to Oxford Advanced Learner's Dictionary, 2000, purchasing power is the money that people have to buy goods with. This explains that the bigger amount of money that people have, the bigger their purchasing power is. Big buying power means they can fulfill their needs and desire. However, as the authors have stated above that human desire are limitless, bigger purchasing power does not means that the person's desire will be easily satisfied and then they will not desire another things. Usually, if the people have bigger purchasing power, that means they are richer, and if they are richer, they usually have more prestige. If they have more prestige, they usually will not buy the cheaper products. Also, richer people could buy much more products.

2.1.3 Product usage

Product Usage is the time of the item being used until it can be used anymore (Aigui, Bretaudeau, & Krob, 2010). Product usage is different between one product and another product. The Duration, actual contact, frequency, and amount of product being used show the Product Usage (Karwowski, Soares, & Stanton, 2011). Every people have their own product usage period. One person can say that the product is not productive anymore while the other person says that the product is still usable.

2.1.4 Social Status

Peoples are living within society. They need each other to helping because they are social being. In society, we know all people have status based on their background live such as family, religious, education, economic. Social status is given by the people inside the society. According Oxford Advanced Learner's Dictionary, 2000, status is the legal position of a person. People have status when they have role in society. According to Pujiastuti status social means position give to people in society (PUJIASTUTI, 2007)

2.1.5 Family Lifestyle

A person's lifestyle is the person's pattern of living in the world as expressed in the person's activities, interest and opinion (Kotler, 2003). Every person have different lifestyle, Even in one family. However, usually the main factor that influenced a person's lifestyle is their family. Furthermore in his book, Kasali stated that people will tend to choose products, services, and activities based on what products, services, and activities can be related to their style. The morphing of somebody's lifestyle happens since they were little and affected by many aspects such as cultures, norms, neighborhood, friends, way of learning, personality, and family (Lantos, 2010). Therefore, in this

research, family lifestyle will be questioned even more on the impact to consumptive behavior in a person.

2.2. Relations and Hypothesis

2.2.1. Fulfilling Desire and consumptive behavior

Human's desire, mainly the additional desire is the reason human have consumptive behavior. However, the main desire can also be the reason for human to have consumptive behavior, for example clothes. Human desire, naturally will not be over. Even if someone already fulfill their desire, another desire will come again. Therefore, the fulfilling desire of human will not be ended. Fulfilling the desires require a consumption, and this makes human have consumptive behavior. As stated above that human desire will never ends, therefore, the consumptive behavior in human will never ends too (Agustia, 2012).

H1: *fulfilling desire (X1) is affecting the consumptive behavior*

2.2.2 Purchasing power and consumptive behavior

Furthermore, this definition can leads to the phenomenon of bigger consumptive behavior. It means that the more money that people got, they tend to be more consumptive. Nowadays, especially in urban or city area, parents are more generous to give their children their allowance. This leads to students given more money that they basically needs. The needs needs of the children are usually not so much, because usually they are still staying at their parent's house and still have treatment like place to stay and foods everyday from their houses that do not require any money. Being given more money makes them to spend their money more and make students nowadays more consumptive (Agustia, 2012).

H2: *Purchasing power (X2) is affecting Consumptive behavior*

2.2.3 Usage of Product and Consumptive behavior

Every people have their own perspective about how long the product still can be used. We related this independent variable (Product Usage) with the Dependent variable (Consumptive behavior) because the varieties of product usage make some people to be consumptive. For example: non-Consumptive people tend to use the Smartphone until it can be used anymore or broken. Consumptive people tend to buy another Smartphone while their Smartphone still can be used or fully functional (HOTPASCAMAN, 2008, pp. 89-95).

H3: *The usages of the product (X3) influence the Consumptive behavior*

2.2.4 Social Status and Consumptive Behavior

Usually, people have higher status has more purchasing power so we can conclude relationship between social status with behavior consumptive very strong. For example: when the price of goods decrease, people who have higher status still to buy product with higher price. This phenomena happen because rich people or high status tend to show their prestige which different with another status (HOTPASCAMAN, 2008, pp. 89-95).

H4: *Social Status (X4) influence the Consumptive behavior*

2.2.5 Family Lifestyle and Consumptive behavior

As stated above, the lifestyle of a person is affected by their surroundings, and the authors consider that family is the biggest aspect that impacted the consumptive behavior of our respondents, since our respondents will be college students that are mostly still close to their family. The likeliness of their parents to go shopping will affect the children's lifestyle to have more consumptive behavior (HOTPASCAMAN, 2008).

H5: *Family lifestyle (X5) affected Consumptive Behavior*

III. RESEARCH DESIGN

3.1. *Sampling*

The target populations for this research consist of college students in Jakarta. The unit of analysis was the individual student. The sampling method that we used in order to collect the data from the respondents that are use for our research are unrestricted or simple random sampling. The authors used this method because the authors did not make any restriction of the respondent of this research beside college student in Jakarta. Therefore, any college student in Jakarta can be chosen as the respondent of this research regardless their batch, age, and academic score. As long as the student is listed in university in Jakarta, they can be the respondent.

3.2 *Data Collection*

In research methodology, the authors use personally administered questionnaires' method that established rapport and motivate respondent. The authors use this method because this method can collect data faster compare with others method. This method also provides almost 100% rate of respond compare with other method such as mail questionnaire and electronic questionnaire (Sekaran & Bougie, 2009). The data will be collected within 3 weeks starting from 20 October 2013 until 6 November 2013. The authors appreciates the respondent who willing to fill the questionnaire.

3.3 *Measures*

Direct single question used to gather all demographic variables such as age, sex, semester, Father's and mother's job,

incentive/month, expense/month, and saving/month. To conduct regression model, authors have to use Normality test, Heterocedasticity, and multicollinearity; but in this research the authors only use Normality test to check the validity of the questions. For Reliability of the assumption, authors sees the result of Cronbach's Alpha in SPSS. If the Cronbach Alpha value is bigger than 0.7, it means the data is reliable, otherwise the data is unreliable (Field & Miles, 2010).

IV. DATA ANALYSIS

4.1 *Demographic*

The authors collected the data from 270 respondents which are university students in Jakarta, the demographic data of the respondents that the authors will include in this section include: age, gender, semester, incentive/month, expense/month, and saving/month.

4.2 *Instrument Test*

In order to get the result of the research, Authors conducted two tests which are Validity test and Reliability test. Authors does not use Multiple Regression test because there are no dependent variable.

4.2.1 *Validity Test*

The authors use validity test to know the whether the Variables are valid or not. The Authors use KMO (Kaiser-Meyer-Olkin) ≥ 0.5 to see whether the variables are valid or not (Warnaars & Pradel, 2007).

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.745
Approx. Chi-Square	1096.680
Bartlett's Test of Sphericity Df	78
Sig.	.000

Validity Test Result for each variable

Communalities

No	Variables	Extraction	Result
a1	Pleasure in buying	.817	Valid
a4	Influence of advertising	.598	Valid
b3	Buying decision regarding financial power	.522	Valid
b4	Buying product using own money or saving	.670	Valid
c1	Buying product without using it	.633	Valid
c2	Buying product for collection (different color and shape with same function)	.653	Valid
d4	Buying product that usually used by mid-high level person	.618	Valid
d5	Buying product that have good reputation	.723	Valid
d6	Felling inferior if do not have good product	.705	Valid
d8	Buying expensive product to show prestige	.831	Valid
e2	Family always remind to buy good product regarding the quality	.769	Valid
e3	Parents give freedom to me to use my own money	.971	Valid
e4	Family like to shopping	.817	Valid

Those variable is valid because it has value more than or equal to 0.5. Since the $KMO \geq 0.5$ is valid, it can pass the validity test and ready to test the reliability.

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.851	29.624	29.624	3.851	29.624	29.624	2.910	22.385	22.385
2	1.762	13.557	43.181	1.762	13.557	43.181	2.104	16.186	38.571
3	1.655	12.732	55.913	1.655	12.732	55.913	1.676	12.892	51.463
4	1.154	8.874	64.787	1.154	8.874	64.787	1.615	12.427	63.889
5	.905	6.962	71.749	.905	6.962	71.749	1.022	7.860	71.749
6	.759	5.839	77.589						
7	.564	4.335	81.924						
8	.558	4.290	86.214						
9	.453	3.485	89.699						
10	.369	2.840	92.540						
11	.344	2.643	95.183						
12	.340	2.615	97.798						
13	.286	2.202	100.000						

Extraction Method: Principal Component Analysis.

In order to pass the validity test, the percentage of cumulative in Rotation Sums of Squared Loadings must be greater than 60%. Since the percentage cumulative of Rotation

Sums of Squared Loadings is greater than 60% (71.749%) the authors assume that the variable is passing the validity test (Warnaars & Pradel, 2007).

Rotated Component Matrix^a

	Component				
	1	2	3	4	5
a1			.899		
a4	.757				
b3	.665				
b4	.794				
c1	.777				
c2	.688				
d4		.734			
d5		.798			
d6		.777			
d8				.902	
e2				.842	
e3					.972
e4			.893		

The authors will test the reliability test base on the component in the Rotated Component Matrix. For the first Component the variables are a4, b3, b4, c1, c2. Second components are d4, d5, d6. Third components are a1 and e4. Fourth components are d8 and e2. The last component only consists of one variable. The further research, which is reliability

test based on Cronbach's Alpha cannot be conducted on a variable with only 1 variable, therefore the authors will not conduct the reliability test for fifth component.

4.2.2 Reliability Test

Reliability is concerned with estimates of the degree to which a measurement is free of random or unstable error. To

measure reliability, the authors used Cronbach's Alpha Coefficient. If the Cronbach's Alpha value is bigger than 0.7, it means the data is reliable, otherwise the data is unreliable (Field & Miles, 2010).

Reliability test for Components

Reliability Statistics

Components	Cronbach's Alpha	N of Items
1	.824	5
2	.745	3
3	.770	2
4	.720	2

The Cronbach's Alpha of the components in this research are all ≥ 0.7 , therefore all the components in this research are reliable. Also, all of the Cronbach's Alphas had been maximized so that deleting any variables in each component could not change the Cronbach's Alpha to become bigger.

V. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

Based on the research that the authors have conducted to 270 respondents, the authors conclude the entire variable into 5 dominant factors that had influence to their consumptive behavior.

1. Product Usage and Purchasing Power

The variance of initial Eigenvalues shows that the first factor has 29.624% of 71.749%. That shows fulfilling desire is the most dominant factor that influences the consumptive behavior. Base on the question number 1 (variable 1) in the fulfilling desire section, the authors can see majority select number 3 (149 choices) and 4 (73 choices) which are agree and strongly agree. The question refers to the likeliness to spend money to buy something or to buy product that useful and product that suitable with their purchasing power. Question number 4 (variable 4) also show the same fact that when people buy a product they tend buy another product. It showed in the questioner where the majorities choose number 3 and 4 (138 and 64 choices). Product usage and purchasing power (H1) is affecting the Consumptive Behavior. Therefore, authors' hypothesis 1 (H1) is accepted.

2. Social Status

The variance of initial Eigenvalues shows that the second factor has 13.557% of 71.749%. This value shows that social status has a big role in creating the consumptive behavior. To maintain social status people become consumptive.

3. Satisfaction

The variance of initial Eigenvalues shows that the third factor has 12.732% of 71.749%. As the third biggest percentage, satisfaction becomes one of the key factor of creating Consumptive behavior. In question number eleven we can see that majority choose agree and strongly agree. Satisfaction (H3) is affecting Consumptive Behavior. Therefore, authors' hypothesis 3 (H3) is accepted.

4. Prestige

The variance of initial Eigenvalues shows that the fourth factor has 8.874% of 71.749%. Prestige also become one of the factor that creating consumptive behavior. To maintain the prestige, people become more consumptive. Question number 19 shows that majority choose agree and strongly agree in respond to the question.

Compare with another journal conducted by HOTPASCAMAN.S. All of the variables are accepted and it related each other. So we can conclude this result of this research has the similarity with the result of research conducted by HOTPASCAMAN. The difference is in authors result, the family lifestyle is rejected. Family lifestyle hypothesis is rejected meanwhile in HOTPASCAMAN result the hypothesis is accepted.

5.2 Suggestion

5.2.1. For the university students

The authors hope that by knowing the factors that influenced consumptive behavior that the authors have shown in this research, the students can be more aware about the consumptive behavior. The authors conduct this research in hope that the students can minimize their consumptive behavior by knowing the factors that triggered it. The authors also hope that the students can be more aware about the importance of savings. As we can see in the demographic part of chapter 4, in the savings graph and table, it is shown that most of the respondents do not have any savings or only a few amounts of cash from their allowance, even if they have allowance above Rp 2,500,000 a month. Students really should have some money for them to save; besides they can buy products beyond their buying power if they save money, but it also can train them to be not too consumptive later in the future if they are accustomed to save some of their allowance.

5.2.2. For future research

For future research, the authors hope that the respondents can be added because Jakarta is a big city and the respondents could be more than what the authors have conducted. Also the location could be bigger than Jakarta, such as Jabodetabek (Jakarta, Bogor, Tangerang, Bekasi) or Java Island. Future research could also increase the number of factors and questions that being used in conducting the research. A future research also can make the concern deeper, as the authors only put concern in the consumptive behavior can make people will not be able to save money. This topic is very vast therefore expanding the topic for the future research is much recommended.

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Cikarang, October 22 2013
The Authors

REFERENCES

- [1] Agustia, R. S. (2012). Gambaran Perilaku Konsumtif Siswa-i Sekolah Menengah Atas "International Islamic Boarding School Republic of Indonesia" (SMA IIBS RI).
- [2] Aiken, L. S., West, S. G., Cohen, J., & Cohen, P. (2013). Applied Multiple Regression/Correlation Analysis for the Behavioral Sciences. Routledge.
- [3] Aiyer, A. (2007). The Allure of The Transnational: Notes on Some Aspect of the Political Economy of Water in India. 640.
- [4] Campen, H. L., Gerlinger, K., & Reusswig, F. (2005). Changing Global Lifestyle and Consumption Patterns: The Case of Energy and Food. Reusswig, I.
- [5] Charles H. Zastrow, K. K.-A. (2012). Understanding Human Behavior in the Social Environment. In K. K.-A. Charles H. Zastrow, Understanding Human Behavior in the Social Environment (p. 3). Cengage Learning.
- [6] Dunung, S. P., & Carpenter, M. (2011). International Business v1.0. Flat World Knowledge.
- [7] Field, A., & Miles, J. (2010). Discovering Statistics Using SAS. Sage.
- [8] HOTPASCAMAN. (2008). Hubungan Antara Perilaku Konsumtif Dengan Konformitas Pada Remaja. pp. 89-95.
- [9] Karwowsk, W., Soares, M. M., & Stanton, N. (2011). Human Factors and Ergonomics in Consumer Product Design. In W. Karwowsk, M. M. Soares, & N. Stanton, Human Factors and Ergonomics in Consumer Product Design: Uses and applications (p. 522). CRC Press.
- [10] Kotler, P. (2003). Marketing Management. Pearson Education International.
- [11] Lantos, G. P. (2010). Consumer Behavior in Action: Real-Life Applications for Marketing Managers. M.E. Sharpe.
- [12] Secrets of Mind and Reality. (2009). Retrieved October 4, 2013, from mindreality: <http://www.mindreality.net/the-reasons-why-it-important-to-save-money>
- [13] Sekaran, U., & Bougie, R. (2009). Research Methods For Business A Skill Building Approach. Chichester, West Sussex: John Wiley & Sons Ltd.
- [14] Wahyningtyas, P. (2011, August 1). The Consumptive Behavior of Indonesian Teenagers. Retrieved October 4, 2013, from <http://salitaviki.blogspot.com/2011/08/consumptive-behaviour-of-indonesian.html>

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Financial Innovation and Poverty Reduction

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Abstract- Financial sector has witnessed many changes over the last few decades. The economic development of a country is correlated with the financial sector. For the growth of financial sector the participation of every individual of a country is needed that is reflected in the motive of financial inclusion. Since in developing countries or LCDs large proportion of population is dependent on agriculture, but in most of rural areas of these countries financial intermediation has a poor performance and is unable to meet sustainable development. Financial inclusion at a broader level for poor is still a dream for most of the countries. Financial innovation therefore may be the only way to make financial facility available for poor at all levels of income. Some of these products are especially designed targeting the poor. New financial products for poor will be able to remove poverty in rural areas and can play a crucial role in socio-economic change in the rural society. This paper discusses literature review of financial innovation, its impact on rural areas and discusses how some of the innovative financial products helped in financial inclusion for poor people. Moreover it reflects use of technological advancement for innovative financial products that helped in financial inclusion and poverty alleviation. It also gives some suggestions for new financial products to bring more rural poor people in the ambit of financial inclusion for their financial needs. The data and facts used is secondary data from world bank and other agencies reports.

Key Words- financial innovation, financial inclusion, poverty alleviation, development

JEL Classification- P23, P36, P45, P46

I. INTRODUCTION

Financial sector has witnessed many changes over the last few decades. There was increase in financial institution, large capital inflows, regulatory bodies, deregulation in the sector and many innovation in financial instruments. All the necessary steps were taken to broaden the scope of the sector and to be accessible for more and more individuals. Developing countries are taking many necessary steps to include the poor in the ambit of financial sector. Research interest in this sector has been developed because of importance of financial sector in the economies of today. There is ample macroeconomic evidence suggesting that the development of a country is strongly correlated with the development of financial markets (see e.g. Banerjee and Duo (2005). Greenbaum and Haywood(1973) reviewed the history of American financial market and argued that the growth of wealth is the determinant of demand of financial innovation. Financial markets play critical roles in mobilizing savings, evaluating projects, managing risk, monitoring managers, and facilitating transactions. Therefore the development of financial markets is critical for a nation's innovation (Schumpeter, 1911).

What is Financial innovation?

Financial markets have continued to produce a multitude of new products, including many new forms of derivatives, alternative risk transfer products, exchange traded funds, and variants of tax-deductible equity. A longer view suggests that financial innovation like innovation elsewhere in business is an ongoing process whereby private parties experiment to try to differentiate their products and services, responding to both sudden and gradual changes in the economy.(Miller,1986). "Financial innovation is viewed as the "engine" driving the financial system towards its goal of improving the performance of what economists call the "real economy."In a wide sense financial innovation is the creation of new approaches for the financial industry. It can be in the form of new types of security or money management process. In financial innovation new instruments are designed for investors that have never been offered before. Financial markets have continued to produce a multitude of new products, including many new forms of derivatives, alternative risk transfer products, exchange traded funds, and variants of tax-deductible equity. Financial innovation includes: "new financial instruments, new decision processes and criteria, cultivation of new markets for financial instruments, new organisational and managerial practices and new institutions" (Bhatt, 1995:9). Frame and White (2004) defined financial innovation as "representing something new that reduces costs, reduces risks, or provides an improved product/service/instrument that better satisfies participants' demands" (Frame and White, 2004:118). The principal role of financial innovation is to make markets more complete so that firms, households and governments can better finance, invest and share risk among each other (see for example Allen and Gale, 1997, or Acemoglu and Zilibotti, 1997). Zhou and He (1985) remarked that financial innovation is the diversified economy phenomena, including the appearance of new financial assets, new financial market and new medium of payment. Empirical studies of the adoption of financial innovations have focused on the introduction of automated teller machines (Hannan and McDowell (1984, 1987) and Saloner and Shepherd (1995)), patents (Lerner (2002)),off-balance sheet activities of banks (Molyneux and Shamroukh (1996), Obay (2000)),junk bond issuance (Molyneux and Shamroukh (1999)) and corporate security innovations (Tufano (1989)).

Financial innovation and poverty reduction:

Since financial innovation contributed a lot in development of new securities and financial market but it also helped financial sector to be accessible for a common man also. Researches in this area shows that development of a viable financial sector is vital for both economic growth and poverty reduction (World Bank, 2004; DFID, 2004a) . After realising the fact that economic development of a country cannot be possible without the involvement of rural area and poor, many new financial institutions and instruments were framed keeping in view of financial inclusion of the poor but even then Financial exclusion was substantiated by the fact that as per the World Bank estimate in 1995,in most developing countries the formal financial system reaches only the top 25 percent of the economically active population (Sinha, 2004). For the growth of a country and its overall development financial inclusion was necessary thus it became the one of priority for rural section of society thus Financial inclusion has been discussed in recent years, particularly in banking circles with the main objective of delivering affordable banking services to the disadvantaged sections of the society,

i.e. clients who belong to the unorganised segments of the economy and per force have to depend upon non-institutional sources of finance (Rao, 2007; Ray and Singh, 2006). Research also suggest that in many of the least developed countries (LDCs) the rural financial market is often fragmented and unable to meet the finance needs of the rural population, especially for investing in agriculture, the predominant sector. (Besley, 1994). Generally rural economy is financially very insubstantial and there is lack in the availability of credit facility at a reasonable rate. They need finance for up gradation of method of production and for new technology. Finance is also required for commodity marketing, sometimes through inventory-backed financing, which offers rural producers, traders and processors the opportunity to improve household income through adopting better produce marketing and raw material procurement strategies (Coulter and Onumah, 2002). According to world poverty report 2011 there are one billion people who live in poverty in rural area and large proportion of poor and hungry are children and young people. Recent estimates shows that only 2.7 billion people around the world have no access to formal financial services. And only 10 per cent of even the most basic formal financial services reach rural communities (IFAD,2011).

Need of financial service for poor:

The population of the developing world is still more rural than urban: some 3.1 billion people, or 55 per cent of the total population, live in rural areas. Despite massive progress in reducing poverty in some parts of the world over the past couple of decades notably in East Asia – there are still about 1.4 billion people living on less than US\$1.25 a day, and close to 1 billion people suffering from hunger. At least 70 per cent of the world's very poor people are rural, and a large proportion of the poor and hungry are children and young people. (Poverty Report 2011) WWB research shows that the poor save, generally in small amounts, an estimated 10 to 15 percent of their monthly income. The need for formal savings options is crucial: without them the poor are forced to keep cash at home or in informal savings groups which are risky and money can be lost.

The poor need sustainable financial services for different reasons they need;

Micro savings deposit facilities for:

- the safekeeping of savings
- consumption-smoothing
- emergencies
- accumulation of resources
- self-financing of investments

Microcredit, with access to loans of various sizes and maturities for:

- external financing of investments
- consumption-smoothing
- emergencies

Microinsurance, including specialized insurance services (life, health, accident or cattle insurance) and nonspecialized services (providing social protection through access to one's savings or to credit in cases of emergency) for:

- risk management
- social security
- loan protection. IFAD,(2000)

New Innovative Techniques and poverty Reduction:

Mobile Banking

Mobile banking empowers retail and corporate banking customers to access the banking services. Information and communication technology (ICT), particularly mobile phones, is bringing a revolution in information even to remote rural areas. Use of mobile phones is expanding exponentially, and handsets are now affordable for many poor rural people. Mobile phones have greatly reduced market transaction costs for smallholder farmers, making it possible to find out product prices from markets (thus reducing risks related to unequal access to information), contact buyers, transfer money and arrange

loans. More and more (short message service [SMS]-based) services of relevance to poor rural people are now provided by mobile phone. (World Poverty Report 2011). There are 5.6 billion mobile phone users in the world. This can help to provide banking services to those who are presently an unbanked portion of society specially the poor in rural areas of developing countries. The Financial Facility Remittance projects also promote the integration and use of new technologies, such as mobile money transfers and mobile banking, that benefit remittance recipients in rural areas. (World Poverty Report 2011). Many countries are even concerned in this like The Ministry of Finance has recommended consistent tax treatment for mobile banking operations to support national outreach to rural and remote areas. In Mexico, a series of diagnostic and data gathering exercises carried out by or on behalf of the financial authorities identified both gaps and barriers in critical areas. These issues were addressed in Mexico's recently issued regulation on agents, including mobile network operators to set up agent networks and manage mobile accounts on behalf of banks; mobile banking scheme and specific regulation for mobile banking accounts (simplified regime) and limited scope banks "niche banks" (ATISG Report 2010). The use of this service can be availed only if the users are aware of the service that how to use and are financially literate. Mobile money's first big success in serving poor people came when Kenyans discovered how useful it was to be able to "send money home" safely, quickly and cheaply through M-PESA. As mobile money moves from transfers into savings and loans, it will need to demonstrate a similar leap in the usefulness of its products. (CGAP Microfinance Blog, March 21, 2012) What poor people need is: first, convenience, being able to transact near where they live and work; second, trust, putting their money with organisations that seem to care for them and who they feel are going to be there for them when they need them the most; and, third, affordability – being able to transact in small amounts at reasonable cost (Mas,I).

Branchless Banking

Providing financial services without relying on bank branches is another step to include more individual to access the financial services in remote and rural areas. Branchless banking is "the delivery of financial services outside conventional bank branches using information and communications technologies and non-bank retail agents, for example, over card-based networks or with mobile phones." (CGAP 2009). The technological brawn, sophisticated banking and widespread financial literacy seemingly required to deploy mobile-money programs are, of course, heavily concentrated in the developed world. It can help to access financial services in more convenient way and at low cost. According to the World Economic Forum's "Mobile Financial Services Development Report," roughly 10% of Kenya's 40 million people use mobile-money initiatives like Safaricom's M-Pesa. The branchless banking platform enables users, armed with only their mobile phones, to pay bills, deposit and withdraw money as well as transfer funds to M-Pesa's users and non-users alike. (Wall Street Journal Market Watch 28 Feb. 2012). The essential proposition of branchless banking that financial providers can reduce fixed costs by using existing facilities and devices, whether owned by the customer (e.g., mobile phones) or by agents has caught the attention of providers. Success in branchless banking ultimately depends on offering customers a service proposition that is superior to existing options. Poor people in the unserved majority will use new electronic services when these services meet real needs (CGAP, DFID 2009).

Microfinance:

Microfinance services have always focused poor and targeted to make productive investments. Ledgerwood defines microfinance as the provision of financial services like savings, credit, insurance and payment services to low-income clients, including the self-employed (Ledgerwood, 1999). It is thus the provision of a broad range of financial services such as deposits, loans, payment services, money transfers and insurance to poor and low income households and their micro enterprises (Sriram and Kumar, 2007). For the last few decades microfinance has played an important role in meeting the financial needs

for the poor. Microfinance institutions provide a variety of financial services designed for poor clients like (savings products, microcredit, payment services, micro leasing remittances and micro insurance etc.) and has emerged an important tool with the use of new technology, policy reforms and financial innovation across the world. Microfinance institutions (MFIs) have multiplied since 1990; despite the high transaction costs and risks associated with operating in the rural areas, they are getting ever-better at reaching out and responding to demand there. The most innovative are experimenting with ways of enabling the poorest rural people to access financial services. (World Poverty Report 2011). Financial Access 2010 reviews that survey responses from 142 economies and updates statistics on the use of financial services found that many nonbank institutions also provide financial services and some even have specific financial inclusion mandates. These include cooperatives, specialized state financial institutions, and microfinance institutions. In a number of West African countries—Benin, Burkina Faso, Côte d'Ivoire, and Niger deposit-taking microfinance institutions have more depositors than do commercial banks, which suggests that nonbanks can be an important player in providing basic deposit services. Commercial banks mainly target urban areas. Most bank branches are located in urban areas, representing 88 percent of all financial institutions in urban areas. On average, only 26 percent of all bank branches are in rural areas, compared with 45 percent for cooperatives, 38 percent for specialized state financial institutions, and 42 percent for microfinance institutions. (Financial Access 2010)

Islamic Microfinance:

Islamic banking is growing at a rate of 15% for the last three decades. Islamic microfinance is a new concept in microcredit that caters needs of poor all over the world. -Islamic microfinance is becoming an increasingly popular mechanism for alleviating poverty, especially in developing countries around the world. The Islamic finance industry as a whole is expected to reach over \$2 billion dollars in 2012 and is a continually growing sector due to its ethical principles and prohibition of riba (interest). (International Islamic News Agency, 22 Feb. 2012). Since traditional microfinance is based on interest though very low in some cases where as Islamic microfinance is based on interest free principle and favours investing only in those projects that are in compliance with Shariah principle and benefits society at large. Funds to Islamic microfinance may be provided by religious contributions through the institutions of Awqaf, Zakat, Sadaqat, Qard-Hasan and other charities.

Social Entrepreneur:

Social entrepreneurs plays an important role in reducing the level of poverty among many poor and developing nations. By combining innovative ideas from individuals and investments from public, private, and civil society organizations, such entrepreneurs can guide complex global food systems and rural institutions toward their goals. Social entrepreneurship is a drive for social missions that combine business principles and motivations are emerging as promising approaches to international development. Recent experiences have shown that introducing entrepreneurial spirit into the development process can improve the effectiveness of intervention programs. World history shows that every society produces its own social entrepreneurs to solve their problems. (International Food Policy Research Institute 2007), Villgro is a good example of social enterprise that promotes rural innovation-based enterprises as a business incubator that turns grass roots innovations into commercial enterprises. Since 2001 it has identified and groomed innovation for rural benefits. Villgro empowers rural development by identifying and incubating innovations that can be translated to market based models thus impacting thousands of rural households. In efforts to impact rural life, they promote social entrepreneurship and work with different stakeholders to create and support an eco-system that empowers social entrepreneurship by means of seed funding, mentoring, networking and recognition. They have impacted over 360,000 rural users with technology & solutions reaching the grassroots. They have identified and activated more than 2000 social

innovators. Villgro has impacted more than 3.6 lakh lives so far. (Villgro). In Tanzania's Iringa region, an innovative idea to identify village volunteers and train them to monitor child growth as part of an integrated nutrition program helped to reduce infant mortality and child malnutrition substantially. Although successful, many of these advances are largely isolated, typically developed as local interventions that target a limited geographic area. (International Food Policy Research Institute 2007)

Conclusion and suggestions:

For the last two to three decades a lot has been done in the field of financial innovation keeping in view of the demand of particular time but its accessibility to a common man is still a dream for many rural poor. There is a substantial gap between demand and supply of financial services to poor according to their need and accessibility. Steps are needed to make people aware of financial services available to them as most of rural are not financial literate. There can be special awareness camps by financial services provider that enable people to use the technology for cheaper financial services at their door steps. There is need for more financial services that must be compatible according to need of people in rural areas. Some of areas that need focus from this aspects are mentioned below.

Micro credit cards:

Financial institution should be encouraged to issue micro credit cards to rural people that must enable them to use it up to a limit depending upon creditworthiness of cardholder but at nominal or very low interest rate. Camp card or my bonus microcredit cards are examples of it but these should be made available at large scale to rural people.

Islamic microfinance:

Some people of Muslim community don't participate in traditional banking system because of component of interest involved in it. Since interest is strictly prohibited in Islam so they prefer to remain out of system of banking. In those cases Islamic banking should be encouraged and govt. should incorporate suitable working environment to operate these institution at par with other institutions.

Using bank facility for wages to daily wagers:

Daily wagers that are employed at low level should be paid cheque or money should be transferred in their account at all low level so that they might withdraw as much money as per their daily need and rest they should keep with bank. This may inculcate their habit of saving.

Opening of more microfinance branches at village level:

There should be more microfinance branches at village level that have no such branches at present so that it must cater their needs in an effective way. These branches should be open in those areas that are either financially excluded or have low access to it.

Developing financial literacy among rural poor:

Majority of poor are not financially literate they have least knowledge of working of financial system and particularly financial products and thus cannot use which service of medium suits best for their need. So some steps are needed to be taken to make them aware of financial services and products that enable them to achieve the most benefits of existing services.

References:

- [1] Acemoglu, D., and F. Zilibotti, 1997, "Was Prometheus Unbound by Chance? Risk, Diversification and Growth", *Journal of Political Economy*, 105, 709-751.
- [2] Allen F. and D. Gale, 1997, "Financial Market, Intermediaries and Intertemporal Smoothing", *Journal of Political Economy*, 105, 523-546
- [3] ATISG Report(2010), G20 Financial Inclusion Experts Group, 25 May 2010 Available at http://www.aisaid.gov.au/publications/pubout.cfm?ID=8173_8304_3848_5820_7078
- [4] Banerjee, A. V. and Duo, E. (2005), Growth theory through the lens of development economics, in P. Aghion and S. Durlauf, eds, 'Handbook of Economic Growth', Vol. 1 of

- Handbook of Economic Growth, Elsevier, chapter 7, pp. 473-552.
- [5] Besley T. (1994). How do market failures justify interventions in rural financial markets? *World Bank Research Observer* 9: 27-47
- [6] Bhatt, VV (1995) *Financial systems, innovations and development*. New Delhi ; London: Sage
- [7] CGAP,DFID 2009, "Scenarios for Branchless Banking in 2020" October 2009.
- [8] CGAP,(2009) ,"Scenarios for Branchless Banking" Focus Note 57.
- [9] CGAP,The World Bank 2010,"Financial Access 2010 The State of Financial Inclusion Through the Crisis" 2010
- [10] CGAP Microfinance Blog , 2012 "Product Innovation that Provides Useful Services for the Poor: P9 and Jipange KuSave" 21 March <http://microfinance.cgap.org/>
- [11] Coulter, J. and G.E. Onumah (2002). The role of warehouse receipt systems in enhanced commodity marketing and rural livelihoods in Africa. *Food Policy* 27: 319-337.
- [12] DFID (2004b). The importance of financial sector development for growth and poverty reduction. Policy Division Working Paper. Department for International Development: London, UK
- [13] Frame, WS and White, LJ (2004) Empirical Studies of Financial Innovation: Lots of Talk, Little Action? *Journal of Economic Literature* 42: 116-144
- [14] Greenbaum S, Haywood C. (1973),Secular Change in the Financial Services Industry. *Journal of Money Credit & Banking*, 3(2):571-589
- [15] Hannan, T. and J. McDowell (1984), "The determinants of technology adoption: The case of the banking firm." *Rand Journal of Economics* 15 (Autumn):328-335.
- [16] Hannan, T. and J. McDowell (1987), Rival precedence and the dynamics of technology adoption: An empirical analysis. *Economica* 54(May):155-171.
- [17] IFAD,(2011),IFAD Annual report 2010.
- [18] IFAD,(2000) Rural finance for the poor from unsustainable projects to sustainable institutions, From a presentation by IFAD to a regional microcredit summit, October 2000 Available at http://www.ifad.org/pub/other/rural_e.pdf
- [19] International Food Policy Research Institute (2007)" SOCIAL INNOVATION AND ENTREPRENEURSHIP Developing Capacity to Reduce Poverty and Hunger" 2007. Available at http://www.ifpri.org/sites/default/files/publications/beijingbrief_babu.pdf Accessed on 25March, 2012
- [20] International Islamic News Agency, 2012 "Islam/Economy: "Islamic Microfinance: A Model for Alleviating Poverty" Feb 22 http://iina.me/wp_en/?p=1006955
- [21] Ledgerwood, J. (1998). *The Micro finance Handbook: An Institutional and Financial Perspective*, SBP Technical Paper Series, December
- [22] Lerner, J. (2002), "Where does State Street lead? A first look at finance patents, 1971-2000", *Journal of Finance* 57(2), 901-930.
- [23] Mas,I (2010). "Savings for the Poor Banking on mobile phones", *WORLD ECONOMICS* , Vol. 11 , No. 4 , October-December 2010
- [24] Merton, R.C. (1992), "Financial innovation and economic performance", *Journal of Applied Corporate Finance* 4(4):12-22.
- [25] Miller, M. H. (1986), "Financial innovation: The last twenty years and the next", *Journal of Financial and Quantitative Analysis* 21(4):459-471.
- [26] Molyneux, P. and N. Shamroukh (1996), "Diffusion of financial innovations: The case of junk bonds and note issuance facilities", *Journal of Money, Credit and Banking* (August) 502-526.
- [27] Molyneux, P. and N. Shamroukh (1999), *Financial Innovation* (John Wiley, Chichester,England).
- [28] Obay, L. (2000), *Financial Innovation in the Banking Industry: The Case of Asset Securitization* (Garland Publishing, New York)
- [29] PNB Monthly Review, December, pp. 14-27
- [30] Tufano, P. (1989), "Financial innovation and first mover advantages", *Journal of Financial Economics* 25:213-240.
- [31] Rao, K.G. K. Subba (2007). "Financial Inclusion", *Economic and Political Weekly*, February 3, pp. 355- 60
- [32] Ray, Sujit Kumar and Singh, Niraj (2006). "Inclusive Growth – Challenges before Banks",.
- [33] *Rural Poverty Report*, 2011
- [34] Schumpeter, J., 1911, *The Theory of Economics Development* (Cambridge, MA: Harvard University Press).
- [35] Sinha, Archana (2004). "Micro Finance for Women's Empowerment", *Kurukshetra*, April,pp.31-38
- [36] Sriram, M.S. and Kumar, Radha (2007). "Conditions in which Microfinance has Emerged in Certain Regions, *Economic and Political Weekly* , Vol. XLII, No. 49, pp. 67-72.
- [37] Tufano, P. (1989), "Financial innovation and first mover advantages", *Journal of Financial Economics* 25:213-240.
- [38] *Wall Street Journal Market Watch* 2012 "Mobile money faces developed-world challenge" 28 Feb. <http://www.marketwatch.com/story/mobile-money-faces-developed-world-challenge-2012-02-28>
- [39] Women's World Banking WWB website ; Available at <http://www.swwb.org/expertise/our-work>
- [40] World Bank (2004). *Investments in Rural Finance for Agriculture*. Agriculture Investment Sourcebook, Chapter 7 by Pearce, D., A. Goodland and A. Mulder. World Bank: Washington DC, USA
- [41] *World Poverty Report* 2011.
- [42] www.villgro.org Accessed on 25 March, 2012

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Effectiveness of Insecticides and Biopesticides against Gundhi Bug on Rice Crop in District Rewa (M. P.), India

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Abstract- An ecofriendly alternative to chemical pesticides is biopesticides, which encompasses a broad array of microbial pesticides, biochemicals derived from micro-organisms and other natural sources, and processes involving the genetic incorporation of DNA into agricultural commodities that confer protection against pest damage. The field studies were carried out for effectiveness of insecticides and biopesticides against gundhi bug on rice in Rewa region. Study of insect pest complex was done from 2006-07 to 2007-08. The observations were made regarding the grain yield monocrotophos was the most efficient insecticide where as among biopesticides wanis was the best.

Index Terms- Oryza sativa, Biopesticides, Insecticides, Gundhi bug, India

I. INTRODUCTION

Rice is the most important staple food crop with more than half of the world's population relying on rice as the major daily source of calories and protein [1]. Asia accounts for about 90% of world's rice area and production. Among the rice growing countries, India has largest area under rice in the world (about 44.6 mha) i.e. 28% of the world's area of production, and ranks second next to China. The share of India to the world's production is near about 22.1 percent. In Madhya Pradesh, the area under rice cultivation is 5144.6 million hectares with production of 5748.3 million tonnes with a productivity of 1-2 t/ha. [2]

Gundhi Bug (*Leptocorisa varicornis*) is a serious pest of rice and sometimes reduce yield by as much as 30%. The adults are slender and brown-green. They measure 19-16 mm long. The younger instars are pale in color. The nymphs have long antennae. The older instars measure 1.8 - 6.2 mm long. They are yellowish green. The eggs are oval, shiny, and reddish brown.

Evaluation of insecticides against insect pests of rice :

The field experiments were conducted to evaluate the insecticides against insect pests of rice in the years 2007 and 2008.

Treatments:	dose /g. or ml. of formulation/ha
T ₁ Chlorpyrifos	10.0kg
T ₂ Chlorpyrifos	12.5kg
T ₃ Carbofuran	33.0kg
T ₄ Deltamethrin	150.0ml.
T ₅ Monocrotophos	1390.0 ml.
T ₆ Untreated control	check
Design	RBD (Randomized Block Design)

They are laid in batches of 10-20 in one to three rows along the midrib on the upper surface of the leaf. [3]

Agriculture has had to face the destructive activities of numerous pests like fungi, weeds and insects from time immemorial, leading to radical decrease in yields. With the advent of chemical pesticides, this crisis was resolved to a great extent. But the over dependence on chemical pesticides and eventual uninhibited use of them has necessitated for alternatives mainly for environmental concerns. Degraded soils and groundwater pollution has resulted in nutritionally imbalanced and unproductive lands. Volatile pesticide residues also sometimes raise food safety concerns among domestic consumers and pose trade impediments for export crops. Therefore, an ecofriendly alternative is the need of the hour. Biopesticides or biological pesticides based on pathogenic microorganisms specific to a target pest offer an ecologically sound and effective solution to pest problems. They pose less threat to the environment and to human health. [4]

The present piece of work is attempt to compare the efficacy of chemical and biopesticides against Gundhi bug on rice field in Rewa.

II. MATERIALS AND METHODS

The present study was done in Kuthulia farm of Agriculture College of District Rewa. The study was conducted in the seasons of 2006-07 and 2007-08. During this time period average temperature was 30.4 °C (maximum) and 15.61 °C (minimum). During 2007 the monsoon was received on 16th June whereas in 2008 it was on 12th June. Rainfall was adequate in 2007 (669.5mm) in 41 rainy days but the year 2008 it was comparatively high ranging up to 672.6mm.

Replication	3
Plot size	5x2
Spray	02
Fertilizer	NPK 60:40:30 Kg /ha
Variety	Pusabasmati

Ist Spraying of the insecticides was carried out when insect pest incidence was and IInd spray observes was done 10days of Ist Spray.

Evaluation of biopesticides against insect pests of rice :

Treatment :	Dose
T ₁ Achook	5 ml.
T ₂ Neem Azal	3 ml.
T ₃ Neem Gold	3ml.
T ₄ Spictaf	4.3ml.
T ₅ Tricure	5 ml.
T ₆ Wanis`	5 ml.
T ₇ Biofer	1.5ml.
T ₈ Biotos	2.5 ml.
T ₉ Control	Untreated
Design	RBD (Randomized Block Design)
Replication	3
Plot size	5x2
Spray	02
Fertilizer	NPK 60:40:30 Kg /ha
Variety	Pusabasmati

Analysis of variance (ANOVA) was used to compare the data during experiments.

III. RESULTS AND DISCUSSION

Gundhi bug (*Leptocorisa oratorius*), the major insect pest in upland rice environments causes extensive damage every year. Population of insect is governed by a number of abiotic and biotic factors [5]. Varieties favourable for the development of the insect are also one of the factors. [6]

Evaluation of Insecticides against gundhi bug on Rice:

For the evaluation of insecticides against the insect pests 4 insecticides were used namely Chlorpyrifos, Carbofuran, Deltamethrinand, Monocrotophos. Four insecticides at different concentrations were evaluated for controlling foliar pests of rice on most susceptible variety Pusabasmati during the year 2007 and 2008 under irrigated ecosystem. It is evident from the data (Table No. 1) that Monocrotophos was found significantly superior in controlling the gundhi bug population (% grain damage) over untreated check (47.3) and (39.5) during 2007 and 2008 respectively. Minimum grain damage (11.1%) was recorded in Monocrotophos followed by Corbofuran (11.8%) over untreated check (43.4%). The next effective treatment was Deltamethrin (25.25%) and Chlorpyrifos 1250g. a i/ha (27.6%), which were at par and found to be moderately effective in controlling the gundhi bug population and combating the grain damage.

According to Mishra, 2003 [7] six insecticides viz., fenobucarb 50 EC @ 500ml a.i./ha, imidacloprid 200 SL @ 50ml a.i./ha, malathion 50EC@ 500ml a.i./ha, carbaryl 50 WP @ 1kg

a.i./ha, avermectin 1.8 EC @ 18 ml a.i./ha and DDVP 76 EC @ 266ml a.i./ha were field evaluated against mixed population of rice gundhi bug, *Leptocorisa* sp. during *Kharif*, 2002 at Bhubaneswar, Orissa. The results revealed that all the insecticides proved significantly effective in controlling the insect as compared to control.

Evaluation of biopesticides against rice gundhi bug on rice:

For the biopesticides against the insect pests 8 biopesticides were used namely Achook, Neem Azal , Neem gold, Spictaf , Tricure , Wanis, Biofer and Biotos. Eight biopesticides were evaluated against rice gundhi bug in two consecutive years 2007 and 2008 in high susceptible variety Pusabasmati. It was observed that gundhi bug incidence was 32.8 % and 34.7% in 2007 and 2008 respectively in untreated check. Among the tested biopesticides Achook was followed by Tricure and Neem gold. They were found to be significantly superior than other products. It is obvious from the data (Table No.2) that minimum gundhi bug population (% incidence) was recorded (8.85) in Achook which was closely followed by Tricure (12.1) and Neem gold (13.1). The effect of biopesticides was seen also in regard of grain yield and Wanis was found most effective showing 30.86% grain yield and lowest yield was recorded by applying Neem azal i.e. 28.51%., Spictaf, Tricure, Biofer, Biotos, Achook and Neem gold were found in between in an ascending order at grain yield i.e. 29.88, 30.04, 30.23, 30.41, 30.59 and 30.73% respectively.

Increase in grain yield was recorded highest by application of Wanis i.e. 18.92%. While it was recorded to be lowest when Neem azal was applied i.e. only 9.86%. Increase in grain yield was recorded to be 15.1% by the application of Spictaf, 15.76% by Tricure, 16.49% by Biofer, 17.18% by Biotos, 17.8% by Achook and 18.48% by Neem gold.

According to Murthy 2007 [8], different scientists on eco-friendly practices demonstrated that for managing pest problems pesticides of plant origin like soybean oil, Oxymetrin and matrine obtained from *Sophoria* sp., plant extract (Biotos) obtained from *Gaultheria* spp., essential oils obtained from *Vitex negundo*, Pyrethrins present in the seed cases of *Chrysanthemum* plant, the extract of perennial shrub *Dodonaea angustifolia*, "Saponin" from *Sapindus trifoliatus*, Pongam seed oil obtained from *Pongamia pinnata* and *P. glabra* are useful.

Rice gundhi bug had significant negative correlations with minimum temperature, evening relative humidity and rainfall; and positive correlations with sunshine hours and maximum temperature.

Table: 1 - Evaluation of insecticides against gundhi bug Population (2007-2008)

Insecticides					Gundhi bug						
Common name	Trade name	% a.i. formulation	Rate		% grain damage			Grain Yield q/ha			(q/ha)% increase in grain yield
			g. a.i./ha	g. or ml of Formulation /ha	2007	2008	Mean	2007	2008	Mean	
Chlorpyrifos (a)	Dursbam 10G	10%	1000	10.0kg	37.6	35.5	36.55	11.48	13.55	12.51	22.52
Chlorpyrifos (b)	Dursban 10G	10%	1250	12.5kg	28.7	26.5	27.6	13.49	15.65	14.57	42.70
Carbofuran (Check)	Furadan 3G	3%	1000	33.0kg	12.7	10.39	11.8	19.05	19.20	19.12	87.26
Deltamethrin	Decis 10%EC	10%	15	150ml	28.0	22.5	25.25	12.99	13.95	13.47	31.92
Monocrotophos (Check)	Monocrown 36 WSC	36%	500	1390ml	12.0	10.2	11.1	18.92	20.93	19.92	95.10
Untreated Control	-	-	-	-	47.3	39.5	43.4	8.44	11.98	10.21	-
Sem ±	-	-	-	-	0.813	0.126	-	0.166	16.60	-	-
CD (0.05)	-	-	-	-	2.563	0.397	-	0.524	52.33	-	-

Table: 2 - Evaluation of biopesticides against rice gundhi bug (2007-2008)

Neem pesticides products/	Dose/l of water	Gundhi bug incidence (%)			Gain yield (q/ha)			Increase in grain yield (%)
		2007	2008	Mean	2007	2008	Mean	
Achook	5ml	8.5	9.2	8.85	26.80	34.38	30.59	17.8
Neem Azal	3ml	14.1	16.1	15.1	25.90	31.13	28.51	9.86
Neem gold	3ml	12.7	13.5	13.1	27.50	33.96	30.73	18.40
Spictaf	4.5ml	16.8	14.3	15.55	25.30	34.46	29.88	15.1
Tricure	5ml	11.7	12.5	12.1	24.80	35.29	30.04	15.76
Wanis	5ml	12.6	14.7	13.65	25.90	35.83	30.86	18.92
Biofer	1.5ml	14.2	13.6	13.9	27.1	33.37	30.23	16.49
Biotos	2.5ml	14.8	15.8	15.3	27.7	33.12	30.41	17.18
Untreated check	-	32.8	34.7	33.75	24.3	27.6	25.95	-
Sem ±	-	0.942	0.767	-	1.070	0.887	-	-
CD (0.05)	-	2.824	2.302	-	3.208	2.661	-	-

IV. CONCLUSION

Agriculture being the backbone for Indian economy, accounts for about 30% of GDP and two third of the population is dependent on it. After taking various observations we can be concluded that regarding the grain yield monocrotophos was the most efficient insecticide where as among biopesticides wanis was the best. Biopesticides provide environment friendly alternatives to chemical insecticides but they face a number of constraints in their development, manufacture and utilization.

REFERENCES

- [1] Khanjani, M. Crop pests of Iran. Buali Sina University Press. 2006. 717 .
- [2] Anonymous. Statistics of Agriculture, Volume 1, Agricultural and Horticultural Crops, Crop year 2009-2010, Ministry of Agriculture, Department of Economic Planning, Bureau of Statistics and Information Technology. 2011.
- [3] John, S. Pest management need for integrated approach. Pesticides. 1981. XV (9): 3-5.
- [4] Suman Gupta and Dikshit, A. K. Biopesticides: An ecofriendly approach for pest control. Journal of Biopesticides. 2010. 3(1): 186-188.
- [5] Emmel, T.C. Population Biology. 1976. Harper and Row, New York.
- [6] Kennedy, J.S. Mechanism of host plant selection. Ann. Appl. Biol 1965. 56: 317-322.

- [7] Mishra, H.P. Evaluatin of New isecticides against rice gundhi bug. Indian Journal of Plant Protection. 2003. 31 (2) : 107-108.
- [8] Murthy, K.S.R.K. Modern trends – Demonstrated Eco-friendly practices/tools for crop protection. Indian Journal of Plant Protection 2007. 35(1): 22-24.

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Fuzzy Controller Design of Lighting Control System by Using VI Package

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Abstract- This paper describes how we design a lighting control system including hardware and software. Hardware includes Dimmer with relays Bulb light sensing circuit, control circuit, and 8255 expanding I/O circuit, PC, and bulb. Sensing circuit uses photo-resistance component to sense the environmental light and then transmit the signal of the lightness to the computer through an 8-bit A/D converter 0804. The control circuit applies reed relay in digital control way to adjust the variable resistor value of the traditional dimmer. Software incorporates LABVIEW graphical programming language and MATLAB Fuzzy Logic Toolbox to design the light fuzzy controller. The rule-base of the fuzzy logic controller either for the single input single output (SISO) system or the double inputs single output (DISO) system is developed and compared based on the operation of the bulb and the light sensor. The control system can dim the bulb automatically according to the environmental light. It can be applied to many fields such as control of streetlights and lighting control of car's headlights and it is possible to save energy by dimming the bulb. Experimental results show that the fuzzy controller with the DISO system can make bulb response faster than with the SISO system under sudden change of environmental light.

Index Terms- LabVIEW, lighting control system, MATLAB Fuzzy Logic Toolbox, fuzzy logic controller, SISO, DISO.

I. INTRODUCTION

After Lotfi Zadeh had introduced the fuzzy logic in 1965, the fuzzy control method is extensively used since it has the advantage of being model-free without any a priori information required. It is easy to design a fuzzy control system with requisite knowledge and the experience of a skilled operator. Many issues focus on determining fuzzy control rules, membership functions, and structures of fuzzy controllers [2, 4, 6]. Various ways of fuzzy logic used to improve industrial control [5] and methodology to reduce the number of variables

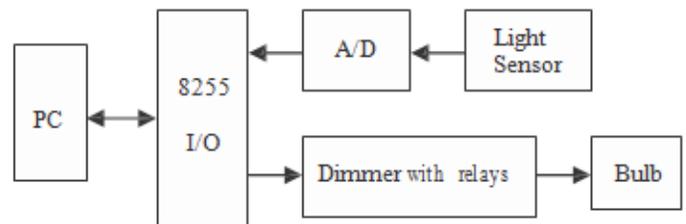


Fig. 1. The block diagram of the proposed lighting control system.

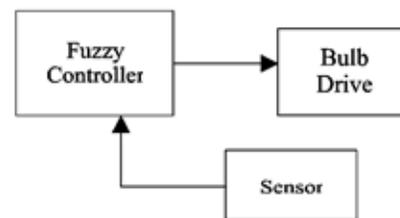


Fig. 2. The fuzzy control scheme.

The application of fuzzy logic in lighting control has been presented in a number of papers. For example, it is possible to save energy by dimming the bulb or the fluorescent lamp. Dimming of the fluorescent lamp can be done by changing the input frequency of the electronic ballast [1]. A microprocessor-based intelligent control device for streetlight control applying fuzzy decision theory to distinguish various interferences accurately and to make it operate reliably, which can turn on or off the transformer automatically according to environmental light [7].

Section II introduces the proposed lighting control system including hardware design. One of the important problems involved with the design of fuzzy logic controllers is the development of fuzzy if-then rules for fuzzy controllers. Section III presents the design method of fuzzy logic controllers. The experimental results and discussions are shown in Section IV.

II. SYSTEM DESCRIPTION

The block diagram of the proposed lighting control system is shown in Fig. 1, which can be represented by a simple form like Fig. 2. The 8255 I/O shown in Fig. 1 is the expanding I/O circuit of a PC printer port. Originally, only 8-bit I/O in PC

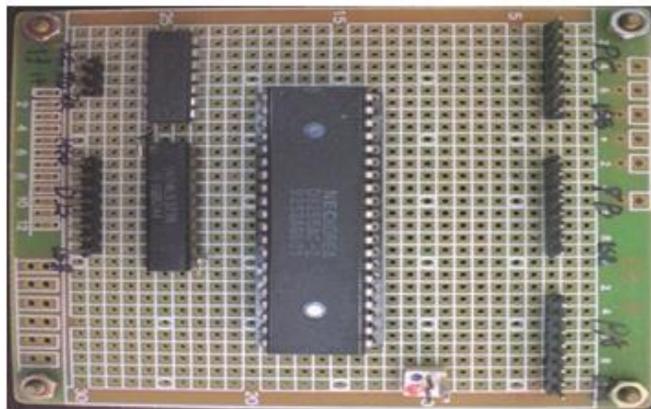
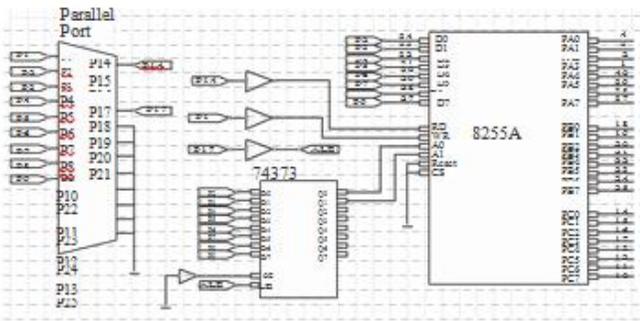


Fig. 3. The 8255 expanding I/O circuit connected with a PC printer port.

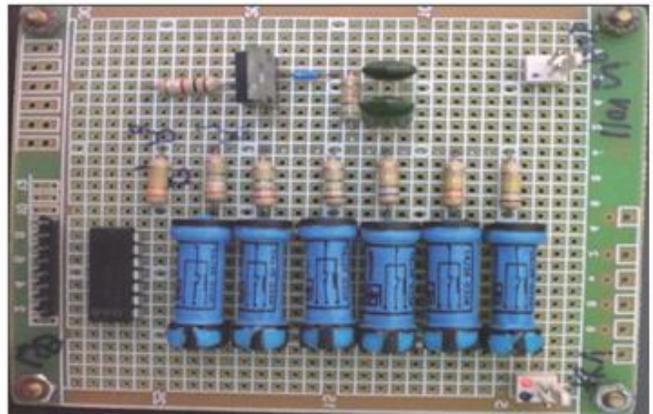
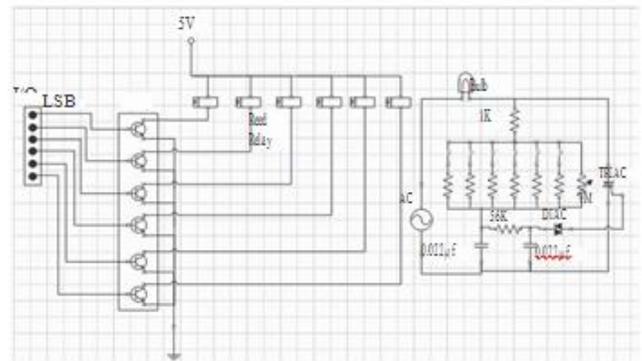


Fig. 4. The control circuit of the system.

printer port can be used. After the 8255 expanding I/O circuit shown in Fig. 3 had been established, we have 24-bit I/O available now. The bulb drive shown in Fig. 2 is basically composed of a dimmer with 6 reed relays, and its corresponding hardware circuit is shown in Fig. 4. The reed relays in the bulb drive are regarded to as digital outputs of the light control system, thus the D/A converter is unnecessary for our case. One more thing need to be done is to design a parallel set of resistor circuit work as the function of the variable resistor in the dimmer. The main objective of designing a parallel-resistor circuit is to make the total resistance decreases homogeneously with the increase of the DN value of the control output. Figure 5 shows the hardware layout of the parallel-resistor circuit, and it stands for one of the many possible solutions as long as the above requirement (homogeneously decreasing) can be met. The simulation result of the total resistance versus control output is shown in Fig. 6. The sensor block in Fig. 2 corresponds to the combination of A/D block and the Light sensor block, its hardware circuit is shown in Fig. 7, which contains photo-resistor CdS sensor and an 8-bit A/D converter and LED displaying circuit. Consequently, the hardware layout of the lighting control system is shown in Fig. 8. After all the hardware works had been done, subsequently, our goal is to design a FLC used to dim the bulb according to the environmental light.

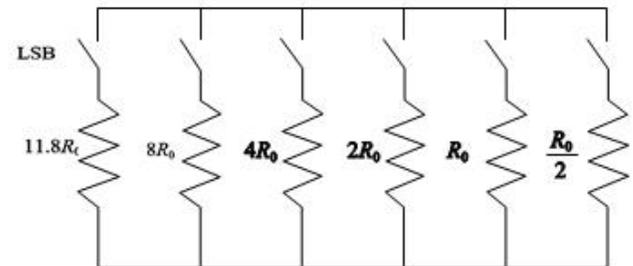


Fig. 5. The hardware layout of the parallel-resistor circuit ($R_0 = 330 \text{ K}\Omega$).

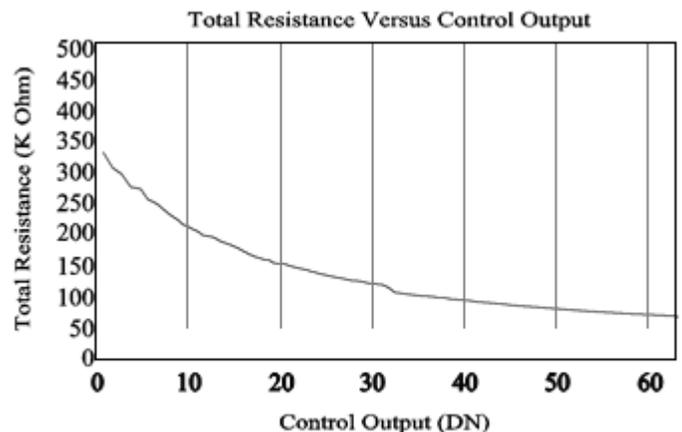


Fig. 6. Total resistance versus control output (DN: 0-63).

III. FUZZY LOGIC CONTROLLER

In this paper, the single input single output (SISO) system and

the double inputs single output (DISO) system are discussed. The environmental light is used as input variable x_1 for the SISO system, while another input variable x_2 (the changing

inferred by the max-min composition and the fuzzy relation describes the desired control action. The fuzzy set of the output variable is defuzzified to deliver a crisp numerical value by the center-of-gravity method. The fuzzy rule base consists of a collection of fuzzy IF-THEN rules of the form.

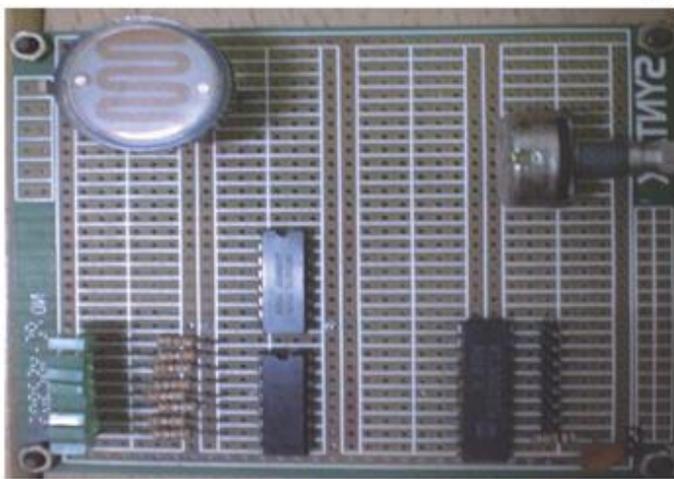
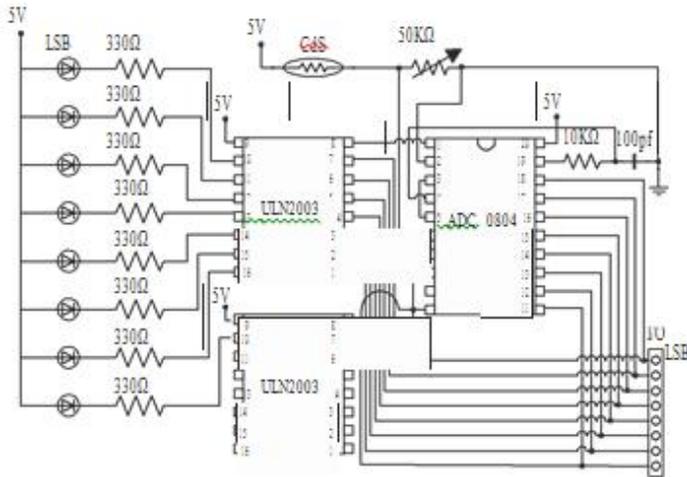


Fig. 7. The sensing circuit of the system.

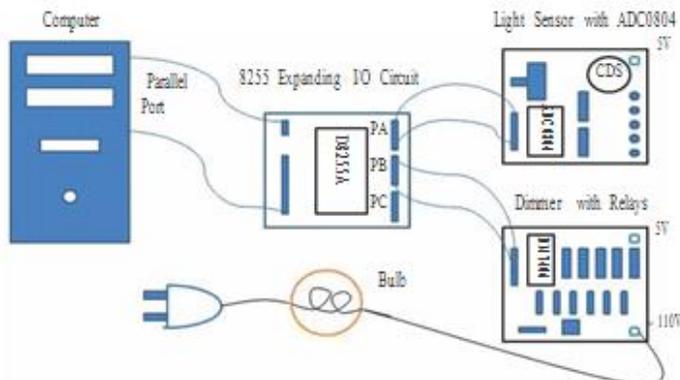


Fig. 8. The hardware layout of the lighting control system.

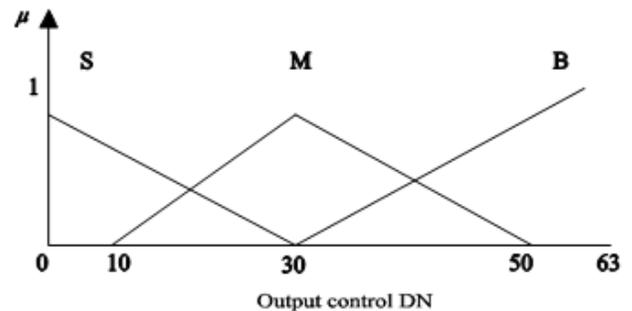
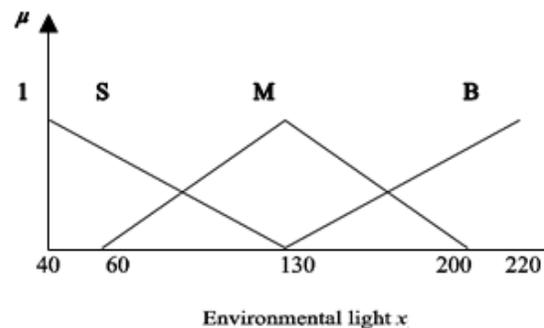
rate of the environmental light) is considered for the DISO system. The output variable is the numerical value DN to the output circuit. The input variables are fuzzified by assigning them a singleton fuzzy set, i.e. a set with membership function μ and zero elsewhere. The fuzzy set of the output variable is

Table 1. Labels for the membership functions in the SISO system.

S	Small
M	Medium
B	Big

Table 2. Rule base of the SISO system.

x_1	S	M	B
	B	M	S



9. Fuzzy sets showing the input and the output of the SISO system.

$$R^{(k)}: \text{IF } x_1 \text{ is } F^k \text{, THEN } y \text{ is } G^k, \quad (1)$$

for $k = 1, 2, \dots, n$

Where $x_1, x_2 \in U$, and $y \in R$ are the input and output of the fuzzy sets in U_1, U_2 and R representing the k th antecedent pairs and consequent pair respectively and n is the number of rules.

The SISO system and the DISO system will be discussed and analyzed by using MATLAB Fuzzy Logic Toolbox in the followings.

1. SISO

We assume that the input to the system is the environmental light x_1 . We further assume that the environmental light can be Big, Medium, and Small. The output DN can range between 0 and 63 and is divided into Small, Medium, and Big. Figure 9 shows the fuzzy sets describing the above. Labels for the

membership functions are given in Table 1. The rules base, with its 3 rules, is shown in Table 2.

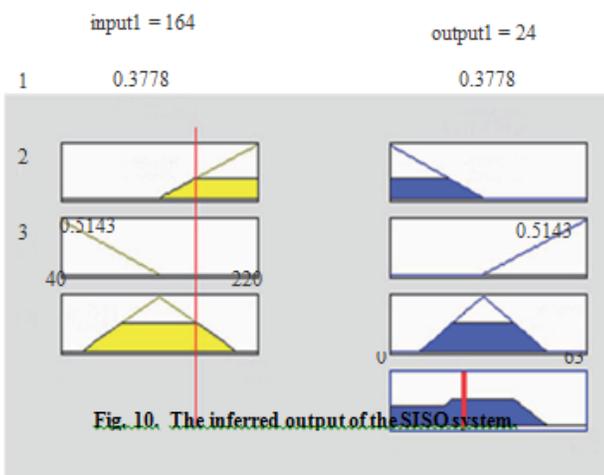


Fig. 10. The inferred output of the SISO system.

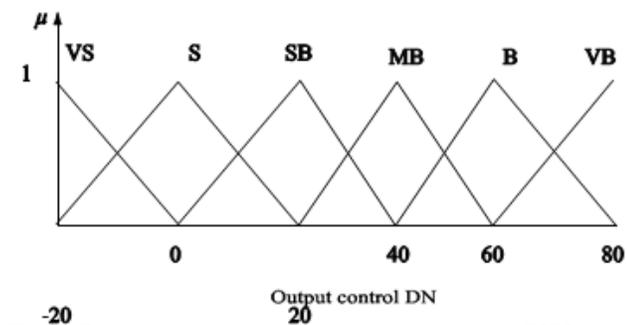
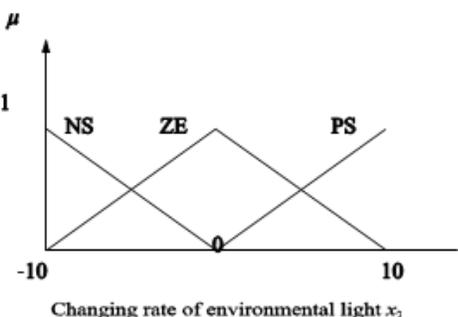
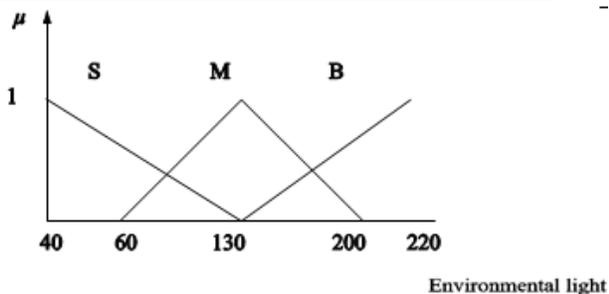


Fig. 11. Fuzzy sets showing the inputs and the output of the DISO system.

Figure 10 shows the results of the simulation of the rule base by fuzzy inference development environment (MATLAB Fuzzy Logic Toolbox) software for the input value of the environmental light $x_1 = 164$. The output is 24.22. Here only two rules are needed to calculate the output. The inferred

Table 3. Labels for the membership functions in the DISO system.

VS	Very Small	NS	Negative Small
S	Small	ZE	Zero
SB	Big Medium	PS	Positive Small
MB	Big		
B	Big		
VB	Very Big		

Table 4. Rule base of the DISO system.

x_1/x_2	S	M	B
PS	MB	S	VS
ZE	B	SB	S
NS	VB	MB	SB

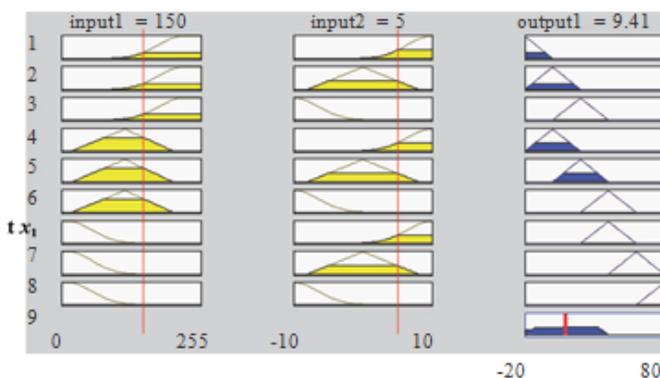


Fig. 12. The inferred output of the DISO system.

output solved by the center-of-gravity method can also be checked by hand calculation as follows:

$$v = \frac{30 * 5.7461 + 20 * 15.616 + 44.223 * 1.637}{5.7461 + 15.616 + 1.637} = 24.22$$

2. DISO

We assume that the inputs to the system are the environmental light x_1 and the changing rate of the environmental light x_2 . Where the changing rate of the environmental light ranges between -10 and +10 and is divided into Negative-Small, Zero, and Positive-Small. We further assume that the environmental light can be Small, Medium, and Big. To make the inferred output value homogeneously distribute on all regions (especially, for dark region), the output DN ranges between -20 and 80 and is divided into VS, S, SB, MB, B, and VB. Figure 11 shows the fuzzy sets describing the above. Labels for the membership functions are given in Table 3. The rules base, with its 9 rules, is shown in Table 4. Figure 12 shows the results of the simulation of the rule base by fuzzy inference development environment (MATLAB Fuzzy Logic Toolbox)

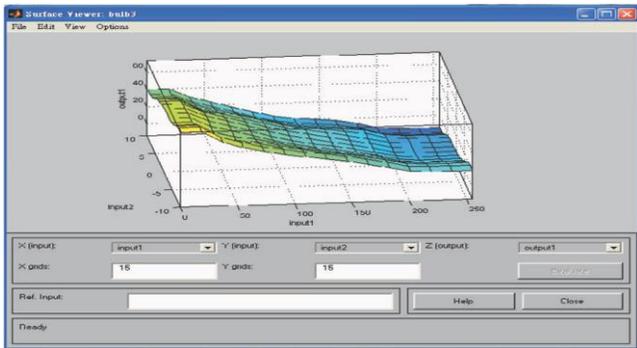


Fig. 13. The result of the simulation of the DISO system using surface viewer of MATLAB fuzzy logic toolbox.



Fig. 14. Bulb responses for control value DN = 5, 15, 25.

software for the input values of the environmental light $x_1 = 150$ and the changing rate of the environmental light $x_2 = 5$. The output is about 9.41. Here only six rules are needed to calculate the output. The surface shown in Fig. 13 is the control surface. It means that for every possible value of the two inputs, there is a corresponding output based on the rules. For example, if the environmental light x_1 and the changing rate of the environmental light x_2 are given, the control output DN of the system can be obtained immediately.

IV. RESULTS AND DISCUSSION

The light control system is constructed in a PC base using the 8255 expanding I/O circuit instead of a DAQ card. The 8255 I/O expanding circuit, sensing circuit, and the output control circuit become the requisite components in the design of a light control system. The resolution of A/D device is 8-bit and the digital outputs used only 6-bit. The tasks of acquiring the input signal, process of the input data, and output of the DN are commanded by using LabVIEW, which is a graphical programming language to accommodate the light control system. Figure 14 shows the corresponding bulb responses for the control value DN = 5, 15, 25 respectively. Figure 15 shows the change of the lightness of the bulb against the variations of the environment lightness.

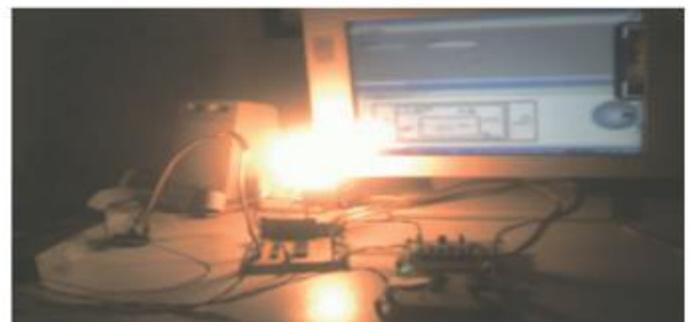
The front panel and the block diagram of the LabVIEW program are shown in Fig. 16. At begin, we create a combo box with two items (SISO and DISO) in the front panel of LabVIEW, shown in the upper part of Fig. 16. To simplify the whole program, we make two sub-vi's icons denoted as FLC



Bright



Moderate



Dark

Fig. 15. Bulb output response against different environmental light.

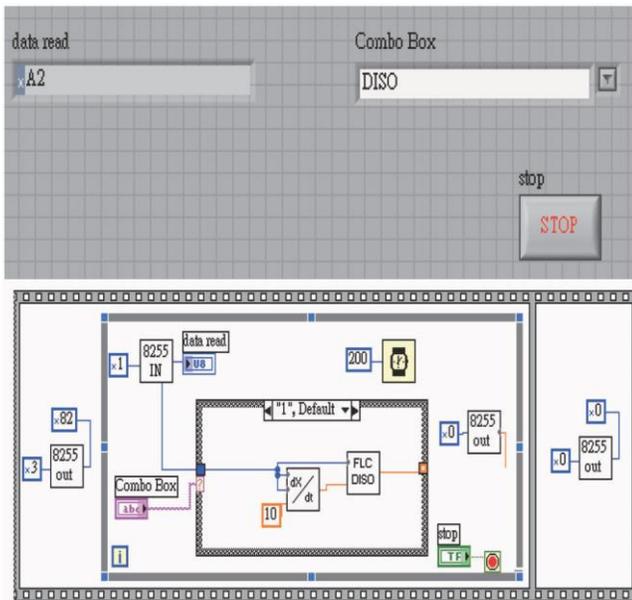


Fig. 16. Front panel and block diagram in LabVIEW.

SISO and FLC DISO to do the corresponding job of the FLC, shown in the lower part of Fig. 16. After that, we can easily run the LabVIEW program and choose the item in the combo box and even switch the item to another one during the execution of the LabVIEW program.

The main features in the design of the light control system using the LabVIEW are:

- (1) Low cost.
- (2) Easy implemented in a PC without any DAQ card.
- (3) Incorporate MATLAB Fuzzy Logic Toolbox with LabVIEW program.

Javidbakht [1] used fuzzy controller with the SISO system to dim the fluorescent lamp based on the availability of the outside light. And Zhang [7] adopted fuzzy controller with the DISO system to distinguish environmental interferences, avoiding the fault action and jittery and improving the reliability. In this paper, both the SISO system and the DISO system are discussed respectively in the fuzzy controller. The experimental results show, due to the light signal and the changing rate are considered, the DISO system responses faster than the SISO system when environmental light changes suddenly. It has also verified the effectiveness and robustness of the proposed fuzzy controller.

V. CONCLUSIONS

Important hardware such as the light sensing circuit and the dimmer with relays (like parallel-resistor circuit) were designed and proved work well. The control device can be used to adjust the light level of the bulb, making relays engaged or disengaged and saving the power. The device is reliable and convenient for maintenance.

The control of the bulb light system using a fuzzy logic controller is presented. Both the SISO system and the DISO system are discussed in the fuzzy logic controller and the

LabVIEW program incorporated with MATLAB Fuzzy Logic Toolbox for the FLC is carried out. The experimental results have shown the satisfactory response of the bulb system against sudden change of the environmental light. This intelligent dimming device can also be applied to dim the bulb of the streetlights or car's headlights automatically according to environmental light, which worked reliably and had obtained good effect of energy saving.

REFERENCES

- [1] Javidbakht, Saeid, Design of a Controller to Control Light Level in a Commercial Office, M.S.Egr. Thesis, Department of Electrical Engineering, Wright State University, pp. 1-106 (2007).
- [2] Mamdani, E. M., "Application of fuzzy algorithms for control of simple dynamic plant," IEE Proceedings, Vol. 121, No. 12, pp. 1585-1588 (1974).
- [3] Mamlook, R., Tao, C. W., and Thompson, W. E., "An advanced fuzzy controller," Fuzzy Sets and Systems, Vol. 103, pp. 541-545 (1999).
- [4] Takagi, T. and Sugeno, M., "Fuzzy identification of systems and its applications to modeling and control," IEEE Transactions on Systems, Man and Cybernetics, Vol. 15, No. 1, pp. 116-132 (1985).
- [5] Van der Wal, A. J., "Application of fuzzy logic control in industry," Fuzzy Sets and Systems, Vol. 74, pp. 33-41 (1995).
- [6] Wu, Z. Q., Wang, P. Z., and Wang, H. H., "A rule self-regulating fuzzy controller," Fuzzy Sets and Systems, Vol. 47, pp. 13-21 (1992).
- [7] Zhang, C., Cui, N., Zhong, M., and Cheng, Z., "Application of Fuzzy Decision in Lighting Control of Cities," 44th IEEE Decision and Control Conference, Seville, Spain, pp. 4100-4104 (2005).

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Removal of Chromium (VI) metal ions from waste water using alternative adsorbents - A comparative study

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Abstract- Alternative adsorbents like Activated charcoal, modified activated charcoal, wheat bran, activated neem leaf powder and groundnut shell powder were used as adsorbents for effective removal of Cr (VI) ions and thus a comparative study between the adsorbents are presented. Waste water containing Cr (VI) ions was treated with all adsorbents for a calculated amount of time. Further, filtration was carried out and was analysed for Cr (VI) metal ions using Spectrophotometric method. By varying the concentration of the solution and studying its effects we have selected the best result obtained for percentage removal of Chromium for the different adsorbents. Other parameters like time of contact, amount of adsorbent used and pH were also varied and the required result i.e. percentage removal of Chromium is shown.

Index Terms- Chromium VI (Cr VI), Waste water, Adsorbents, Spectrophotometric method, metal ions.

1. INTRODUCTION

With water pollution increasing as a result of enhanced industrial activities, the problem of removing pollutants from wastewater is growing daily. Heavy metal pollution is of great concern, due to growing awareness of potentially hazardous effects of elevated levels of these materials in the environment. Toxic metals (i.e., Cr, Cu, Ni, Zn, Cd, Pb) make their way into water bodies via wastewater from metal plating industries, leather industries, pulp and paper mills, refineries and steel work foundries, etc.

The current study focuses on the removal of Cr (VI), heavy metal ions from industrial waste water using unconventional adsorbents. Groundnut shells and wheat bran are available abundantly as agricultural wastes. Neem leaves are available as a natural adsorbent along with activated charcoal.

The advantages of non conventional adsorbents are as follows:

- (1) The efficiencies of various non-conventional adsorbents towards adsorbate removal vary generally between 50 % and 90 % depending on the characteristics and particle size of the adsorbent, and the characteristics and concentration of the adsorbate, etc. Hence, alternate adsorbents can be employed efficiently in removal of heavy metals.
- (2) Non-conventional adsorbents are much cheaper relative to conventional adsorbents, and when readily available locally which leads to much reduced transportation costs.
- (3) Non-conventional adsorbents require simple alkali/and or acid treatment for the removal of lignin before application in order to increase their efficiency.

(4) Non-conventional adsorbents require less maintenance and supervision. [13]

1.1 SOURCES OF CHROMIUM

Chromium emission sources can be divided into two broad classes, direct and indirect. The direct category primarily includes sources that either produce chromium or consume chromium or a chromium compound to manufacture a product.

The sources categories within the direct category are [3]:

Chromites ore refining	60 %
Ferrochromium production	71 %
Refractory production	3 %
Chromium chemicals	17-18 %
Chromium plating	70 %
Steel production	12-28 %
Leather tanning	90 %

2. MATERIALS AND METHODS

2.1. REAGENTS AND APPARATUS

All the primary chemicals used were of analytical grade.

Potassium dichromate, caustic soda, hydrochloric acid solution and other necessary chemicals were obtained from the college laboratory.

A standard solution of 1000 ppm of $K_2Cr_2O_7$ was prepared as the stock solution. This was further diluted to certain concentrations ranging from 50 mg/L to 300 mg/L. The adsorbents used were modified activated charcoal, wheat bran, groundnut shell powder, neem leaf powder, modified neem leaf powder. Conical flasks were used for the preparation and storage of different concentration solutions. Appropriate amount of adsorbents were weighed and added to each conical flask for shaking in a rotary shaker for a given contact time. Spectroscopic analysis was then conducted to get the final concentrations of the solutions. The percentage removal of Cr (VI) metal ions was thus obtained.

2.2. EXPERIMENTAL SETUP:

The equipments used were rotary shaker, pH meter, UV visible spectrophotometer. HACH-DR-4000 UV Visible spectrophotometer was used for determination of chromium content in standard and treated solutions. The pH of the solution was measured with a EUTECH make digital microprocessor based pH meter previously calibrated with standard buffer

solutions. The particle size distribution analysis was carried out with the different adsorbents using a particle size distribution analyzer. The chemical analysis was carried out by standard methods of chemical analysis.

UV spectroscopy:

The solutions were analysed for absorbance at a wavelength of 540 nm.



Fig 1: UV Spectrophotometer

Rotary Shaker:

Rotary shaker was applied for shaking to all the solutions in conical flasks for a constant time. The contents of the flask were shaken at a constant value of 120 rotations per min.



Fig 2: Rotary Shake

2.3 PROCEDURE:

Preparation of standard solution (stock solution)

The stock solution containing 1000 ppm of Cr (VI) was prepared by dissolving a known quantity of $K_2Cr_2O_7$ in 500 ml of deionised, double distilled water.

Activated charcoal was obtained from the laboratory and it was used directly in the powdered form.

The properties of this activated charcoal were then modified. It was oxidised with 0.1 N HNO_3 . 10 ml of this acid was mixed with 0.2 g of activated charcoal, soaked for 2 hours and sun dried for 6 hrs. This sample was again mixed with a known quantity of NaOH and NaCl for 8 hrs. Thus, the activated charcoal was surface modified and used for the adsorption.

Neem powder was collected from local markets. After collection it was washed thoroughly with double distilled water to remove water soluble impurities and then sun dried. This was then ground to pass through 15-20 mesh screens. This was then treated with HCl in the ratio 1:1.8 by weight and dried in the sun for 24 hrs. This was then washed with distilled water to remove the free acid content and then dried in an oven at 400 °C for 4 hrs. To this 100 ml solution, 100 mmol/l copper solution (initial pH 8.5) was added 10 g of treated Neem leaves. The mixture was shaken for 6 hrs at 26±20 °C. [16]

Groundnut shells were obtained from local markets and were washed with tap water. They were then sun dried and ground to 200-300 micrometer size. 20 g of the powder was soaked for 24 hours in 0.1 M concentrated HNO_3 . This mixture was filtered using three layers of filter paper. The residue was washed with distilled water to remove the acid content and dried at room temperature for 1 hour. It was then dried in an oven at 420 °C for 5 hours. [16]

Wheat bran was obtained locally and ground to 200-300 micrometer. It was washed with distilled water and dried for 6 hours under the sun.

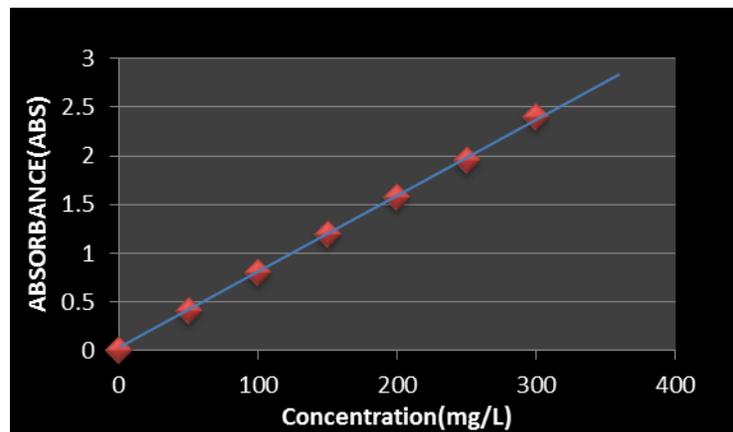
2.4 CALCULATIONS:

Using the calibration chart the corresponding values of concentration were obtained.

The absorbance readings were obtained at 540 nm and they are noted as shown in the table below:

Table 2.1 Absorbance readings

SL. NO.	Initial Concentration of Cr(VI), mg/L	Absorbance (ABS)
1.	50	0.41
2.	100	0.8
3.	150	1.19
4.	200	1.58
5.	250	1.96
6.	300	2.40



Graph 2.1: Absorbance vs Concentration of Chromium (VI)

2.4.1 BATCH ADSORPTION STUDIES:

All experiments were carried out at room temperature, i.e., 30 ± 20 C. Using the 250 ml stopper conical flask containing 50 ml of test solution batch adsorption studies were carried out at the desired pH value, contact time and adsorbent dosage level. pH of the solution was monitored by adding 0.1M HCl and 0.1 M NaOH solution as required. Necessary amount of adsorbent

material was then added and contents in the flask were shaken for the desired contact time in a rotary shaker working at 120 rotations per minute. The time required for reaching the equilibrium condition estimated by drawing samples at regular intervals of time till equilibrium was reached. The contents of the flask were filtered using three layers of filter paper and the filtrate was analysed for remaining Cr (VI) concentration in the sample using the UV Visible Spectrophotometer with 1,5-diphenylcarbazide in acid medium by following APHA,AWWA standard methods for examination of water and wastewater. The amount of Cr (VI) adsorbed per unit mass of the adsorbent was evaluated by using the following mass balance equation,

$$q = (C_o - C_f) v/w$$

The percent removal of Cr (VI) was calculated as follows:

$$\text{Percentage removal of Cr (VI)} = ((C_{\text{initial}} - C_{\text{final}})/C_{\text{initial}}) \times 100$$

Where, $q \Rightarrow$ Adsorption capacity (mg/g)

$C_o \Rightarrow$ initial concentration (mg/L)

$C_f \Rightarrow$ final concentration (mg/L)

$v \Rightarrow$ volume of the solution (L)

$w \Rightarrow$ weight of the adsorbent (g)

Effect on variation of initial concentrations was studied for all the adsorbents, with the variation of Chromium (VI) ion from 50 mg/L to 300 mg/L with an adsorbent dosage of 4 g/L and shaking time of 60 minutes. Further parameters were varied for the adsorbent showing the best removal percentage of Chromium (VI) under the given conditions.

The effect of adsorbent dosage level on percent removal of chromium was studied using Chromium (VI) concentration of 300 mg/L having adjusted the pH to 2. The selected adsorbent concentration was varied from 4 g/L to 20 g/L.

Adsorption experiments for the effect of pH were conducted by using a solution having concentration 200 mg/L of Chromium (VI) with an adsorbent dosage of 4g/L and shaking time of 60 minutes.

2.5 PARAMETERS STUDY:

Various parameters affecting the removal of chromium (VI) from waste water is studied. The parameters include concentration of Cr (VI) solution, Adsorbent dosage, contact time and the pH. The effect of all these parameters on the adsorptive capacity of the different adsorbents used is studied.

2.5.1 CONCENTRATION OF CR (VI) SOLUTION:

50 ml solutions were prepared of different concentrations by appropriate dilution of the standard solution. The concentrations taken were ranging from 50 mg/L to 300 mg/L. The six different concentration solutions were prepared in 250 ml conical flasks. The selected adsorbents were used for different contact times to be shaken with the solution samples and the final concentration

readings were taken to determine the percentage removal of Cr (VI).

2.5.2 ADSORBENT DOSAGE:

50 ml of different concentration solutions were taken in 250 ml conical flasks and different adsorbents were used for the adsorption process. The best adsorbent, modified activated charcoal was chosen and its amount was varied ranging from 2 g/L to 20 g/L. Experiments were carried at room temperature at a constant pH determined experimentally. The results were obtained showing that with increase in the amount of adsorbents used, the adsorption increased initially. After a certain point the graph was constant meaning no further increase in adsorbent dosage had no effect on the removal of Cr (VI).

2.5.3 CONTACT TIME:

Three concentrations were chosen for this experiment, 100 mg/L, 200 mg/L and 300 mg/L. The contact time was varied from 5 min to 140 min keeping the pH value and temperature value constant. The results were obtained and it was seen that with the increase in contact time, i.e., the shaking time of the samples with the adsorbent, the adsorption also increases, till a certain time, after which the graph became constant.

2.5.4 pH:

The concentration of Cr (VI) solution chosen for this experiment was 200 mg/L. The pH was varied from 1 to 11 and the shaking time was taken to be 60 minutes. The results were thus obtained and it was found that maximum removal took place at a pH of 2.

3. RESULTS AND DISCUSSIONS

This chapter deals with the result analysis. A brief discussion on each of the results and the inferences drawn from them are presented. Graphical figures have been plotted to indicate the variations of the percentage removal. The best adsorbent is chosen on the basis of percentage removal by varying the concentrations of initial metal ions in the solutions. Different parameters such as time of contact, pH, and amount of adsorbent are varied for the best adsorbent. Tables show the observations recorded and the calculations performed.

3.1 EFFECT OF INITIAL METAL ION CONCENTRATION:

The efficiency of removal of Cr (VI) was affected by the initial metal ion concentration, with decreasing removal percentages as concentration increases from 50mg/L to 300 mg/L at pH of 2-4, adsorbent dosage level of 4 g/L and contact time of 60 minutes. At low metal ion is to adsorbent ratios, metal ion adsorption involves high energy sites. As this ratio increases the higher energy sites are saturated and adsorption begins on lower energy sites, resulting in decrease in the adsorption efficiency.

OPERATING CONDITIONS

pH	2
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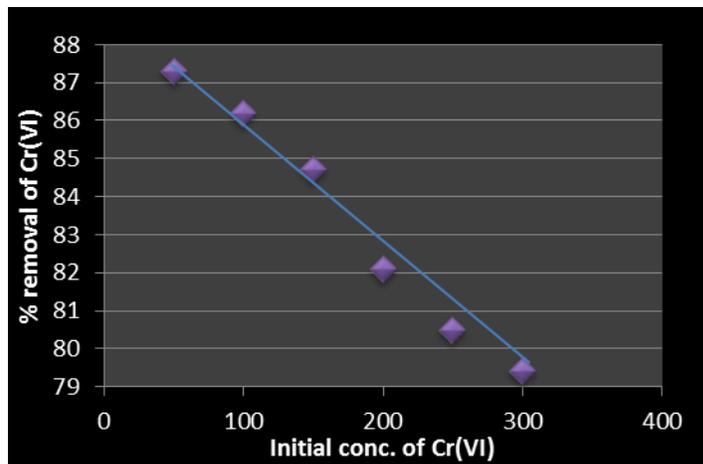
Adsorbent dosage level	4 g/L
Contact time	60 minutes
Temperature	32 °C (room temperature)

Sl. No.	Initial concentration (mg/L)	% Removal of Cr(VI)	Adsorptive capacity, q (mg/g)
1.	50	69	8.625
2.	150	62.5	5.462
3.	200	57	28.500
4.	250	52.6	32.875
5.	300	51.7	38.775

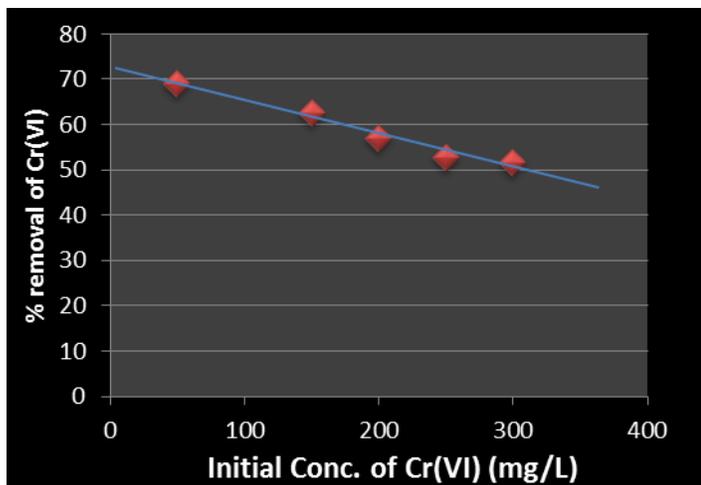
1.	50	87.3	10.910
2.	100	86.2	21.550
3.	150	84.7	31.770
4.	200	82.1	41.050
5.	250	80.5	50.325
6.	300	79.4	59.550

GROUND NUT SHELL:

Table 3.1: Effect of initial metal ion concentration, Ground nut shell



Graph 3.2: % removal of Cr (VI) vs Initial conc. of Cr (VI)



Graph 3.1: % removal of Cr (VI) vs Initial conc. of Cr (VI)

MODIFIED POWDERED NEEM LEAVES

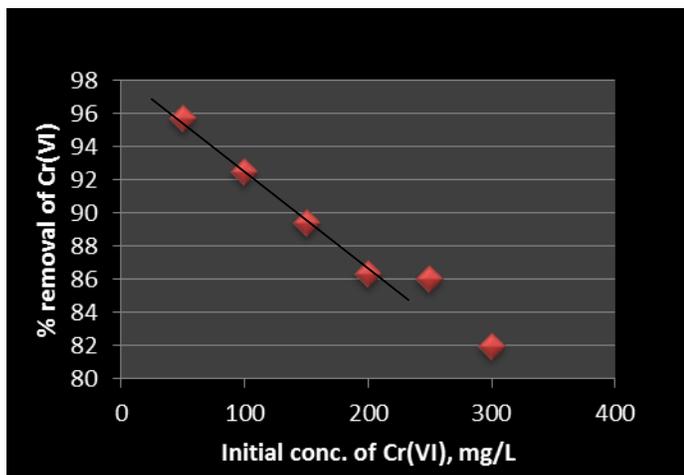
Table 3.3: Effect of initial metal ion concentration, modified powdered neem leaves

Sl. No.	Initial concentration (mg/L)	% Removal of Cr(VI)	Adsorptive capacity, q (mg/g)
1.	50	95.7	11.962
2.	100	92.5	23.125
3.	150	89.4	33.525
4.	200	86.3	43.150
5.	250	84.2	52.625
6.	300	81.9	61.425

POWDERED NEEM LEAVES:

Table3.2: Effect of initial metal ion concentration, neem leaves

Sl. No.	Initial Concentration (mg/L)	% Removal of Cr (VI)	Adsorptive capacity, q (mg/g)
1.	50	95.7	11.962
2.	100	92.5	23.125
3.	150	89.4	33.525
4.	200	86.3	43.150
5.	250	84.2	52.625
6.	300	81.9	61.425



Graph 3.3: % removal of Cr (VI) vs Initial conc. of Cr (VI)

MODIFIED ACTIVATED CHARCOAL:

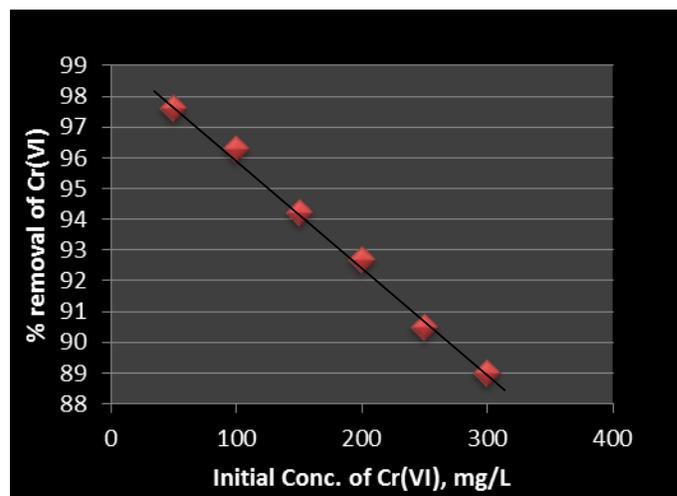
Table 3.5: Effect of initial metal ion concentration, activated charcoal

Sl. No.	Initial concentration (mg/L)	% Removal of Cr (VI)	Adsorptive capacity, q (mg/g)
1.	50	97.6	12.2
2.	100	96.3	24.075
3.	150	94.2	35.325
4.	200	92.7	46.350
5.	250	90.5	56.575
6.	300	89	66.750

WHEAT BRAN:

Table 3.4: Effect of initial metal ion concentration, wheat bran

Sl. No.	Initial concentration (mg/L)	% Removal of Cr(VI)	Adsorptive capacity, q (mg/g)
1.	50	83.3	10.418
2.	100	81.2	20.312
3.	150	80.32	30.120
4.	200	79.5	39.750
5.	250	79.2	49.500
6.	300	78.6	59.110



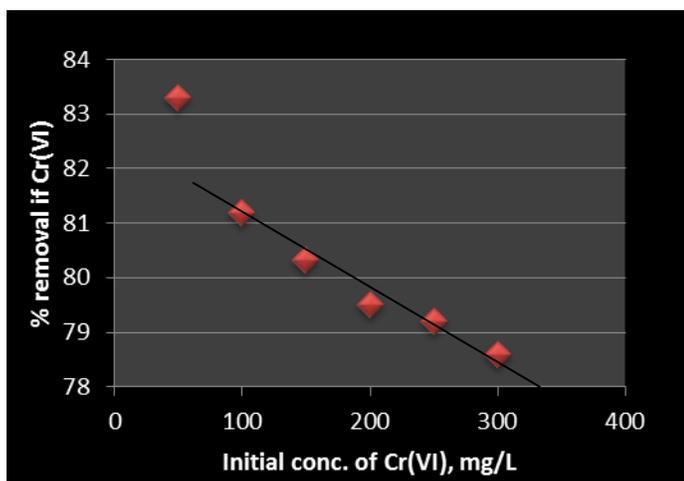
Graph 4.5: % removal of Cr (VI) vs Initial conc. of Cr (VI)

Based on the results, the best adsorbent under the given conditions was found to be modified activated charcoal. Thus further experimentation was done by varying various parameters and analysing their effects on the removal of Cr (VI).

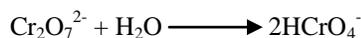
3.2 EFFECT OF INITIAL pH:

The percentage of Cr (VI) adsorbed by modified activated charcoal decreased from 96.3 % to 50.1 % when the pH was increased from 1-7 and this value further decreased to 35.5 % when the pH was further increased to 7-11. The maximum percent of removal of Cr (VI) was obtained between pH 1-3 at the initial concentration of metal ion at 100 mg/L, adsorbent was taken as 4g/L and shaking time of 60 minutes at room temperature of 28 °C and thus pH of 2 was chosen for the rest of the experiments.

Chromium exists in two oxidation states which are Cr (VI) and Cr (III) and the stability of these forms is dependent on the pH of the system. It is well known that the dominant form of Cr (VI) at pH 2 is HCrO_4^- which arises from the hydrolysis reaction of the dichromate ion ($\text{Cr}_2\text{O}_7^{2-}$) according to the equation-



Graph 3.4: % removal of Cr (VI) vs Initial conc. of Cr (VI)



Increasing the pH will shift the concentration of HCrO_4^- to $\text{Cr}_2\text{O}_7^{2-}$ and other forms as CrO_4^{2-} . Maximum adsorption at pH of 2 indicates that it was the HCrO_4^- form of Cr (VI), which was the predominant species at this pH range and adsorbed preferentially on the adsorbents. Better adsorption capacity observed at low pH between 2 and 3 may be attributed to the large number of H^+ ions present at these pH values, which in turn neutralize the negatively charged hydroxyl groups ($-\text{OH}^-$) on adsorbed surface thus reducing the hindrance to the diffusion of dichromate ions. At higher pH values, the reduction in adsorption may be possible due to abundance of OH^- ions causing increased hindrance to diffusion of dichromate ions. [25]

3.3 EFFECT OF ADSORBENT AMOUNT:

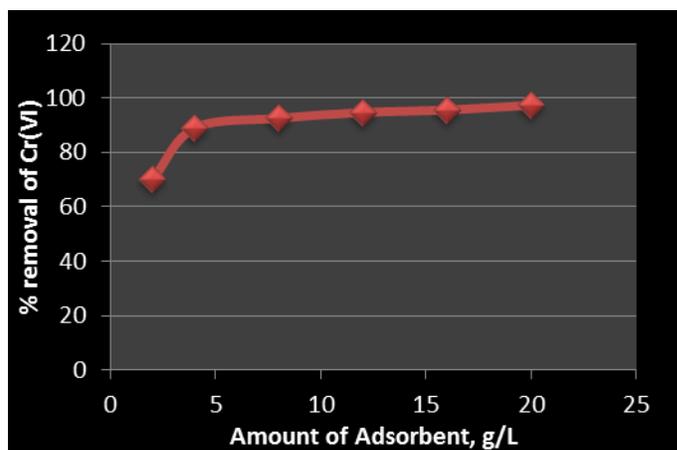
When the amount of activated charcoal was varied from 2g/L to 20g/L at initial concentration of Cr (VI) at 300 mg/L, contact time of 60 minutes, pH of 2 was maintained and 50 ml. of sample was taken, the percentage of Cr (VI) removed increased from 70.1% to 97.44%.

OPERATING CONDITIONS

pH	2
Concentration	300 mg/L
Time of contact	60 minutes
Temperature	32 °C (room temperature)

Table 3.7: Effect of amount of adsorbent used on percentage removal

Sl. No.	Amount of adsorbent (g/L)	% Removal of Cr (VI)	Adsorptive capacity, q (mg/g)
1.	2	70.1	89.98
2.	4	89	66.75
3.	8	92.6	34.72
4.	12	94.7	23.67
5.	16	95.6	18.05
6.	20	97.4	14.61



Graph 3.7 %removal of Cr (VI) vs Amount of adsorbent (g/L)

3.4 EFFECT OF CONTACT TIME:

The experimental runs measuring the effects of contact time on the batch adsorption of Cr (VI) was carried out at pH maintained at 2 and initial Cr (VI) concentrations of 100 mg/L, 200 mg/L and 300 mg/L.

Over the first 20 minutes the percentage removal of Cr (VI) from the solution increased rapidly and reached 82.4 % for 300 mg/L and 90.3 % for 100 mg/L. After this the percentage removal tapered off until about 70- 80 minutes when it reached about 93 % for the 300 mg/L and 96.8 % for 100 mg/L solution. Further increase in contact time had a negligible effect on contact time. Thus taking an optimum time and economic considerations into account, a contact time of 60 minutes was used for all batch experiments.

OPERATING CONDITIONS

pH	2
Adsorbent dosage	4 g/L
Temperature	32 °C (room temperature)

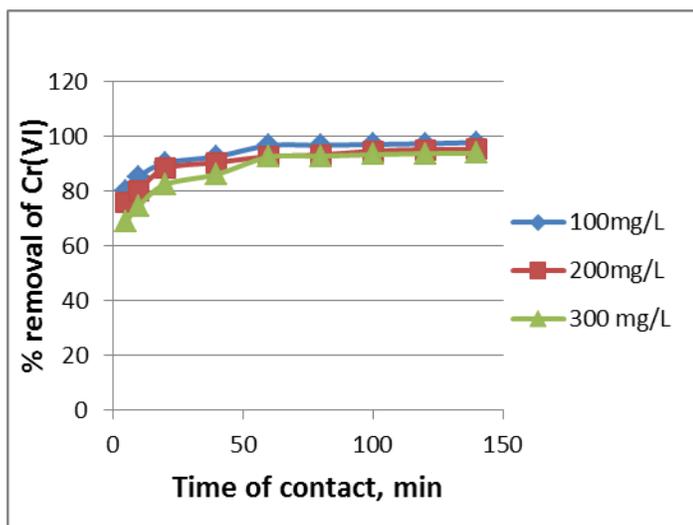
Table 3.8: Effect of contact time on percentage removal

Sl. No.	Time (min)	%Removal 100 mg/L	%Removal 200 mg/L	%Removal 300 mg/L
1.	5	80.1	75.7	68.8
2.	10	85.3	80.2	74.6
3.	20	90.3	88.3	82.4
4.	40	92.7	90.5	86.2
5.	60	96.7	92.7	92.5
6.	80	96.8	93.3	92.8
7.	100	97.1	94.7	93.4

Sl.No.	C_e	C_e/q_e
1.	1.2	0.098
2.	3.7	0.15
3.	8.7	0.25
4.	14.6	0.31
5.	23.7	0.42
6.	33	0.50

8.	120	97.4	95.2	93.8
9.	140	97.8	95.3	93.9

Table 3.9: Langmuir isotherm



Graph 3.8 % removal of Cr (VI) vs time of contact (min.)

3.5 ADSORPTION ISOTHERM:

The equilibrium of adsorption is an important physio-chemical parameter for evaluation of the adsorption process. To model the adsorption behaviour two adsorption studies were studied and their correlation with the experimental data was assessed. These included the Freundlich and Langmuir isotherms, which are the earliest and simplest known relationships describing the adsorption equation. [13]

3.5.1 LANGMUIR ISOTHERM:

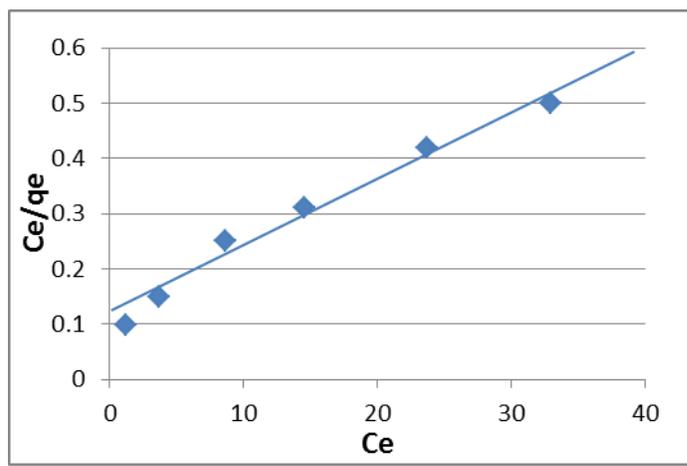
The linear form of the Langmuir equation is shown in the following equation

$$C_e/q_e = 1/bq_m + C_e/q_m$$

Where, b and q_m → constants related to the apparent energy of adsorption and the adsorption capacity, respectively

q_e → the amount adsorbed per unit mass of the adsorbent (mg g^{-1}) with an equilibrium concentration of C_e (mg L^{-1}).

A plot of (C_e/q_e) vs. C_e was linear and the constants q_m and b were determined from the slope and intercept of the plot. The correlation coefficient obtained with the Langmuir equation was high, which indicated a good fit between the parameters. The dimensionless parameter ($R_L = 1/(1+bC_e)$), which is a measure of adsorption favourability, was found to be in the range of $0.03105 < R_L < 1$ and confirmed that Cr(VI) removal using activated charcoal at pH 2 and $27 \pm 2^\circ\text{C}$ was a favourable adsorption process.



Graph 3.9: C_e/q_e vs C_e

3.5.2. FREUNDLICH ISOTHERM

The Freundlich isotherm is expressed by the equation

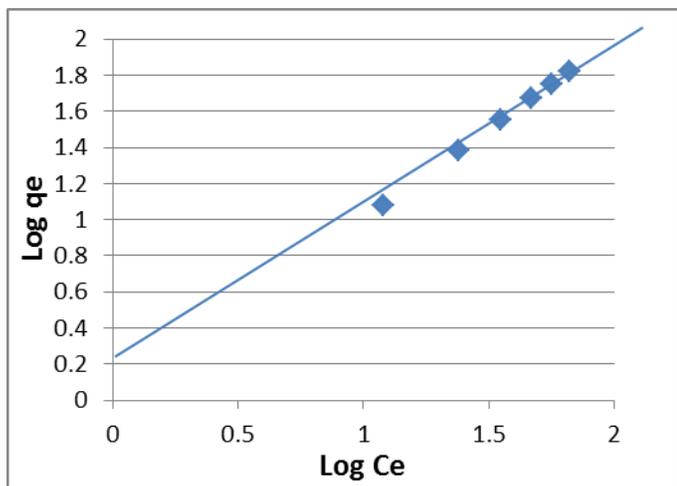
$$\text{Log } q_e = \text{Log } K_f + (1/n_f) \text{Log } C_e$$

Where, K_f ($\text{g}^{1-1/n} \text{L}^{1/n} \text{kg}^{-1}$) → the Freundlich constant which indicates the relative adsorption capacity of the adsorbent related to the bonding and regime

n_f → the heterogeneity factor representing how the adsorption deviates from linearity.

The value of 'n' as shown in the table lies between 1 and 10, which represents a favourable adsorption.

Sl. No.	Log C_e	Log q_e
1.	0.07	1.08
2.	0.56	1.38
3.	0.93	1.55
4.	1.16	1.67
5.	1.370	1.75
6.	1.510	1.82



Graph 3.10 Log q_e vs Log C_e

RESULTS

Table 3.11: Linear regression equations, coefficient of determination and isotherm constants for Langmuir and Freundlich isotherms

Langmuir isotherm	q_m	b
	55.24	0.624
Freundlich	K_f	n_f
	1.08	1.92

4. CONCLUSION

Batch adsorption studies for the removal of Cr (VI) from aqueous solutions have been carried out using five different adsorbents. The study indicated the suitability of the adsorbents used for removal of Cr (VI) aqueous solution. The selected adsorbents may be viewed as a useful material while considering the economic aspects of wastewater treatment. The obtained results may be summarised as follows:

- 1) The concentration variation studies showed that percentage of Cr (VI) removal from waste water using groundnut was found to be ranging from 51.7% to 69%, for neem powder 79.4% to 87.3%, for modified neem leaf powder 81.9% to 95.7%, for wheat bran 78.8% to 83.35%, and for modified activated charcoal the percentage removal was found to be ranging from 89% to 97.6%.
- 2) The best results were obtained by using modified activated charcoal in quantities that are economical for large scale purpose.
- 3) Other parameters such as pH, amount of adsorbent, contact time were varied for this particular adsorbent.
- 4) The pH variation studies showed that the adsorption process is highly pH dependent. The pH was varied from 1 to 11 and the optimum removal was found to be at pH 2.

- 5) Increase in adsorbent dosage leads to increase in Cr (VI) adsorption due to increased number of adsorption sites. Maximum uptake of Cr (VI) was obtained as the adsorbent dosage was increased from 2 g/L to 20 g/L.
- 6) The contact time, i.e., the time of shaking in the rotary shaker was varied from 5 min to 140 min for three different concentrations. The percentage removal increases as the contact time is increased.
- 7) The results suggest that adsorption of Cr (VI) on the selected adsorbents involves a complex mechanism and in the adsorption process there are two distinct stages – the initial stages of boundary layer diffusion due to external mass transfer effects and the later stages it was due to intra particle diffusion which contributes to the rate determining step.
- 8) The adsorption isotherm studies showed that both Langmuir and Freundlich adsorption isotherm model fits well with the experimental data.
- 9) The adsorption capacities of the adsorbents for the removal of Cr (VI) have been compared with those of other adsorbents reported in the literature.
- 10) Modified neem leaf powder can be used as the next best adsorbent according to the comparative study made above.

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REFERENCES

- [1] World Health Organization, Environmental Health Criteria 61, Chromium, WHO, Geneva, 1988.
- [2] G. Saner, Alan R Liss Inc., Chromium in Nutrition and Disease New York, 1980.
- [3] US Department of Health and Human Services, Toxicological Profile for Chromium, Public Health Services Agency for Toxic Substances and Diseases Registry, Washington, DC, 1991.
- [4] M. Cieslak-Golonka, Toxic and mutagenic effects of chromium (VI), Polyhedron (1995).
- [5] C. Raji, T.S. Anirudhan, Batch Cr (VI) removal by polyacrylamide-grafted Sawdust: kinetics and Thermodynamics, Water Res. 32 (1998).
- [6] EPA (Environmental Protection Agency, Environmental Pollution Control Alternatives. Cincinnati, US, 1990.
- [7] MINAS, Pollution control acts, rules, and notification there under Central Pollution Control Board, Ministry of Environment and Forests, Government of India, New Delhi, 2001.
- [8] Indian Standard, 1991. Drinking water—specification (first revision), IS 10500, 1991.
- [9] K. Pagilla, L.W. Canter, Laboratory studies on remediation of chromium contaminated soils, J. Environ. Eng. 125 (1999).
- [10] C.F. Lin, W. Rou, K.S. Lo, Treatment strategy for Cr (VI) bearing wastes, Water Sci. Technol. 26, 1992.

- [11] L. Dupond, E. Guillon, Removal of Hexavalent chromium with a lignocelluloses substrate extracted from wheat bran, Environ. Sci. Technol. (2003).
- [12] M.P. Candela, J.M.M. Martinez, R.T. Macia, Chromium (VI) removal with activated carbons, Water Res. 29 (1995) .
- [13] V. Sarin, K.K. Pant, Removal of chromium from industrial waste by using eucalyptus bark, Bioresour. Technol. 97 (2006) 15–20.
- [14] Rais Ahmad, Rifaqat Ali Khan Rao and Mir Mohammad Masood, Removal and Recovery of Cr (VI) from Synthetic and Industrial Wastewater, Environmental Research Laboratory, Department of Applied Chemistry, Faculty of Engineering and Technology, Aligarh Muslim University, Aligarh – 202 002 (UP), India.
- [15] Suresh Gupta, B V Babua, Adsorption of Cr (VI) by a Low-Cost Adsorbent Prepared from Neem Leaves Chemical Engineering Group, Birla Institute of Technology and Science, Pilani-333 031, Rajasthan, India.
- [16] K. Periasamy, K. Srinivasan, P.R. Murugan, Studies on chromium (VI) removal by activated ground nut husk carbon, Indian J. Environ. Health (1991) husk and palm pressed fibres, Environ. Technol. 14 (1993) 277–282.

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INTELLIGENT VEHICLE TRACKING FOR DETECTION OF OBJECTS

P. Venkateshwari

Abstract- This paper introduces the real time implementation of a vehicle in the changing environment, changes in the environment is notified through video motion transmitter and receiver. The receiver takes snapshot of an image to detect threatening objects in the environment. Those images are trained and tested by using Associative memory. The runtime image has been trained, tested and quickly retrieved for fast decision making. This robot detects threatening objects in the environment with HAM network. After making decision the remote control access is done through Zigbee device to monitor and control the speed of a Roving robot in an accurate path. Supervised learning method has been applied to detect the object correctly. Delta learning rule is applied in HAM network to test and train the image.

Index Terms- HAM, Associative memory, Supervised Learning, Delta learning rule and roving robot.

I. INTRODUCTION

Navigation of a robot in real time environment is possible and it should be adaptable to the changing environment [1]. CIR is the Compact Internal Representation method. This method creates IR of an arena; sub-conscious and conscious pathway has been created to move in the path with CNN [1]. In this paper real time changes are continuously monitored and controlled, when there is a loss of control Cognition is a group of [mental](#) processes that includes [attention](#), [memory](#), producing, [problem solving](#), and [decision making](#). Cognition is the development of a rigorous method of analyzing behavior and a character [2]. The roving robot is designed and trained and the objects in the area are found and trained using this cognition method. Proto-cognition is the word meant for its structure and model. There is a necessary to set trajectory for the navigation purpose to launch the vehicle in specified path. In our work, we proposed to find the track of robot in the dynamic environment. Dynamic neural network is used to train the robot in each level of motion [3]. Trajectory setting is controlled by the user or the person who is monitoring the environment. In this work the robot is trained and controlled at two

levels in static as well in dynamic condition. A final and fine decision is made by the monitor or user. It is not an autonomous robot; it is controlled and monitored by the user. A robot is an electro-mechanical machine that is guided by a computer program or electronic circuitry. Robot may be fully autonomous or partially autonomous such as ASIMO to Nano robots and industrial robots. The robot conveys its purpose through sense of intelligence. It is an electrical product coated with physical object and it is programmed to do specific task and action. It is has some sensors and actuators to do task in the environment. Sensors monitor the environment and produce logic output that is processed by the robot. Motors and actuators are used for motion control and to rectify the problem acquiring in the environment.

The video transmitted to the PC is changed to a continuous video motion frames. Those image frames are stored in the memory to recognize an object using Bayesian method [4]. Instead of Bayesian method, HAM network is used to train and test the image to recognize an object. Test and train process is not possible by using Bayesian method. Haar like structure is taken over full image to recognize object using Bayesian method. In this work whole image is taken to recognize object in an image. Haar structure takes some height and width to partition the image. Image database is created and computed image is compared with those images to recognize an object, threatening objects such as gun, bomb, etc. The object in various views such as in top, bottom, right and left side views has been stored to detect the object. Morphological structures of an object can be stored and recognized easily [5]. Hetero Associative Memories are usually used as content addressable memories. The most likely applications for the neural networks are (1) Classification (2) Association and Reasoning. One of the applications of neural networks is applied in the field of object recognition. Object recognition is a branch of artificial intelligence concerned with the classification or description of

observations. The images are classified based on shape, texture, color, etc. Statistical pattern recognition method is used to test and train pattern using probability density function. Probability function is similar to Bayesian method. In syntactic pattern recognition method sub-patterns are used to recognize, it is used for grammatical error checking purpose. In Knowledge-based pattern recognition rules are laid down to check an output . The datasets are paired to estimate the correct output [6]. The ANN type of method is used to recognize an object. Instead of pattern recognition, object recognition is focused on in this paper. Object recognition technique is used here to recognize threatening objects. The novelty of this paper approach is to detect and recognize threatening objects in space using HAM network. Eye-bots and foot-bots are placed in the arena. Foot-bots sense the signal of eye-bots by this sensing effect; it could reach the destination [7]. Instead of this sensing effect, real time monitoring is done to control the robot to reach the target.

II. METHODOLOGY

2.1 Proposed work:

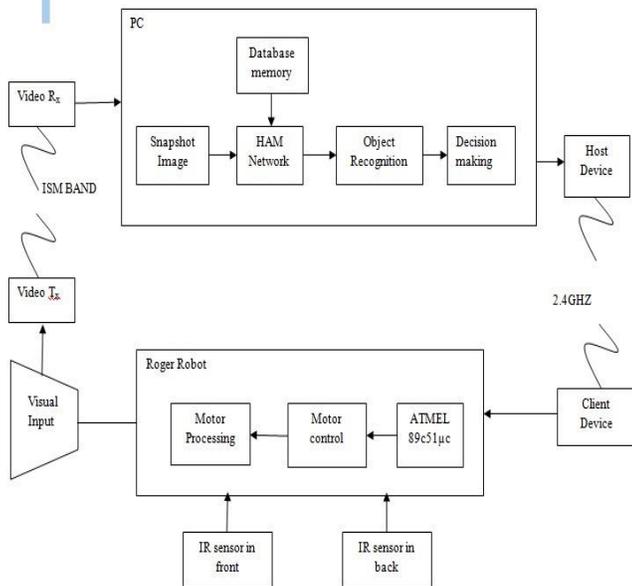


Fig1: This is the general architecture of real time implementation of robot.

Visual input is a OEM capture device as input. Snapshot type of camera is taken and fixed to the Robot. This camera transfers real time motion to the PC through video motion transmitter and receiver.

Video Tx section is fixed to the robot. Video Rx section is fixed to the PC through cable. Video Tx and Rx communicates through ISM band. Roger Robot is a type of a robot; its purpose is to make a Human – Robot interactions. IR sensor is an Infrared sensor, these sensors has been used in the front and back of a robot to detect the obstacles. Once the obstacle is detected, the robot stops in that location, until the signal comes from the Host device. These Infrared sensors are installed in the robot to avoid hitting the wall when there is a loss of a signal. Host device signals to the client device, the serially transferred data is stored in the RAM of AT89C52µc. Host device and Client device communicates through the ISM band. Roger robot is composed of microcontroller and motor. Microcontroller controls the motion and direction of a robot. The command from Host device is received by client device, serially communicated data is fed to the microcontroller. Then microcontroller controls the motor of a robot as per coding in the device. The Snapshot image is taken from the video; those images are fed to the HAM network. HAM network test and train the images. HAM network compares the real time images with the database to recognize the object. The robot is controlled and monitored.

2.2 HAM Architecture:

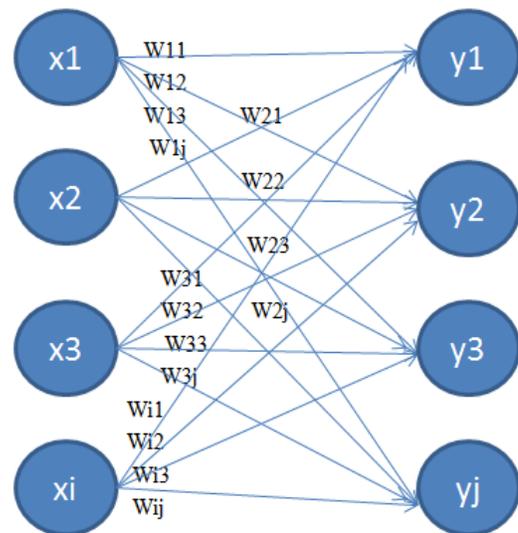


Fig2: This figure shows the architecture of HAM. Hidden neurons are not fixed, it is dynamic in nature.

HAM is a Hetero-Associative memory. It is called as content addressable memory. It maps one pattern to another. One type of format to another format. Values of red frame are mapped with an image. Input is fed as values and output as image.

Step 1: Weights are initialized using Hebb or delta rule.

Step 2: For each input vector do steps 3 to 5.

Step 3: Set the activation for input layer units equal to the current vector x_i .

Step 4: Compute net input to the output units

$$Y_{inj} = \sum x_i w_{ij} \quad (1)$$

Step 5: Determine the activation of the output unit.

The simple method for determining the weights for an associative memory neural network is Hebb rule (HR). The other learning rule that can be used with Associative memory is Delta Learning Rule (DLR). The algorithm is as follows:

Step 1: Initialize all weight to random values.

Step 2: For each training input-target output vector, do steps 3-5.

Step 3: Set activations for input units to present training input.

Step 4: Set activations for output units to current target output.

Step 5: Adjust the weights.

$$W_{ij}(\text{new}) = w_{ij}(\text{old}) + \Delta w \quad (2)$$

Weight correction Δw is

$$\Delta w = \alpha(t_j - y_{inj})x_i \quad (3)$$

Where $i= 1$ to n , $j= 1$ to m

t - target vector,

y_{inj} - actual output vector

α - learning rate.

III. EXPERIMENTAL SETUP

3.1 Prototype model creation:

This is the first stage of this paper. A prototype robot model has been created for a simple application.

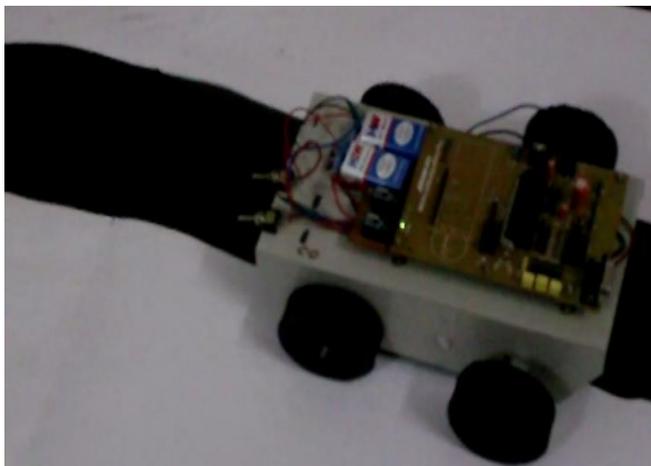


Fig3: This shows a simple prototype model of a line tracking robot. This robot is designed by using microcontroller AT89C52. This atmel chip is programmed by using Keil software.

The goal of this prototype model is to design a robot that can follow a line. The track is created on a white (reflecting) surface. White shiny chart can be used. A black line is created by using paint (optically absorbing). The turning ratio should be smooth enough, so that robot won't have to back up while following the line. The contrast colors are large enough to determine the robot over the track. The robot could be configured for a one track and a timed race, or configured to make two closed loop tracks for head-to-head racing. The robot will have two optical sensors placed close together on the bottom. Each sensor will return a logic signal depending on whether it senses those contrast colors. If both sensors expose with black color, then the robot is properly positioned on the track. When the left sensor is exposed to a white signal (and the right sensor still sees black) then the software knows the robot is veering off to the left. Similarly, when the right sensor is exposed to a white signal then the robot is veering off to the right. It is important to note that the two sensors should be close enough so that both will be black when the robot is on the track, but far apart to avoid optical crosstalk. Crosstalk occurs when the infrared transmission of one sensor is sensed by the receiver of the other sensor.

3.2 Image Preprocessing techniques:

In the second stage of this work, image could be taken from the cited environment. Those images are treated or preprocessed to remove unwanted noise present in it. Original image is taken Gaussian noise, salt and pepper noise is removed from those images. The unwanted signals and noise is removed by using filtering techniques [8]. Neural Network are non-linear statistical data modeling tools and can be used to model complex relationships between inputs and outputs or to find patterns in a dataset [9]. Salt and pepper noise is a form of noise seen on images. The image contains randomly occurring white and black pixels. Salt and pepper noise occurs on images in situations where quick transients, such as faulty switching, take place. Gaussian noise is statistical

noise that has its probability density function equal to that of the normal distribution, which is also known as the Gaussian distribution. In other words, the values that the noise can take on are Gaussian-distributed. Image is blurred to reduce noise and details in the image.

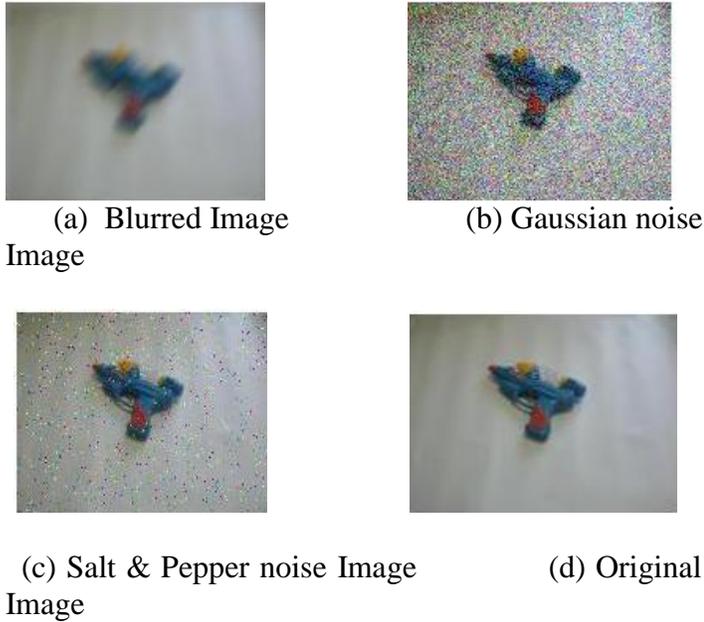


Fig4: This Image shows Original, Blurred, Gaussian noise and Salt & pepper noise image.

In this stage, the preprocessed image is taken. The RGB value of an image could be noted. Any one frame value can be loaded into the network. The network goes for several iterations and it finds out the original image. The database should be created. The HAM network associates frame values with those images to recognize original image from the database.

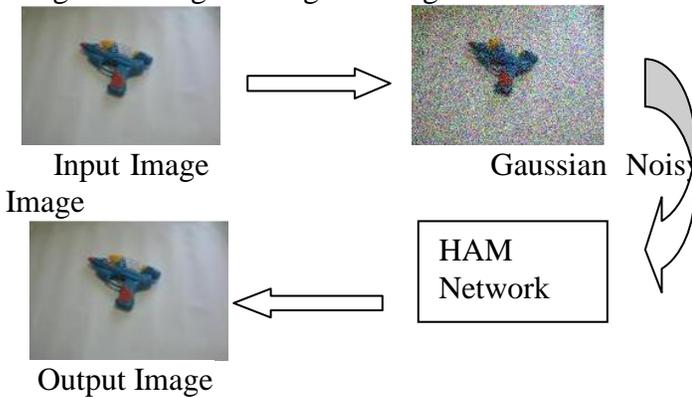


Fig5: This architecture is used for training image using HAM.

Image has RGB frame. RGB refers to Red, Green and Blue frame. Original image is taken and it is blurred by adding noise. Gaussian noise is used to blur the original image. Gaussian noise is a statistical noise, its probability density function is equal to normal distribution. Blurrednoisy image value is taken. Red frame is first frame so, when the program is runned, in the command window variable values are available. Those values are fed as input to the HAM. HAM accepts input in numeric value format. It displays the output in image format. Here the images are represented and stored in jpeg format. JPEG is a Joint Photographic Experts Group. This is commonly used method for lossy compression of digital photograh. An eigenvector of a square matrix is a non-zero vector t, when multiplied by the matrix yields a vector that differs from the original at most by a multiplicative scalar. Specifically, a non-zero column vector v is a right eigenvector of a matrix A if (and only if) there exists a number λ such that $Av = \lambda v$. If the vector satisfies $vA = \lambda v$ instead, it is said to be a left eigenvector. The number λ is called the eigen value corresponding to that vector. The set of all eigenvectors of a matrix, each paired with its corresponding eigen value, is called the eigen system of that matrix.

The eigen values of a matrix A are precisely the solutions λ to the equation

$$\det(A-\lambda I)=0. \tag{4}$$

Here det is the determinant of the matrix formed by $A-\lambda I$ and I is the $n \times n$ identity matrix. This equation is called

the characteristic equation (or, less often, the secular equation) of A. For example, consider the special case of a diagonal matrix A:

$$A = \begin{bmatrix} a_{1,1} & \dots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \dots & a_{n,n} \end{bmatrix} \tag{5}$$

The characteristic equation of A would lead:

$$\det(A-\lambda I) = \det \begin{bmatrix} a_{1,1}-\lambda & \dots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \dots & a_{n,n}-\lambda \end{bmatrix} = \begin{bmatrix} \dots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \dots & 1 \end{bmatrix}$$

$$= \det \begin{bmatrix} a_{1,1} - \lambda & \dots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \dots & a_{n,n} - \lambda \end{bmatrix}$$

$$= (a_{1,1} - \lambda)(a_{2,2} - \lambda) \dots (a_{n,n} - \lambda)$$

(6)

The solutions to this equation are the eigenvalues

$$\lambda_i = a_{i,i} \quad (i = 1, \dots, n).$$

the characteristic equation (or, less often, the secular equation) of A.

The data base is created to recognize image. The threatening objects are stored in a database for future recognition. The object in the environment is captured and matched with the database image[11]. Instead of using markov chain model ANN used to recognize an image.



Fig 6: This is the database of a set of threatening objects.

IV.SIMULATION RESULTS

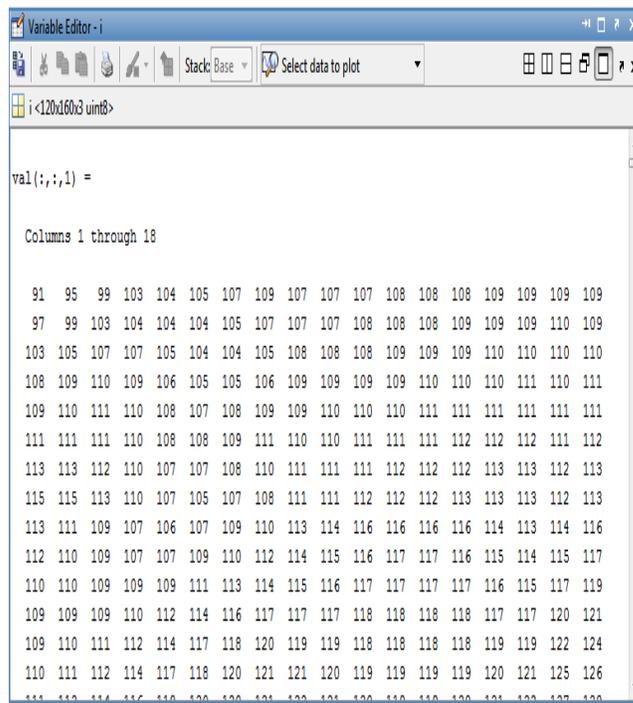


Fig7: R frame value of an object image.

Variable editor in command window is used to show the gray scale value of an image in matrix format. Gray scale Value ranges from 0 to 255. Color image is three types RGB, CMY and CMYK. RGB consist of three frames they are R-frame, G-frame and B-frame[10]. Variable editor displays R frame value in the window. The Euclidean distance is calculated between train and test part of an image. If both the images are same and the distance calculated is less, it would recognize the opted image from the database as equivalent image. The computation time is calculated for each image. The computation time is also called as elapsed time.

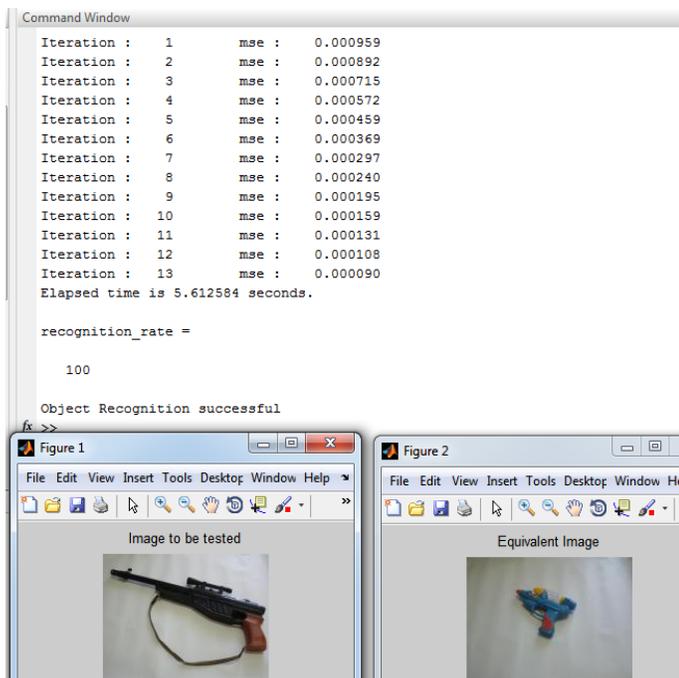


Fig8: Simulation result of Object recognition using HAM with 10 hidden neurons.

During the execution of the program the necessary file directory is checked. The MSE is calculated for several epochs. The elapsed time to recognize object for 10 hidden neurons are approximately 6 seconds. Iterations achieved are 13 and MSE is 0.000090.

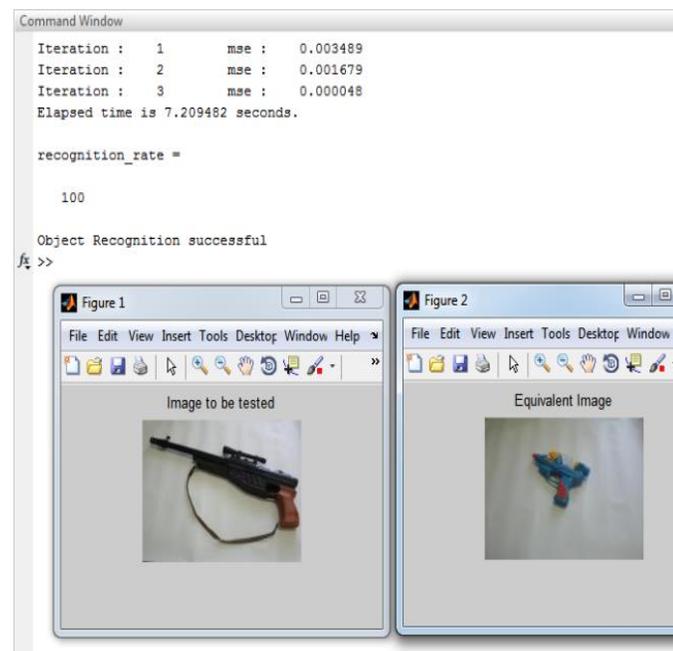


Fig9: Simulation result of Object recognition using HAM with 90 hidden neurons.

P matrix shows the Rframe value of an image. S1 and S2 are the number of nodes in the hidden and output layer they are 90 and 3. Since it is a matrix form, output layer has 3 nodes, because of matrix dimension. Iteration limit is 120000 and the maximum error limit is kept as 10e-5. For the 90 hidden neurons the elapsed time is 7.2 seconds, iteration reaches 3, MSE is 0.000048. We can select the image to be tested. Image classification is done to train and test the image. Elapsed time is the CPU usage time.

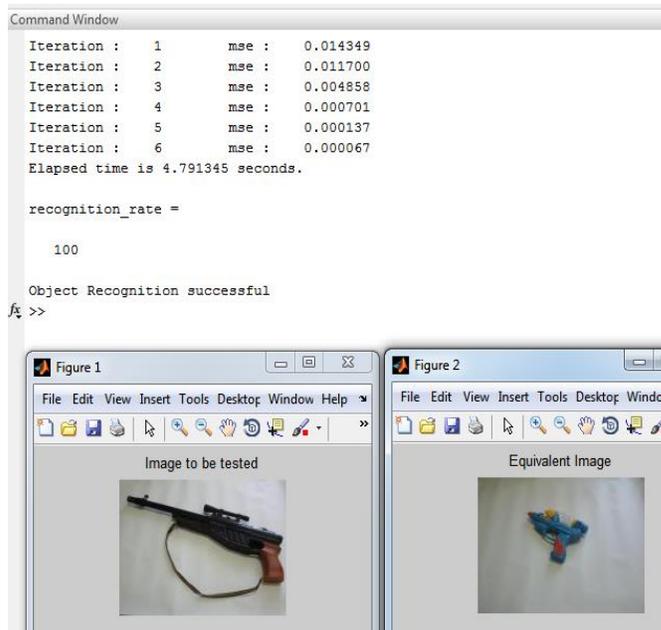


Fig 10: Simulation result of Object recognition using HAM with 100 hidden neurons.

In this number of hidden neurons are set as 100. The test image is changed. The user suggest some other image, if it is unknown to him, the user can select and test the image randomly from the database. The elapsed time to recognize object using 100 hidden neurons is 4.7 seconds. Since the network is dynamic in nature the elapsed time, Iterations and MSE(Mean Square Error) also varies dynamically with respect to an images.

V. Conclusion and Future work

Thus the robot is programmed and real time controlling has been done through that the arena or area is surveyed continuously. The object in the environment is tested and trained using HAM network. This Associative memory associates the image and detects the object present in the environment. It could be used for detecting threatening objects in the unarmed space and area.

This type of robot is useful for military purpose to detect threatening objects in opponent place.

The input window contains more background pixels. Because of those pixels have less stable features. So, it is tuff to view objects and detect it. Simultaneously background separation could be done to capture same object in different environment and to detect those objects in real time.

V I. ACKNOWLEDGEMENT

The images used in this project are real time captured image and those objects used in this work are dummy toy objects.

VII. REFERENCES

- [1] Jose Antonio, Villacorta-Atienza, and Valeri A. Makarov, "Navigation in Time-Evolving Environments Based on Compact Internal Representation: Experimental Model" in IEEE Transaction Neural Networks and Learning systems,, May 2012.
- [2] Brenda Milner, Larry R. Squire and Eric R. Kandel, "Cognitive Neuroscience and the study of memory", Neuron, Vol. 20, 445–468, March, 1998.
- [3] Stephan K.U.Zibner, Christian Faubel, Ioannis Iossifidis, and Gregor Schöner, " Dynamic Neural Fields as Building Blocks of a Cortex-Inspired Architecture for Robotic Scene Representation" in IEEE Transactions on autonomous mental development, VOL. 3, NO. 1, March 2011.
- [4] Yuhua Zheng1 and Yan Meng "Object Detection and Tracking using Bayes constrained Particle Swarm Optimization" IEEE transaction on computer intelligence in robotics and automation., 978-992., 2007.
- [5] B.Raducanu, M.Grana, F.X.Albizuri, A.Anjou, "Face localization on morphological multiscale fingerprints" in Elsevier jornal paper on pattern recognition letters vol 22 , page359-371, 2001.
- [6] Yash Pal Singh, V.S.Yadav, Amit Gupt, Abhilash Khare, " Bidirectional Associative Memory Neural Network Method in Character Recognition" Journal of Theoretical and Applied Information Technology, 2005 - 2009 JATIT.
- [7] Frederick Ducatelle.Gianni A.Di Caro. Carlo Piciroli.Luca M.Gambardella "Self-organised cooperation between robotic swarms" in springer journal paper on Swarm intelligence, 73-96., March 2011.
- [8] Tuba Kurban and Erkan Besdok, "A Comparison of RBF Neural Network Training Algorithms for Inertial Sensor Based Terrain Classification", in sensor journal, 2009.9.6312-6329; doi:10.3390/s90806312.
- [9] Yu, B.; He, X. "Training Radial basis Function Networks with Differential Evolution". In proceedings of IEEE conference on granular computing, Atlanta, GA, USA, 2006; 369-372.
- [10] [Quraishi, M.I.](#) , [Choudhury, J.P.](#) ; [De, M.](#) , "Image recognition and processing using Artificial Neural Network" in ieeepaper on [Recent Advances in Information Technology \(RAIT\), 2012 1st International Conference on](#) march 2012, pages 95-100.
- [11] T. Mori, Y. Segawa, M. Shimosaka, and T. Sato, "Hierarchical recognition of daily human actions based on continuous hidden markov models", In Proc. of IEEE Int. Conf. on Automatic Face and Gesture Recognition page 779-784.

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Production and optimization of cellulase enzyme by *Pseudomonas aeruginosa* MTCC 4643 using sawdust as a substrate

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Abstract- The main objective of the study is to explore easier and cost effective method to produce the cellulase enzyme by using sawdust as a substrate, which is an industrial waste. In the present investigation, different cultural conditions (Concentration of sawdust, pH, Temperature and Inoculum size) were examined to assess their effect for optimum cellulase production using *Pseudomonas aeruginosa* MTCC 4643. Pretreated sawdust produced highest cellulase activity (12.08 U/g) at 5% concentration. Optimum pH and temperature for cellulase production was observed 6.0 and 30°C respectively.

Index Terms- Cellulase, Lignocelluloses, *Pseudomonas aeruginosa*, Sawdust

I. INTRODUCTION

In recent years, growing attention has been devoted to the bioconversion of lignocellulosic materials to energy. Several researches have shown that the production cost of ethanol is tightly associated with the production of cellulase enzyme. Accountable studies were carried out to produce ethanol by a wide range of cellulase producing microorganisms using different types of lignocellulosic material as a substrate including bacteria such as *Pseudomonas* sp. from CMC (Bakare *et al.*, 2005), *Cellulomonas* sp. from CMC, cellulose, *Acacia auriculiformis* Cunn.'s leaves and sugar cane (Siddiqui *et al.*, 1997; Rajoka, 2004 and Sankharak *et al.*, 2011), *Bacillus* sp. from CMC, coir wastes and saw dust (Ariffin *et al.*, 2006; Verma *et al.*, 2012 and Shanmugapriya *et al.*, 2012).

In this present study, Separate Hydrolysis and Fermentation (SHF) method was adopted and sawdust was used as a carbon source under different environmental parameters (i.e., Concentration of saw dust, pH, Temperature, Inoculum size). The objective was to optimize the enzymatic hydrolysis conditions and maximize enzyme production.

II. MATERIALS AND METHODS

Substrate: Sawdust was used as a carbon source collected aseptically from M/S Sharma Hardware Pvt. Ltd., District Alwar, Rajasthan, India-301001 and sun dried to reduce the moisture content.

Pretreatment of Substrate: Sawdust was soaked in 1% sodium hydroxide solution (NaOH) in the ratio 1:10 (sawdust: solution) for two hours at room temperature and autoclaved at 121°C for one hour. The treated sawdust was then filtered and washed with

distill water until the washed water become neutral (Soloman *et al.*, 1999 and G. Immanuel *et al.*, 2007) and then dried at 50°C for overnight.

Microorganism: *Pseudomonas aeruginosa* MTCC 4643, used for the present study was procured from the Microbial Type Culture Collection and Gene Bank (MTCC), Chandigarh, India.

Culture condition and Inoculum Preparation: The bacterial culture received in vials from MTCC, Chandigarh was mixed into 1 ml saline solution and vortexed for 20 seconds. *P. aeruginosa* was sub cultured on Nutrient Agar (NA) plates at 30°C for two days and stored thereafter in refrigerator at 4°C till further use. Inoculum for bacterium was prepared in Nutrient Broth. About 100 ml of inoculum was prepared for bacterial culture in 250 ml Erlenmeyer flask. Few colonies were picked up from two days old culture and were inoculated at 30°C on a rotary shaker (200rpm) for twenty four hours, before it was used for the saccharification process.

Minimum Culture Medium Preparation: The media contained following chemicals (g/l) in distilled water: NaNO₃ (4.0), NaHPO₄ (3.0), KH₂PO₄ (3.0), CaCl₂ · 2H₂O (0.1), FeSO₄ · 7H₂O (0.001), NaCl (1.0), KCl (1.0). The pH of culture medium was set as 7.2±0.2.

Saccharification of substrate: 100 ml of the media was taken in 250 ml Erlenmeyer flask and sterilized by autoclaving 121°C for 15 min and cooled. Autoclaved sawdust was added in flask before inoculation then inoculated with 2ml of inoculum of *P. aeruginosa* MTCC 4643, under controlled conditions and incubated at 30°C for twenty four hours. This culture was harvested after 24 hours by centrifugation at 5000 rpm for 10 min at 4°C using refrigerated ultracentrifuge. The supernatant was used as the crude extracellular enzyme source. Three replicates were set for each treatment.

Cellulase assay: A reactive mixture contains supernatant (1 ml) to 1 ml volume of CMC substrate solution. We mixed the resulting solution thoroughly and transfer to a water-bath maintained at 40.0 ± 0.1°C then after 10 minutes (reaction step), we removed the test tube from the water bath and add 4 ml of DNS-Lactose solution and mix to stop the enzymatic reaction. We covered the tubes and placed in a boiling water bath for 15 min and cooled to room temperature with a cooling water bath

and then it was used for measuring optical density at 540 nm against water blank and standard graph was made (Ghose, 1987).

Optimization of substrate concentration: To study the effect of saw dust concentration, the minimal culture medium was prepared in 250 ml conical flasks by setting the different concentrations of saw dust such as 1%, 2%, 3%, 4% and 5% respectively in triplet. The pH of minimal culture medium was set as 7.2 ± 0.2 . About 2 ml of 24 h old inoculum suspension was inoculated and placed at 30°C for 24 h. The initial saw dust concentration that was efficiently utilized by microbe was observed and the same concentration of saw dust was used for setting experiments for optimization of other factors.

Optimization of pH: Minimal culture medium was prepared and pH was set at different level such as 5.0, 6.0, 7.0, 8.0 and 9.0 by adding 1% NaOH and concentrated HCl respectively, were tested for saccharification using initial saw dust concentration. About 2 ml of 24 h old inoculum suspension was inoculated and placed at 30°C for 24 h.

Optimization of temperature: To optimize the saccharification temperature, saccharification was carried out at 25, 30, 35, 40 and 45°C .

Optimization of inoculum size: To study the effect of inoculum sizes on saccharification process, the pH of minimal culture medium was set 7.2 ± 0.2 and using the 24 h old inoculum was inoculated, by setting the different sizes of inoculum such as 1%, 2%, 3%, 5% and 10% respectively in triplet and the all flasks were placed in an incubator at 30°C .

III. RESULTS AND DISCUSSION

A. Optimization of substrate concentration:

The effect of various concentrations of substrate (1-5%) on cellulase activity in the presence of bacteria *Pseudomonas aeruginosa* MTCC 4643 is shown in Figure 1. The maximum cellulase activity (12.08 U/g) was found at 5% concentration of saw dust at temperature of 30°C and pH of 7.2 ± 0.2 . Shabeb *et al.* (2010) reported that *Bacillus subtilis* KO exhibited maximum activity at 10% concentration of molasses. Similarly Harchand and Singh (1997) investigated that *S. albaduncus* showed highest level of cellulase activity with 3% concentration of cotton used as a substrate.

B. Optimization of pH:

The effect of pH-value by *Pseudomonas aeruginosa* MTCC 4643 on cellulase activity was examined at various pH values ranging from 5-0 to 9.0 as shown in Figure 2. The cellulase activity was found at a broad range of pH values (pH 5-0 to 9.0) with optimal pH of 6.0 (19.99 U/g). Cellulase activity was reduced to 49% at pH 9.0. This result was approximately in correlation with the findings of many other workers. Bakare *et al.* (2005) found pH 6.5-7.0 optimum for the production using the CMC as a substrate by *Pseudomonas fluorescens*. Shankar and Isaiarasu (2011) and Ariffin *et al.* (2006) revealed that *Bacillus pumilus* produced maximum cellulase at pH 6.0.

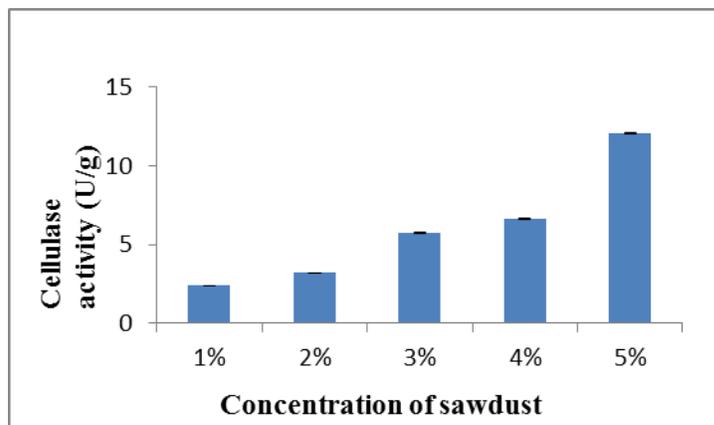


Figure 1: Impact of concentration of sawdust on cellulase activity (U/g) at $\text{pH } 7.0 \pm 0.2$; 30°C .

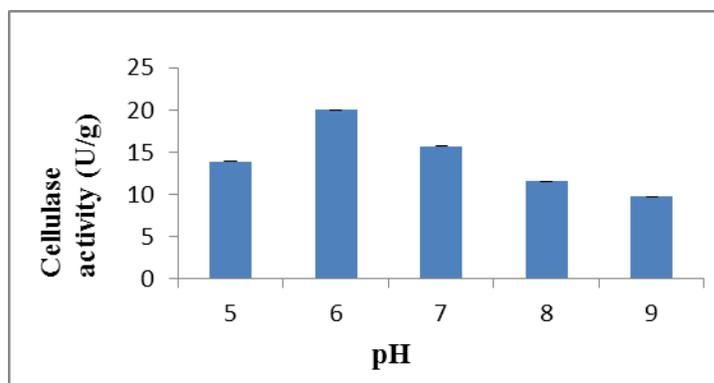


Figure 2: Impact of pH on cellulase activity (U/g) at 30°C using 5% substrate concentration.

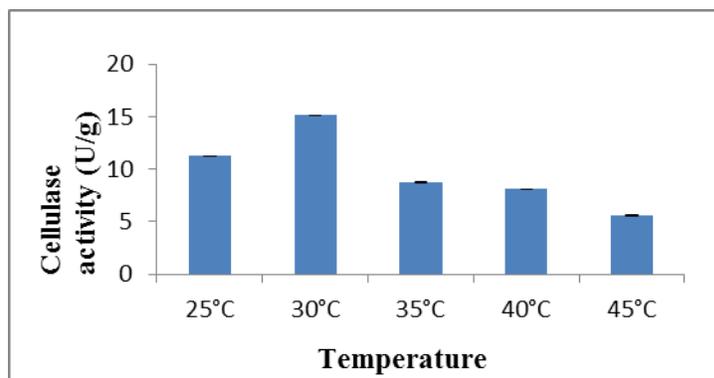


Figure 3: Impact of temperature on cellulase activity (U/g) using 5% substrate concentration.

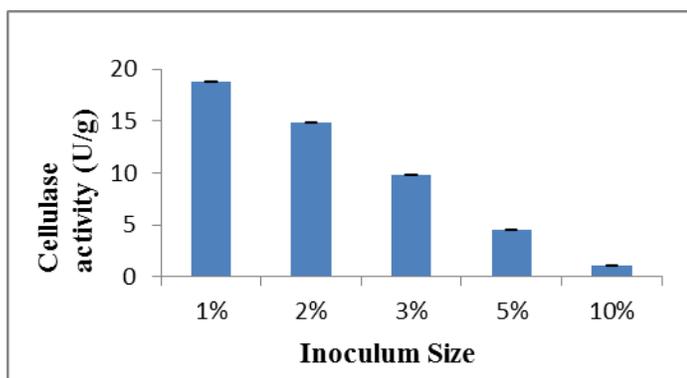


Figure 4: Impact of Inoculum size on cellulase activity (U/g) at pH 7.0±0.2; 30 °C and 5% substrate concentration.

C. Optimization of temperature:

The observations were carried out by *P. aeruginosa* MTCC 4643 on cellulase activity at various temperatures ranging from 25-45°C at 5% concentration of saw dust with pH of 7.2± 0.2 as shown in Figure 3. Temperature strongly affects the conversion of lignocellulosic substrate into end product, which varies according to the organism involved even slight changes in temperature can affect cellulase production. (Vuet *al.* 2011). The optimum cellulase activity (15.12 U/g) was observed at 30°C. Bakare *et al.* (2005) recorded the optimum temperature of 35°C for best production of enzyme by *Pseudomonas fluorescens* using CMC as a substrate. Rajoka (2004) showed that an optimum temperature for *Cellulomonas flavigena* was 30°C when cellulose and sugar cane bagasses used as a substrate respectively.

D. Optimization of inoculum size:

The initial inoculum level in the media is a critical factor in fermentation process (Shankar and Isaiarasu, 2011). The effect of various inoculum size of 1-10% was tested as presented in Figure 4. The maximum cellulase activity (18.83 U/g) was found at 1% v/v using 5% of saw dust with temperature of 30°C and pH of 7.2± 0.2. Decline productions were observed by increasing the inoculum's concentration of 2% v/v. Shankar and Isaiarasu (2011) found 2% inoculum size optimum for the cellulase activity when CMC used as a substrate by *Bacillus pumilus*.

IV. CONCLUSION

In conclusion, *Pseudomonas aeruginosa* MTCC 4643 is capable of producing cellulases from sawdust. Sawdust is low-cost lignocellulosic waste material and potentially useful for commercial cellulase production.

References

1. Ariffin H., Abdullah N., Umi Kalsom M.S., Shirai Y. and Hassan M.A., "Production and characterization of cellulase by *Bacillus pumilus* EB3" in International Journal of Engineering and Technology, 2006; vol. 3(1); pp.47-53.
2. Bakare M.K., Adewale I.O., Ajayi A. and Shonukan O.O., "Purification and characterization of cellulase from the wild-type and

- two improved mutants of *Pseudomonas fluorescens*" in African Journal of Biotechnology, 2005; vol. 4(9); pp. 898-904.
3. Eshaq F.S., Ali M.N., Khan M.M., "Production of bioethanol from next generation feed-stock alga *Spirogyra* species" in International Journal of Engineering Science and Technology, 2011; vol.3(2); pp. 1749-1755.
4. Ghose T.K., "Measurement of cellulase activities" in Pure and Applied Chemistry; 1987; vol. 59 (2); pp. 257-268.
5. Harchand R.K. and Singh S., "Extracellular cellulase system of a thermotolerant streptomycete: *Streptomyces albaduncus*" in [Acta Microbiol Immunol Hung.](#) 1997; vol. 44(3); pp.229-39.
6. Immanuel G., Akila Bhagavath C.M., Lyappa Raj P., Esakkiraj P., Palavesam A., "Production and partial purification of cellulase by *Aspergillus niger* and *A. fumigatus* fermented in coir waste and saw dust" in The Internet Journal of Microbiology, 2007; vol. 3(1); pp.1-17.
7. Rajoka M.I., "Influence of various fermentation variables on exo-glucanase production in *Cellulomonas flavigena*" in Electronic Journal of Biotechnology, 2004; vol. 7(3); pp. 256-263.
8. Sangkharak K., Samae R. and Wangbua C., "Conversion of leafwaste to sugar and ethanol by SHF and SSF fermentation using cellulase from *Cellulomonas* Sp." in International Journal of Advanced Biotechnology And Research, 2011; vol. 2(3); pp. 345-349.
9. Shabeb M.S.A., Younis M.A.M., Hezayen F.F. and Nour-Eldein M.A., "Production of cellulase in low-cost medium by *Bacillus subtilis* KO strain" in World Applied Sciences Journal, 2010; vol. 8(1); pp. 35-42.
10. Shankar T. and Isaiarasu L., "Cellulase production by *Bacillus pumilus* EWBCM1 under varying cultural conditions" in Middle-East Journal of Scientific Research, 2011; vol. 8 (1); pp. 40-45.
11. Shanmugapriya K., Saravana P.S., Krishnapriya, Manoharan M., Mythili A. And Joseph S., "Isolation, screening and partial purification of cellulase from cellulase producing bacteria" in International Journal of Advanced Biotechnology and Research, 2012; vol. 3(1); pp. 509-514.
12. Siddiqui K.S., Rashid M.H., Ghauri T.M., Durrani I.S. and Rajoka M.I., "Purification and characterization of an intracellular β -glucosidase from *Cellulomonas biazotea*" in World Journal of Microbiology and Biotechnology, 1997; vol. 13; pp. 245-247.
13. Solomon, B.O., B. Amigun, T.V. Betikue, T. Ojumu and S.K. Layokun, "Optimization of cellulase production by *Aspergillus flavus* Linn. isolates NSPR 101 grown on baggase" in JNSCHE, 1999; vol. 18; pp. 61-68.
14. Verma V., Verma A and Kushwaha A., "Isolation and production of cellulase enzyme from bacteria isolated from agricultural fields in district Hardoi, Uttar Pradesh, India" in Advances in Applied Science Research, 2012; vol. 3 (1); pp. 171-174.
15. Vu V.H., Pham T.A. and Kim K., "Improvement of fungal cellulase production by mutation and optimization of solid state fermentation" in Mycobiology, 2011; vol. 39(1); pp. 20-25.

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Synthesis and Characterization of Mixed Ferrites

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Abstract- In this work we prepare nanocrystalline mixed ferrites by equilibrated low entropy routes with generic formula of $Mn_xNi_{1-x}Fe_2O_4$. Two series of samples have been prepared where “x” varies as 0.0, 0.1, 0.2, 0.3, 0.4 and 0.5 the samples have been prepared by chemical co-precipitation route. For the first calculated amount of salts of Mn, Fe and Ni were dissolved in deionized water and stirred for a few minutes. 0.1 M NH_4OH solution was then slowly added drop-wise under vigorous stirring. The alkali addition was continued till the pH of the solution was 10 and was left undisturbed for 1hour for complete digestion. The precipitate was then washed thoroughly till pH 7 and then heated to 600 °C. For the next series “x” was kept fixed at 0.5 and the same synthesis steps were repeated. The sample was divided into three batches and heat treatment was performed at 600 °C, 900 °C. The samples were checked for their phase purity by x ray diffraction which confirmed the spinel phase without any impurity. Dielectric measurements were performed within a frequency window of 1 Hz to 1 MHz the dielectric dispersion can be well explained by Koops and Maxwell – Wagner theory. Raman spectroscopy also gave detailed information about the structural order of the samples.

Index Terms- Nanocrystalline, spinel structure, chemical coprecipitation, Raman spectroscopy, XRD (x-ray diffraction), JCPDS (joint committee for powder diffraction standards)

I. INTRODUCTION

Ferrites are mixed metal oxides with iron (III) oxide as main component it is a magnetic material exhibit in ferrimagnetic ordering and magnetism due to the super exchange interaction [1]. Present day’s nanocryastalline mixed spinel structure ferrites are the particular research topic for the researcher all over the world, because of large variety of unique results associated with electric, dielectric, magnetic properties. $Mn_xNi_{1-x}Fe_2O_4$ manganese nickel ferrite belongs to the class of mixed spinel ferrite where “x” varies from 0.0 to 0.5 (variation of cation) shows unexpected properties at nano regime due to the re-distribution of cations, cation ionic radii, crystal field effect, presence of ion to specific site, ionic charge are the main factors that causes distribution of cation in mixed spinel ferrites [2]. Spinel ferrites structures partially determine by oxygen ion in a cubic arrangement there are two types of interstitial spaces between the anion tetrahedral co-ordinate site and octahedral co-ordinate site [1]. For the satisfactory results of cation distribution in tetrahedral and octahedral sites we prepare the series of sample varying the no. of cations and studied through Raman

spectroscopy .Electrical properties of samples were studied by dielectric studies and porosity of the samples derived from x-ray densities which utilizes structural parameters obtained through XRD measurement. The nanocrystalline mixed spinel ferrites materials used in various technological issues like nano ferrite doped microstrip patch antenna for improved the overall antenna performance, microwave dielectric property study and antenna miniaturization [3,4] .Application of nano ferrites are in fashion these days because of its simple preparation, compatibility with electrical circuits, low overall cost and light weight these have numerous application in almost every field some of them like medical, electric, power, communication, mechanical etc.

II. EXPERIMENTAL

The nanocrystalline mixed ferrite material of manganese nickel ferrite of formula $Mn_xNi_{1-x}Fe_2O_4$ prepared by chemical co-precipitation method, Solution of $MnCl_2 \cdot 4H_2O$, $Ni(NO_3)_2 \cdot 6H_2O$ and $Fe(NO_3)_3 \cdot 9H_2O$ with distilled water is prepared The main solution of $Ni^{2+}, Fe^{3+}, Mn^{2+}$ were Mixed according to the calculated weight of samples. Calculated amount of salt of Mn, Fe, and Ni were dissolved in deionized water and stirred for a few minutes. 0.1M NH_4OH solution was then slowly added drop-wise under vigorous stirring the alkali addition was continued till pH of the solution was 10 and was left undisturbed for 1 hour for complete digestion. The reactions involved are

- $MnCl_2 + 2NH_4OH \rightarrow Fe(OH)_3 + 2NH_4NO_3$
 $Mn(OH)_2 \xrightarrow{Heat} MnO + H_2O$
- $Ni(NO_3)_3 + 2NH_4OH \rightarrow Ni(OH)_3 + 2NH_4NO_3$
 $Ni(OH)_2 \xrightarrow{Heat} NiO + H_2O$
- $Fe(NO_3)_3 + 3NH_4OH \rightarrow Fe(OH)_3 + H_4NO_3$
 $2Fe(OH)_2 \xrightarrow{Heat} Fe_2O_3 + H_2O$

After calculation we have Fe, Ni, Mn in 250 ml for 0.04M is 0.7985gm, 0.7469gm, 0.7093gm respectively. After chemical co-precipitation process we separate nanoparticles formed in the bottom of beaker from supernatant by centrifuge machine operating at a speed of 2200 rpm and duration is fixed at 4 or 5 minutes, the centrifugal process is continued till the pH reached at 7 after this we done the centrifugal process with alcohol we repeat this process at least 2 times with alcohol and then obtained the final product but it is still in wet condition so left it for whole

day to dried it. By repeating whole process we prepare two series of samples in first series where “x” varies as 0.0, 0.1, 0.2, 0.3, 0.4 and 0.5 is heat treated at 600 °C for 8 hours and for second series where x=0.5 kept constant The sample was divided into three batches and heat treatment was performed at 300 °C, 600 °C, 900 °C for 8 hours respectively and finally we obtained our desired nanocrystalline manganese nickel ferrite material.

III. RESULTS AND DISCUSSION

3.1 XRD:

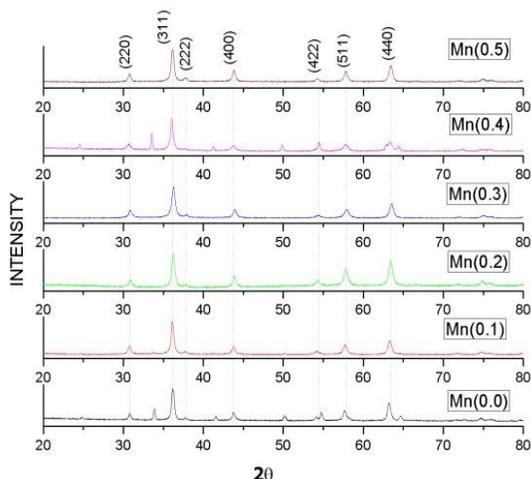


Fig1.1 XRD pattern of Mn_xNi_{1-x}Fe₂O₄, (Manganese Nickel Ferrite) where “x” varies as 0.0, 0.1, 0.2, 0.3, 0.4 and 0.5.

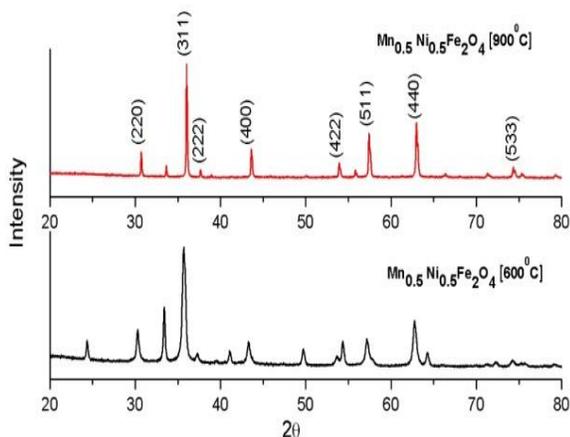


Fig1.2 XRD pattern of Mn_{0.5}Ni_{0.5}Fe₂O₄, (Manganese Nickel Ferrite) at 600°c and 900 °c

The X-ray diffraction patterns of the synthesized ferrite nanocrystals have been shown in Fig 1.1 and 1.2

The peaks in XRD patterns illustrate the characteristic peaks of single phase cubic spinel structure. Peak intensity is indicative of high degree of crystallinity of prepared ferrites. The existence of the (220), (311), (222), (400), (422), (511) and (440) major lattice planes in the XRD patterns confirms the formation of spinel cubic structure with the Fd3m space group, which is consistent with the powder diffraction file of JCPDS. The patterns were compared with standard data (JCPDS PDF card

No. 074-2082) and the formation of single phase cubic MnNiFe₂O₄ nanoparticles in all the samples except x=0.1 and x=0.4 was confirmed. The mean particle sizes (D) were calculated from the X-ray line broadening of the (311) diffraction peak using the **Scherrer’s equation**:

$$D = k \lambda / \beta \cos\theta$$

Where D is the crystallite size, λ is the wavelength of X-ray radiation, θ is the Bragg angle and β is the full width at half maximum (FWHM). From the analysis of the XRD spectra we found that the mean particle diameter (D) is nearly the same for all synthesized specimens, ranging from 18- 22 nm which shown in table 3.1. Broad peaks indicating the fine grain size of the samples. With higher annealing temperature, powders have stable structure and fine crystallization, when the annealing temperature is increases Intensity of the peaks in all XRD spectra is increased and the sharpness of peaks indicated the highly crystalline nature of the precipitate. The results indicate that the crystalline sizes increase with the annealing temperature. The crystallite sizes of annealed powder increase from 21 to 51 nm with the annealing temperature increase from 600°C to 900°C. The reason why the grain sizes increase dramatically at annealing temperature of 900°C might be due to the dominance of the activation energy during the grain growth process [5]. At the higher temperature the removal of extra undefined phases also noticed.

Table 3.1– Average particle size estimated from the diffraction spectrum in Figure 1.1 by using FWHM.

SAMPLE NAME	2θ	FWHM (B) IN RADIANS	AVERAGE SIZE OF THE PARTICLE (NM APPROX.)
Mn _{0.0} Ni ₁ Fe ₂ O ₄	36.16	0.40	21
Mn _{0.1} Ni _{0.9} Fe ₂ O ₄	36.06	0.38	22
Mn _{0.2} Ni _{0.8} Fe ₂ O ₄	36.27	0.46	18
Mn _{0.3} Ni _{0.7} Fe ₂ O ₄	36.24	0.41	20
Mn _{0.4} Ni _{0.6} Fe ₂ O ₄	36.14	0.39	21
Mn _{0.5} Ni _{0.5} Fe ₂ O ₄	36.20	0.39	21

Table 3.2– Average particle size estimated from the diffraction spectrum in Figure 4.2at 600°C and 900°C by using FWHM.

Mn _{0.5} Ni _{0.5} Fe ₂ O ₄ [600°C]	36.20	0.39	21
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$Mn_{0.5}Ni_{0.5}Fe_2O_4$ [900°C]	36.05	0.17	51
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3.2 Dielectric study

The samples for dielectric measurement were pressed by applying a pressure of 120-150 Kg/cm² tones to get compact circular pellets with dimensions 12mm in diameter and approximately 0.5mm to 2 mm in thickness. The LCR meter is compactable with such dimension of the pellets. The dielectric constant measurements of the samples at low and high frequencies from a few Hz to 10MHz were carried out by a Alpha-A High Performance Modular Measurement System (NOVOCONTROL). The temperature variation studies are also carried out. The dielectric constant of the sample can be calculated using the equation,

$$\epsilon_r = (c d / \epsilon_0 A)$$

Where, A= area of sandwiched structure

c= Capacitance measured by LCR

d = Thickness,

ϵ_0 = Absolute permittivity

Koop's and Maxwell Wagner theory well explain the dielectric behavior of ferrites [6], the variation of Mn concentration on dielectric properties of mixed ferrites explain here,. fig (a) shows the dielectric permittivity decreases with the increase in frequency the reason behind of it is with the increase of Mn concentration decrease in Ni⁺² nickel ions concentration consequently the Fe⁺² ions results less no. of pairs for hole and electron hopping as a result charges getting build up across the grain boundaries and resistance increases, this may be the reason behind low permittivity value in Mn rich concentration. From fig.(b) it is observed that tanδ decreases with increase of frequency and at high frequency it is constant for all samples, dielectric relaxation occur in the frequency range of 100Hz to 1000Hz due to the hopping frequency of charge carriers equal to the applied field frequency[1]. It is seen that from fig. there is absence of relaxation in Mn rich concentration due to the unavailability of hopping charges, for manganese nickel ferrite conductivity and resistivity can be explain on the basis of hopping of electron and hole charges on the octahedral site fig (c) and fig (d).for the second series the fig (e) and fig (f) shows the changes in loss tangent and dielectric permittivity and it can explain as the temperature increases from 300 °C to 600 °C and 900 °C there is decrease in permittivity in great extent due to charges accumulation on grain boundaries.

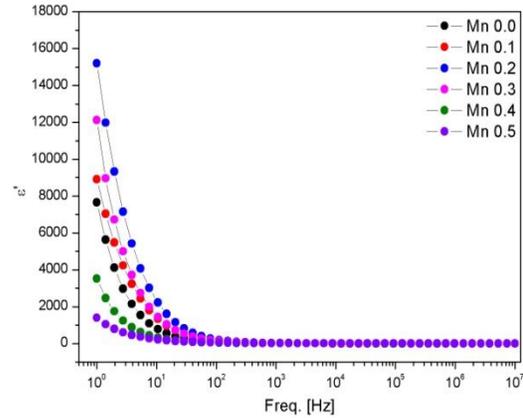


Fig (a): permittivity vs. frequency plot

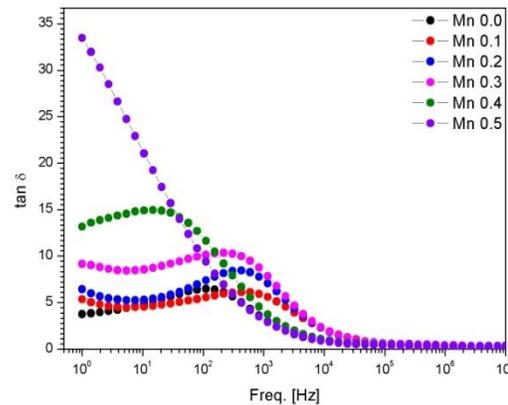


Fig (b): loss tangent vs. frequency plot

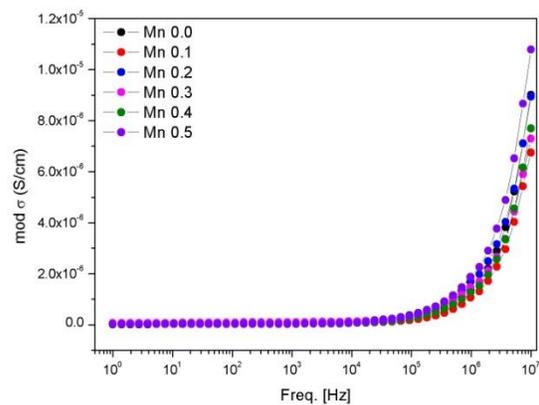


Fig (c): conductivity vs. frequency plot

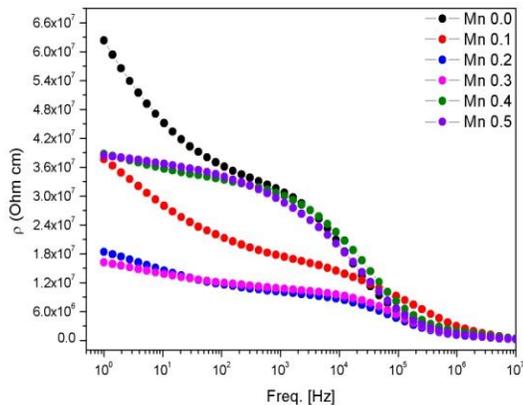


Fig (d): resistivity vs. frequency plot

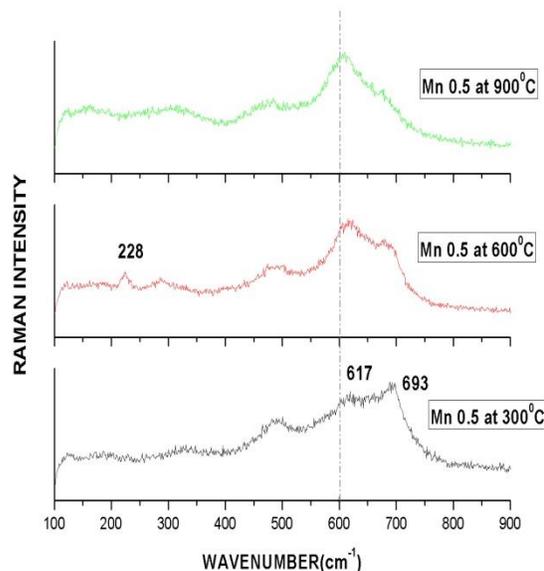


Fig.(h) Raman spectra for the second set of series

3.3 Raman Spectroscopy

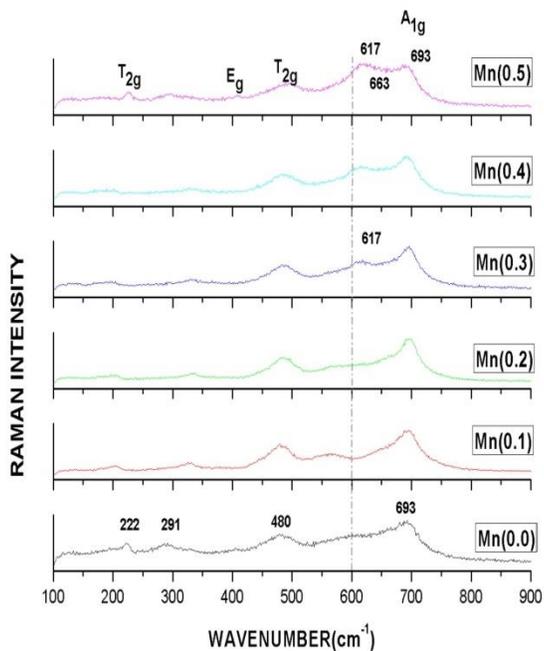


Fig.(g) Raman spectra for the first set of series

According to the literature five Raman active bands A_{1g} , E_g , and three T_{2g} [7].fig (g) shows the room temperature Raman spectra of $Mn_xNi_{1-x}Fe_2O_4$ sample where “x” varies from 0.0 to 0.5 observed in the range of 0-1500 cm^{-1} , the vibrational modes are around at 222 cm^{-1} , 291 cm^{-1} , 480 cm^{-1} , 693 cm^{-1} , since modes above 600 cm^{-1} corresponds to the tetrahedral sub lattice (A_{1g} symmetry) and due to the motion of the oxygen atoms in tetrahedral group and below refers octahedral sub lattice (T_{2g} symmetry) [8,9]. Broadening of modes in Raman spectra is due to the strain development and reduction in grain size [9,10] in Nano crystalline ferrites phonons with q (phonons) > 0 involves in scattering so that broadening and shift of Raman spectra observed. The mass difference between the three ions (Ni^{2+} , Fe^{3+} , Mn^{2+}) splits the A_{1g} mode in three different energy value the lightest ion Ni^{2+} responds to around 693 cm^{-1} for $x= 0.3$ to 0.5 the heaviest one i.e. Fe^{3+} respond to around 617 cm^{-1} and an intermediate mode of Mn^{2+} ion around 663 cm^{-1} . On relative intensity and peak position can be explained considering alloy effects, resulting from the introduction of a new ion at increasing content. Further, the Raman frequency depends on the Fe(Ni)-O and bond length. The intensity of the highest wavelength Raman mode (initially around 693 cm^{-1}) decreases with increasing Mn-content the intensity of the Raman mode peaking around 617 cm^{-1} increase proportionally. Those with q (phonons) >0 take part in the Raman scattering process, resulting in the of the peak position and the broadening of the peak width. The Raman intensity of the signal increases as the sintering temperature is increased, as shown in figure (h) the intensity of Raman mode 617 cm^{-1} increases at 900 $^{\circ}C$ and mode 693 cm^{-1} is disappeared at 900 $^{\circ}C$ in fig (h) The shift toward lower wave number is attributed to the crystalline disorder and also to the presence of grain boundaries, which are large in small-sized nanomaterials. Another important parameter of Raman signal, i.e. the bandwidth, shows broadening for the small-sized nanomaterials (~20 nm), which also supports the crystalline disorder. The Raman shift toward lower wave number and the line broadening

are generally observed in polycrystalline materials and are attributed to the confinement of optical phonons in a small crystalline particle [11].

IV. CONCLUSION

Nanocrystalline manganese Nickel ferrite particles for $x=0$ to $x=0.5$ and europium and terbium doped Nickel ferrite for $x=0.02, 0.05, 0.1$ were prepared using wet chemical co-precipitation technique. The particles were found to be exhibiting a spinel structure with sizes varying from 21nm - 51nm. Overall result of xrd pattern confirms the spinel cubic structure with high degree of crystallinity of prepared ferrites. The result of Raman modes confirms the five Raman modes and distribution of cation distribution in octahedral and tetrahedral sub lattices in agreement with the as-synthesized samples. The frequency and temperature dependence of the dielectric parameters of. The mechanism of dielectric polarization was found to be similar to that of conduction process involving the hopping of charge carriers. The decrease in ϵ with Mn substitution point to the decrease in availability of Ni^{2+}/Ni^{3+} and Fe^{2+}/Fe^{3+} pairs with increasing Mn. The $\tan\delta$ and exhibit strong relaxation peaks and relaxation time (Γ) was estimated from these relaxations.

REFERENCES

- [1] Veena Gopalan E. "on the synthesis and multifunctional properties of some Nano crystalline spinel ferrites and magnetic Nano composite" Ph.D. thesis (department of Cochin university of science and technology) 14, 16, 18
- [2] Sakurai j and Shinjo T.J phys. Soc. Japan 23 (1967) 1426 S.A Oliver, H.H Hamdesh, J.C Ho; phys. Rev. B60 (1999)3400
- [3] JeongKeunJi, Won Ki Ahn, Jun Sig Kum, Sang Hoon Park, Gi Ho Kim, and Won Mo Seong "Miniaturized T-DMB Antenna With a Low-Loss Ni-Mn-Co Ferrite for Mobile Handset Applications"(IEEE MAGNETICS LETTERS, Volume 1 (2010) Soft Magnetic Materials By Research and Development Center, E.M.W. Antenna Company,
- [4] John Jacob, M Abdul Khadar, Anil Ionappan and K. T Mathew "Microwave dielectric properties of nanostructure nickel ferrite" (Bull. Mater. Sci., Vol. 31, No. 6, November
- [5] G..Nabiyouni et al., "Characterization and Magnetic Properties of Nickel Ferrite Nanoparticles Prepared by Ball Milling Technique", CHINS PHYS. LETT.Vol. 27, No. 12 (2010) 126401.
- [6] P. Chandra Mohan, M.P Srinivasan, S Velmurugan and S.V Narasimhan J. Solid State chemistry 184, 89(2011).
- [7] White WB, DeAngeli BA (1967). "Interpretation of vibrational spectra of spinels" SpectrochimActa 23A:985-995. doi: 10.1016/0584-8539(67)80023-0.
- [8] Y.Qu, H.Yang, N. Yang, Y.Fan, H Zhu and G. Zou Mater, Lett. 60, 3548 (2006).
- [9] P. Chandra Mohan, M.P Srinivasan, S Velmurugan and S.V Narasimhan J. Solid State chemistry 184, 89(2011).
- [10] T.Yu, S.C Tan, Z.X Shen, L.W Chen, J.Y Lin and A.K See, Applied physics Lett. 80, 2266(2002).
- [11] Jitendra Pal Singh, et al. "Micro-Raman investigation of nanosized zinc ferrite: effect of crystallite size and fluence of irradiation", J. Raman Spectrosc.(2011) (wileyonlinelibrary.com) DOI 10.1002/jrs.2902.

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Research on ADR in in-patients using Naronji's and who scale: A basic necessity for better therapeutic outcomes and rational drug use

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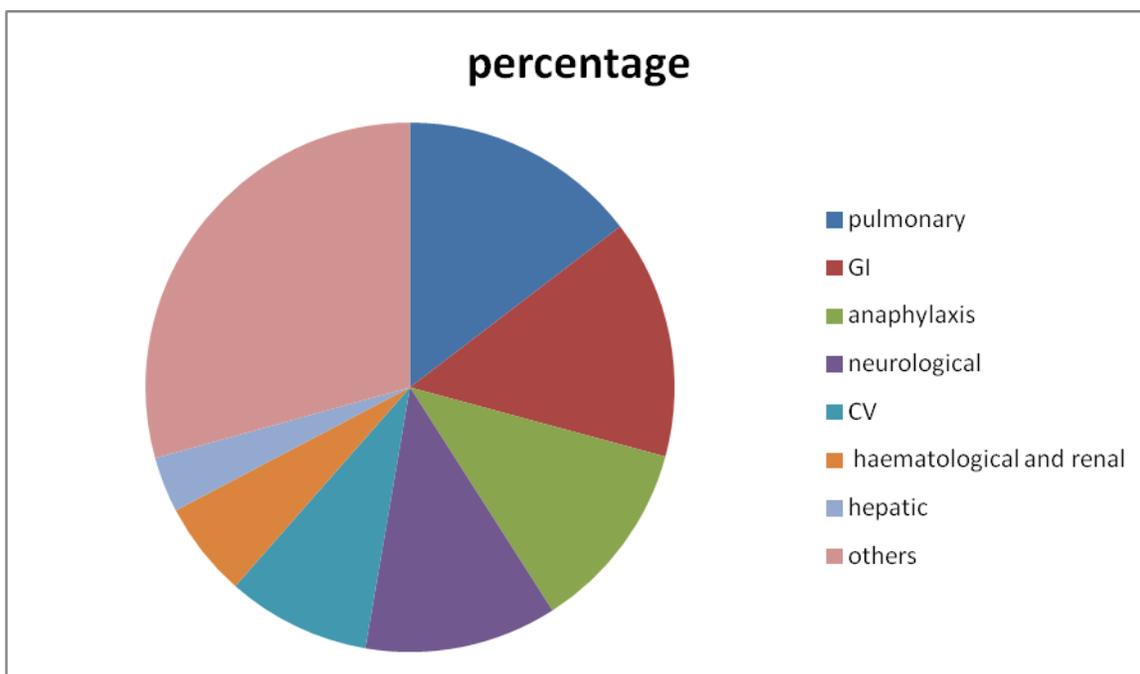
INTRODUCTION: This research aims at enlightens and emphasizing the most prevailing disease conditions and disorders which are most common in mahabubnagar locality ,were category A(augmented) type ADR are more followed by type C(continous).

METHODS: A retrospective research study was conducted using Naronji's and WHO standard scales have been used to categorise the ADR into category A, category B, category C and category D for the given cases. Epidemiological data like age, ADR, and disease condition prevailing in hospitalised patients are noted and categorised department wise.

RESULTS: In 290 females and 310 males cases high percentage of ortho related medication ADR (10.61%) in males than in females were reported followed by CV 63cases (10.5%) in arrhythmias, MI, CAD in ratio of 1:2.5:1. It is succeeded by gynaecological medicational ADR accounting for 8.6% and goitor 3.8% are found which is followed by paediatric cases occupying 6.3% in 600case studies. Naronji's and WHO standard scales have been used to denoted the ADR category.

Based on age CV are more compared to pulmonary, hepatic, ortho, neurologic, GI, circulatory , renal, and others.

S.no	Conditions	No. of peditrics	No. of adult	No. of geriatrics
1	CV	38	42	1
2	Endocrine	5	49	56
3	Pulmonary	19	8	15
4	Hepatic	5	10	6
5	Ortho	10	28	43
6	Neurologic	57	19	20
7	GI	13	43	37
8	Circulatory	5	9	3
9	Renal	0	8	6
10	Others	8	20	17



Among all cases the common avoidable ADR are seen in pulmonary, GI, anaphylaxis, neurological, CV, haematological and renal, hepatic and others (HTN, skin rashes, urticaria).

CONCLUSION: The statistical data from the research study is useful in different fields of pharmacy like pharmacovigilance, clinical pharmacy and pharmacoepidemiological studies. Taking this into consideration pharmacovigilance department has taken measure and considerable decrease in ADR's have been noted. All hospital organisations need a pharmacist team responsible for medical prescription analysis before preparation, dispensing and administration of drugs to inpatients. This study provides the significance of highly notable diseases and related disorders along with common ADR in a given area providing statistical data useful in different pharmacy and medical fields with main aim of improving the quality of life through rational drug use.

REFERENCES:

- Brennan TA, Leape LL, Laird NM, et al. Incidence of ADE and negligence in hospitalised patients, N Engl J Med. 1991;324:370-376.
- Leap LL, Bates DW, Cullen DJ, et al. Systems analysis of ADR JAMA. 1995;274:35-43.
- Kohn LT, Corrigan GM, Donaldson MS, To err is human; building a safer health system. Institute of medicines, Washington DC: National Academy Press; 1991.

Chemical Analysis of Leaf Extracts of *Calotropis procera*

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Abstract- Since ancient time plants have been used as source of therapeutic agents, plants play a significant role in the indigenous system of medicines to combat diseases. Plants are richest source of bioactive organic chemicals on earth. Phytochemical properties of leaf of *Calotropis procera* obtained from methanol and petroleum ether extracts were investigated. The results suggest that the Phytochemical properties of the leaf for using various ailments.

Index Terms- *Calotropis procera*, Phytochemical

I. INTRODUCTION

“Phyto” is the greekword for plants. There are many “families” of phytochemicals which helps the human body in variety of way. Phytochemical are non-nutritive plant chemicals that have protective or disease preventive properties. Plant produce these chemicals to protect themself but recent research demonstrate that many phytochemicals can protect humans against disease (Srivastava et al, 2010).

Calotropis procera commonly known as Aak is used in many Ayurvedic formulations like Arkelavana. The medicinal potential of *Calotropis procera* has been known to traditional system of medicine. The use of the plants, plant extracts and pure compounds isolated from natural sources has always provided a foundation for modern pharmaceutical compounds (Murti et al, 2012). Plants have been a rich source of medicines because they produce wide array of bioactive molecules, most of which probably evolved as a chemical defence against predation or infection (Ramaprabha et al, 2012). It is estimated that only one percent of 2,65,000 flowering plants on earth have been studied exhaustively for their chemical composition and potential against important medicinal value (Cox et al, 1994). Here an attempt has been made to investigate the chemical present in the leaf for curing various diseases.

II. MATERIAL AND METHODS:

1. Plant material:

Calotropis procera leaf collected in January 2013 from Rewa. The plant material was identified at the field using standard keys and descriptions.

2. Method of extraction:

Solvent – Petroleum ether, Methanol

Method – Maceration

Procedure:

Leaf powder was weighed 500 gm and kept in a container in contact with pet ether for seven days, with vigorous shaking at regular interval. Material was filtered a first with muslin cloth and then with filter paper. Filtrate was collected and dried in water bath till no further reduction in mass of extract was observed. Dried extract was weighed and packed in air tight container and the marc was air dried then kept in a container in contact with methanol for seven days, with vigorous shaking at regular interval. Material was filtered a first with muslin cloth and then with filter paper. Filtrate was collected and dried in water bath till no further reduction in mass of extract was observed. Dried extract was weighed and packed in air tight container.

3. Phytochemical Screening-

Phytochemical Screening was carried out using standard methods to detect the bioactive compounds like alkaloids, tannins, phenols, steroids, flavonoids, saponins (Trease et al, 1989).

III. RESULT AND DISCUSSION

TABLE 1: Phytochemical Screening of *Calotropis procera* Leaf

Phyto chemicals	Petroleum ether extract	Methanol extract
-----------------	-------------------------	------------------

Alkaloids	-	-
Carbohydrates	-	+
Reducing Sugar's	-	-
flavonoids	-	+
Glycoside	+	+
Tannin and Phenolic	-	+
saponin	-	-
Protein and amino acid	+	+
Fats and oils	-	-
Triterpenoids and steroids	+	+

(+) indicates presence

(-) indicate absence

The result of Phytochemical screening of Petroleum ether and methanol leaf extracts of *Calotropis procera* revealed the presence of Glycosides, Protein, Triterpenoids, Steroids, Flavonoids (Table1). The presence of these components in this species is an indication that it may have some medicinal potential. The parts of the plant used in Ayurvedic medicine are leaves, the roots, root bark and the flowers. The powered leaves are used for the fast healing of wounds, as a purgative and to treat indigestion. They are used to treat skin disorders and liver problems. The dried leaves are used to promote sexual health including Penile dysfunction and are reputed to be an aphrodisiac. The leaves of *Calotropis procera* are used by various tribes of Central India as a curative agent for jaundice (Sharma et al, 2011). The leaves are used to treat joint pain and reduce swelling. It is also used as a homeopathic medicine (Meena et al, 2011). It is also used by traditional medicine practitioners in Gwari communities for the treatment of ringworms (Kuta, 2008). Tannins have been reported to have antibacterial potential due to their basic character that allows them to react with proteins to form stable water soluble compounds thereby killing bacteria by directly damaging its cell membrane (Mainasara et al, 2012). Murti et al (2010) analysed pharmacognostic standardization of leaves of *Calotropis procera*. Varahalarao et al (2010) examined bioassays for antimicrobial activities using stem, leaves and flowers of *Calotropis procera*.

This research has been proved as a path to many scientists who may implement the result of the present work in developing drugs from *Calotropis procera* against human pathogenic microorganisms.

IV. CONCLUSION

Empirical knowledge about medicinal plants plays a vital role in primary health care and has great potential for the discovery of new herbal drugs. *Calotropis procera* leaf extract made in methanol and petroleum ether contains different secondary metabolites with biological activity that can be of therapeutic index.

Table 1 showed preliminary Phytochemical screening of *Calotropis procera*. It is interesting to note that the action of the extracts of *Calotropis procera* is non-toxic. The obtained results provide a support for the use of this plant in traditional medicine.

REFERENCES

- [1] Srivastava, M., Kumar, A. and Pal, M. 2010. Phytochemical investigation on *Jatropha curcas* seed cake. *Int. J. of Pharmacy and Life science*, 1(6):357-362.
- [2] Murti, Y., Yogi, B. and Pathak, D. 2010. Pharmacognostic standardization of leaves of *Calotropis procera* (Ait.) R.Br. (*Asclepiadaceae*). *Int. J. Ayurveda Res*, 1:14-7.
- [3] Ramaprabha, M. and Vasantha, K. 2012. Phytochemical and antibacterial activity of *Calotropis procera* (Ait.) R.Br. flowers. *Int. J. of Pharma and Biosciences*, 3(1):1-6.
- [4] Cox, P. A. and Balick, M. J. 1994. The ethnobotanical approach to drug discovery. *Scientific American*, 270:60-65.
- [5] Trease, G. E. and Evans, W. C. 1989. A Textbook of Pharmacognosy. Bacilliere tinal Ltd., London, 13th edition.
- [6] mainasarsa, M. M., Aliero, B. L., Aliero, A. A. and yakubu, M. 2012. Phytochemical and antibacterial properties of root and leaf extracts of *Calotropis procera*. *Nigerian J. of Basic and Applied Science*, 20(1):1-6.
- [7] Varahalarao, V. And Chandrashekhar, N. 2010. In vitro bioactivity of Indian medicinal plant *Calotropis procera*. *J. of global Pharma technology*, 2(2):43-45.
- [8] Sharma, A. K., Kharib, R. and Kaur, R. 2011. Pharmacognostical aspects of *Calotropis procera*. *Int. J. of pharma and biosciences*, 2(3):480-488.
- [9] Meena, A. k., Yadav, A. and Rao, M. M. 2011. Ayurvedic uses and pharmacological activities of *Calotropis procera* Linn. *Asian J. of traditional Medicines*, 6(2): 45-53.
- [10] Kuta, F. A. 2008. Antifungal effect of *Calotropis procera* stem bark on Epidermophyton floccosum and Trichophyton gypseum. *African J. of Biotechnology*, 7:2116-2118.

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Effects of Resistance Training with Different Nutrient Supplementation on Muscle Strength

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Abstract- A large body of scientific evidence holds that a combination of carbohydrates and protein/essential amino acids is more efficient than carbohydrates alone when in optimal muscle strength and size gains through resistance training is the goal. However, there is much less consensus on what the optimal timing of administration is, with conflicting reports regarding consumption of supplements before, during, and after training. To try and answer some of these questions, a study was conducted using 23 volunteers performing resistance training for 8 weeks, and consuming either a combination of carbohydrates and protein or carbohydrates alone. Measurements of body composition, limb circumference and strength were performed both before and after. No significant differences could be found observed in any of the measurements between the two groups after 8 weeks of training. While this was unexpected, a closer look at the data, as well as an evaluation of the training methods and nutrient supplementation used in the study in comparison with by other studies in the field, revealed that issues such as nutrient composition, dosage and the training process (directly supervised or not) training may have a strong influence on the results of a training study. Thus, in order to conclusively answer the question of which training and nutritional strategy produces were the best results, first of all, a more standardized training methods are required.

I. INTRODUCTION

Muscle strength is a topic of great interest for scientific research, whether the goal is to improve quality of life in the elderly or seriously ill, or to maximize athletic performance. It is widely accepted that the maximal force output of a muscle is dependent on several different factors, such as motor neuron activation and muscle size. A popular strategy to increase muscle strength is resistance training, which is known to act on both of these factors (Phillips et al, 2005; Weinert, 2009; Andersen et al, 2005; Aagaard, 2004), albeit non-linearly, with increases in actual protein content and cross-sectional area believed to occur later than neuronal adaptations (Fleck & Kraemer, 2004; McArdle et al, 2010). To strengthen the effects on muscle size, resistance training is often accompanied by supplementation of carbohydrates and/or proteins or amino acids (Andersen et al, 2005; Kerksick et al, 2008; Aagaard, 2004). Evidence has shown that a combination of resistance training and proper nutrient supplementation can provide superior results than either alone (Dreyer et al, 2008; Kerksick et al, 2008; Aagaard, 2004; Wolfe, 2000; Bird et al, 2006 a,b,c, Rennie & Tipton, 2000; Cribb & Hayes, 2006).

In light of this background, the present study was conducted as an attempt to evaluate the effectiveness of supplementing macro-nutrients during the training itself, i.e. between sets. The purpose was to assess whether an experimental combination of carbohydrates and proteins could prove more efficient than carbohydrates alone in the context of assisting strength and muscle size gains in conjunction with resistance training over a period of time. The nutritional solution was designed to be consumed during the individual training bouts, similar to the studies by Bird et al (2006 a,b,c), to provide subjects with a near-constant flow of nutrients during resistance training. This in turn would provide a scientific basis on which to evaluate whether supplementation of nutrients during resistance training is a valid strategy when pursuing maximal muscular strength. Previous research in the matter (Dreyer et al, 2008; Kerksick et al, 2008; Aagaard, 2004; Wolfe, 2000; Bird et al, 2006 a,b,c, Rennie & Tipton, 2000; Cribb & Hayes, 2006) indicates that a synergistic effect between carbohydrates and proteins on the processes regulating muscular strength and size ought to occur, leading to greater adaptations than supplementation of carbohydrates alone would provide. Thus, the hypothesis was that a combination of carbohydrates and proteins would prove superior to carbohydrates alone, and provide both greater gains in lean mass and muscle strength. The study was conducted using a randomized double-blind model on volunteering human subjects.

Nutritional supplementation protocol

Using a double blind protocol all subjects were randomly assigned into two groups: CHO group and CHO+PRO group. In the CHO group, thirteen subjects (25 ± 3 yr; 79 ± 7 kg; 182 ± 7 cm) consumed a carbohydrate solution at 0.6667g cho/kg of body weight whereas in the CHO+PRO group, 10 subjects consumed a carbohydrate and protein solution at 0,1667g pro/kg and 0,5g cho/kg of body weight (25 ± 3 yr; 79 ± 8 kg; 181 ± 6 cm). The beverage was consumed during training sessions for both groups. Additionally, all subjects were fed a commercially available recovery drink (Gainomax) at 0.5g of cho/kg and 0.25g of pro/kg of body weight twenty-five minutes after a completed session. Subjects were instructed to avoid all other commercial and non-commercial supplements during the course of the study. A scheme of the CHO and CHO +PRO groups pre-training statistics is given.

Training protocols

Over the course of eight weeks, the subjects were given a choice of three different resistance training programs based on predilection and available time. The programs varied in training

days per week (2,3 or 4), sets and reps in order to periodize training loads, in general, all programs offered a blend of guided-motion machines and free weights, and targeted all major muscle groups in the body, with a certain emphasis of the legs, particularly the quadriceps. Both the 2 and 3 sessions/week programs re-used the training schedule of weeks 1 through 4 with increased loads for weeks 5 through 8. The 4 sessions/week program, however, featured a different set of exercises for weeks 5 through 8. Each session lasted approximately 60 minutes, with

an additional 10 minutes of standardized warmup before, and 25 minutes of rest after each session. A scheme of a typical resistance training session is given as figure 1. All participants were instructed to avoid excessive endurance training during the duration of the study, to avoid a potential negative effect on adaptations to resistance training (Fleck & Kraemer, 2004). All training schedules, as well as a more detailed explanation of each of the 3 programs.

Warmup (stationary bike)	First training period		Second training period		Third training period		Fourth training period		Recovery 25 min rest, recovery drink
	% of beverage	Resistance training	% of beverage	Resistance training	% of beverage	Resistance training	% of beverage	Resistance training	
10 min, 50 rpm, 1,5 kpa		2 exercises, 2-4 sets		2 exercises, 2-4 sets		2 exercises, 2-4 sets		2 exercises, 2-4 sets	

Figure 1. Typical resistance training protocol for this study. Depending on which program subjects chose, the precise number of exercises could vary. Nevertheless, the basic schedule of warmup – ingestion of beverage – resistance training – ingestion of beverage was the same for all three programs, and recovery drinks were provided to all participants regardless of group assignment (i.e. CHO or CHO+PRO)

II. RESULTS:

Body composition

Table 1a. Body composition statistics for the CHO and CHO+PRO groups before and after exercise as well as P-values for both within group- and between group analyses. All data are presented ± SD. An indicates that P<0,05.

After the 8 weeks training, both groups showed significant (P<0.05) increase in overall weight and whole body lean mass (Table 1a).

	CHO		CHO+PRO		P-values			
	PRE	POST	PRE	POST	Within groups		Between groups	
					CHO	CHO+PRO	PRE	POST
Weight (kg)	78,67 ± 8,44	80,8 ± 8,86	78,87 ± 6,87	81,24 ± 6,95	0,0004*	0,0005*	0,9518	0,8984
Whole body lean mass (kg)	61,02 ± 6,96	63,06 ± 6,91	59,72 ± 5,44	61,92 ± 5,16	0,0001*	<0,0001*	0,6323	0,6655
Whole body fat mass (kg)	14,37 ± 3,45	14,45 ± 3,93	15,83 ± 3,61	15,98 ± 4,05	0,7710	0,6475	0,3378	0,3701
Whole body fat %	19 ± 3,91	18,51 ± 4,17	20,88 ± 4,22	20,4 ± 4,47	0,1064	0,1475	0,2832	0,3075
Fat mass torso (kg)	6,98 ± 1,91	7,15 ± 2,32	7,41 ± 1,94	7,56 ± 2,24	0,4079	0,5031	0,6016	0,6739
Lean mass torso (kg)	27,92 ± 3,26	28,4 ± 3,11	26,86 ± 2,6	27,38 ± 2,31	0,0660	0,0438*	0,4114	0,3977
Fat mass legs (kg)	5,02 ± 1,29	4,93 ± 1,28	5,92 ± 1,38	5,91 ± 1,51	0,2830	0,9374	0,1217	0,1085
Lean mass legs (kg)	21,39 ± 2,67	22,52 ± 2,84	21,46 ± 1,72	22,62 ± 1,8	0,0001*	<0,0001*	0,9425	0,9252
Fat mass arms (kg)	1,5 ± 0,51	1,5 ± 0,49	1,57 ± 0,4	1,6 ± 0,46	0,9671	0,4742	0,6998	0,6082
Lean mass arms (kg)	8,34 ± 1,27	8,8 ± 1,27	7,84 ± 1,14	8,41 ± 1,12	0,0006*	<0,0001*	0,3412	0,4547

Table 1b. Delta values in body composition for the CHO and CHO+PRO group after 8 weeks of training. A double asterisk indicates a non significant advantage for one group over the other.

	CHO Delta ± SD	CHO+PRO Delta ± SD
Weight (kg)	2,13 ± 1,6	2,37 ± 1,41**
Whole body lean mass (kg)	2,05 ± 1,25	2,2 ± 0,65**
Whole body fat mass (kg)	0,08 ± 0,92	0,16 ± 1,05**
Whole body fat %	-0,5 ± 1,03	-0,48 ± 0,96
Fat mass torso (kg)	0,17 ± 0,71**	0,15 ± 0,68
Lean mass torso (kg)	0,48 ± 0,85	0,52 ± 0,7**
Fat mass legs (kg)	-0,08 ± 0,26**	-0,01 ± 0,33
Lean mass legs (kg)	1,13 ± 0,75	1,16 ± 0,2**
Fat mass arms (kg)	0 ± 0,12	0,03 ± 0,13**
Lean mass arms (kg)	0,46 ± 0,36	0,57 ± 0,18**

Strength

As seen in table 2a, no significant differences were observed in any of the strength parameters between the two groups either before or after the 8 weeks of training.

*Table 2a. Strength results for the CHO and CHO+PRO groups before and after exercise, as well as P-values for both within group- and between group analyses. All data are presented ± SD. The CHO group had 11 subjects complete measurements for peak torque values, and 12 subjects complete the bench press 3 RM test. For the CHO+PRO group, one subject failed to complete measurements on his left leg post-exercise, thus bringing the number of completed measurements for peak torque in the left leg to 9. An * indicates that P<0,05.*

	CHO		CHO+PRO		P-values			
	PRE	POST	PRE	POST	Within groups		Between groups	
					CHO	CHO+PRO	PRE	POST
Peak torque extension R (Nm)	241,36 ± 48,16	257,75 ± 54,63	246,03 ± 29,84	263,55 ± 39,87	0,0672	0,0248*	0,7950	0,7862
Peak torque extension L (Nm)	242,58 ± 37,28	259,66 ± 42,23	231,82 ± 30,58	245,12 ± 34,88	0,0606	0,0425*	0,5046	0,4192
Peak torque flexion R (Nm)	122,95 ± 21,97	129,79 ± 24,79	129,53 ± 14,91	133,54 ± 11,84	0,1307	0,3247	0,4371	0,6688
Peak torque flexion L (Nm)	121,3 ± 21,01	124,96 ± 23,49	118,81 ± 10,69	125,84 ± 12,97	0,3074	0,0481*	0,7528	0,9212
Benchpress 3RM (kg)	79,17 ± 14,16	84,38 ± 14,15	75,25 ± 17,26	79,75 ± 19,16	0,0411*	0,0642	0,5649	0,5225

Table 2b. Delta values in strength for the CHO and CHO+PRO group after 8 weeks of training. A double asterisk indicates a non significant advantage for one group over the other.

	CHO Delta ± SD	CHO+PRO Delta ± SD
Peak torque extension R (Nm)	16,39 ± 26,48	17,52 ± 20,59**
Peak torque extension L (Nm)	17,08 ± 26,8**	13,3 ± 16,55
Peak torque flexion R (Nm)	6,84 ± 13,77**	4,01 ± 12,17
Peak torque flexion L (Nm)	3,66 ± 11,3	7,03 ± 9,05**
Benchpress 3RM (kg)	5,21 ± 7,8**	4,5 ± 6,75

Limb circumference

In both groups, overall limb circumference at all measuring points for both arm and leg increased following the training period (table 3a).

*Table 3a. Limb circumference results for the CHO and CHO+PRO groups before and after exercise, as well as P-values for both within group- and between group analyses. All data are presented ± SD. An * indicates that P<0,05.*

	CHO		CHO+PRO		P-values			
	PRE	POST	PRE	POST	Within groups		Between groups	
					CHO	CHO+PRO	PRE	POST
Arm 40 % (cm)	33 ± 2,18	33,79 ± 2,13	32,11 ± 1,9	32,87 ± 1,92	0,0654	0,1033	0,4254	0,3638
Arm 50 % (cm)	32,46 ± 2,51	33,15 ± 2,33	30,93 ± 1,71	31,82 ± 1,48	0,2283	0,0035*	0,2304	0,1759
Arm 60 % (cm)	31,16 ± 2,17	32,24 ± 2,49	30,01 ± 1,79	30,92 ± 1,61	0,0867	0,0014*	0,3438	0,2099
Leg 40% (cm)	57,64 ± 3,32	59,55 ± 3,21	58,47 ± 2,79	60,41 ± 3,04	0,0030*	0,0019*	0,5548	0,5781
Leg 50% (cm)	54,85 ± 2,79	56,58 ± 3,36	55,67 ± 3,31	57,94 ± 3,06	0,0094*	0,0094*	0,6361	0,3935
Leg 60% (cm)	50,88 ± 3,34	52,53 ± 2,7	51,54 ± 3,04	54,61 ± 3,6	0,0135*	0,0025*	0,6635	0,2011

Table 3b. Delta values in limb circumference for the CHO and CHO+PRO group after 8 weeks of training. A double asterisk ** indicates a non significant advantage for one group over the other.

	CHO Delta ± SD	CHO+PRO Delta ± SD
Arm 40 % (cm)	0,79 ± 1,02**	0,76 ± 1,23
Arm 50 % (cm)	0,69 ± 1,47	0,89 ± 0,65**
Arm 60 % (cm)	1,08 ± 1,53**	0,91 ± 0,58
Leg 40% (cm)	1,91 ± 1,22	1,94 ± 1,28**
Leg 50% (cm)	1,73 ± 1,38	2,38 ± 2,1**
Leg 60% (cm)	1,65 ± 1,42	3 ± 2,17**

III. DISCUSSION

Overall, the results of this study showed that there are no statistically significant differences between the CHO and the CHO+PRO group after 8 weeks of training. Comparison within each of the two groups confirmed this result. However, a closer inspection of the data revealed that the CHO+PRO group exhibited slightly better, albeit not significantly so, results in body composition and limb circumference than the CHO group.

Body composition

As shown in table 1a, in the 10 parameters measured in the study, none of them showed significant difference between the two groups, indicating extra supplementation of protein in the CHO+PRO group did not bring more effectiveness in improving body composition compared to carbohydrates alone in the CHO group. This is confirmed by comparisons of the parameters within each group (shown in table 1a). The CHO+PRO group reached statistical significance in 5 parameters, whereas the CHO group reached significance in 4. Similar results were obtained when comparing the delta values of the two groups. As shown in table 1b, the CHO+PRO group obtained slightly better results in lean mass accretion, both at the whole body level and in individual segments, but this did not reach a significant level.

A very important consideration when examining these results is the nature of the nutritional supplement that was provided. As was mentioned earlier, carbohydrates are capable of influencing protein accretion in the muscles, mainly through their effect on insulin, and the subsequent decrease in catabolism observed in the muscle cells (Bird et al, 2006 a,b; Aagaard, 2004, Lemon et al, 2002) Thus, it is not the increase in lean mass exhibited by the CHO group that is unexpected in itself, but rather the lack of significant difference with the CHO+PRO group, since combination of both carbohydrates and protein is widely considered to be more efficient than either nutrients alone (Volek, 2003; Dreyer et al, 2008; Kerksick et al, 2008; Aagaard, 2004; Wolfe, 2000; Bird et al, 2006 a,b,c, Rennie & Tipton, 2000; Cribb & Hayes, 2006).

Also of interest when analyzing these results is the actual dosage of nutritional supplementation that the subjects were given. The dosage of nutritional supplementation received by the test subjects were relatively modest, and, as described in the methods section, both groups received the same post-exercise supplement. This means that the difference between both groups was a small amount of mixed protein over each training session. While mixed protein is known to have an anabolic effect in combination with resistance training (Hulmi et al, 2010; Hulmi et

al, 2009; Weinert, 2010; Andersen et al, 2005; Willoughby et al, 2006), it seems that essential amino acids, in particular leucine, have a similarly potent effect (Dreyer et al, 2008; Greiwe et al., 2001; Karlsson et al., 2004; Rennie, 2005; Smith et al., 2005; Bohé et al., 2003; Hara et al., 1998; Weinert, 2009). In particular, the studies published by Bird et al (2006 a,b,c) obtained hypertrophic responses from their subjects with dosages of 6g essential amino acids. Other studies report similar effects when essential amino acids are supplemented (Børsheim et al., 2002; Karlsson et al., 2004). Perhaps a higher concentration of these essential amino acids instead of mixed protein would have been more beneficial. Alternatively, a higher dosage of protein might also have led to more clearly defined results, such as those of Hulmi et al (2009) (30g), Hartman et al (2007) (35g) Willoughby et al (2006) (40g) and Andersen et al (2005) (50g). This is further supported by the lack of significant differences post-exercise between test subjects in a study by Rankin et al (2004), who used a low dosage of protein (0,21g/kg body weight).

Strength

Comparison in results of all parameters between groups showed no significant difference in results, suggesting no effect on muscle strength with extra protein supplementation during resistance training. However, within group analyses showed that the CHO+PRO group obtained slightly better results than the CHO group, with the former presenting 3 statistically significant changes and the latter only 1 statistically significant change (see table 2a). This result suggests that the extra protein supplementation during resistance training in this study is indeed more effective in improving muscle strength, albeit not significantly so. Further analysis of the delta values of both groups, as seen in table 2b, revealed no trend towards either group becoming better in results than the other, thus supporting our conclusion based on comparisons between groups.

As seen in table 2a, both groups exhibit strong trends towards increases in the parameters where statistical significance was not reached, with the exception of flexion for both legs. It is possible this is a result of the training programs mainly focusing on exercises targeting the quadriceps, responsible for extending the knee joint, as well as the fact that the hamstring muscles, the main knee flexors, are generally smaller muscles when compared against the quadriceps (Tortora & Derrickson, 2006). However, the effect of directly supervised training could also be an important factor, as directly supervised resistance training has been shown to produce better effects than unsupervised training in moderately trained young men (Mazetti et al, 2000). In particular Mazetti et al. (2000), demonstrated that mean training loads, expressed in kg per set, as well as rates of increase and

maximal 1 RM strength in the squat and bench press were significantly higher in a group training for 12 weeks under direct supervision, when compared to another unsupervised group. The difference in duration notwithstanding, the method used by Mazetti et al. (2000), is quite similar to the method in this study regarding the use of direct supervision. In that study, the author concluded that the reason direct supervision was more efficient than unsupervised was because of the increased training loads supervised subjects was exposed to, due to a faster weekly progression. This may have been caused by two separate factors working in a feed-forward fashion, with the presence of a personal trainer increasing motivation and competitiveness in the supervised subjects, thus enabling the use of higher loads, which in turn would have caused a higher recruitment of fast-twitch motor units. Over a period of 12 weeks, these factors working in tandem are a probable explanation to the results displayed, as the author himself theorize (Mazetti et al, 2000). Working on this assumption, it is quite possible that the positive psychological, motivational, and logistical aspects, such as spotting, of the direct supervision that both the CHO and CHO+PRO groups were subject to may have had similar effects on the end results displayed. Thus, it is a possibility that this also could have acted in a manner that would have decreased differences between the two groups. This is not supported by the results of Hartman et al (2007), who reported significant differences between a group consuming fat-free milk and two other groups consuming soy or carbohydrate after 12 weeks of directly supervised training. However, as mentioned earlier, Hartman et al (2007) also used a relatively large dosage of protein (35g), which may partially account for the discrepancy with our results. In comparison, Bird et al (2006) also used direct supervision for 12 weeks, but reported few significant differences between treatment groups, likely because of low nutrient dosage. Similar results are exhibited by Rankin et al (2004), who report no significant differences between a group consuming fat-free milk and a group consuming carbohydrates only after 10 weeks of supervised training. Again, low dosage of nutrients appears to be a likely explanation, since Rankin et al (2004) used 0,21g of protein/ kg body weight. Thus, while supervision on its own is known to play an important role in increasing adaptation to resistance training, it seems that this effect is not as potent when combined with various supplementation regimes. However, to this authors knowledge, no study has examined this directly. Thus, more research is required in order to assess whether or not this is the case.

Limb circumference

Has been shown in this study, both the CHO+PRO group and the CHO group increased their lean mass almost equally. Consequently, there are no statistical differences between the two groups regarding limb circumference either. Since limb size is dependent on the accretion of protein in muscles, it is possible that many of the factors mentioned earlier as likely explanations for the lack of significance between the groups also apply here. Limb circumference is also not a very common indication of increased muscle size, however studies that have measured CSA through muscle biopsies tend to support this theory. For example, in a 12 week training study using an intense (5 sessions/week) protocol, subjects consuming a fat-free milk solution showed

greater increase of CSA in both type I and II fibers. This study also used a large (35g of protein) dosage of nutrient supplementation (Hartman et al, 2007). In comparison, Bird et al (2006 c), who also used directly supervised training report a significant difference between their CHO+EAA and CHO only group only in type I fiber CSA. In that study, the nutritional dosage was low (6g of essential amino acids). Similar results are also reported by Rankin et al (2004), who used direct supervision and a low dosage of nutrient supplementation.

IV. CONCLUSION

In conclusion, no significant differences were observed in any of the measurements between the two groups after 8 weeks of training. a closer look at the data generated by this study shows that supplementation of protein and carbohydrates at a dosage of 1,667 and 0,5g/kg body weight during training bouts produces slightly better results than supplementation of carbohydrates at 0,667g/kg body weight, in young healthy men with resistance training experience. However, while within-group analyses show a trend for the CHO+PRO group to exhibit better results than the CHO group, between-group analyses show no significance. Examining the results shown by this study and those of others suggest several factors, like nutrient dosage and composition, as well as training duration, periodization and supervision, all influence the final results. Adaptation to training, although what, if any degree of synergy there is between these factors is hard to assess because of dissimilar methods and results. Thus, any future studies aim to examine nutritional supplementation during resistance training to improve muscle strength and size should take precautions to avoid such mitigating factors, in order to insure more clearly defined answers

REFERENCES

- [1] Andersen, L.L., Tufekovic, G., Zebis, M.K., Cramer, R.M., Verlaan, G., Kjær, M., Suetta, C., Magnusson, P., Aagaard, P. (2005) The effect of resistance training combined with timed ingestion of protein on muscle fiber size and muscle strength. *Metabolism clinical and experimental*, 54, 151-156.
- [2] Bird, S.P., Tarpinning, K.M., Marino, F.E. (2006 a) Effects of liquid carbohydrate/essential amino acid ingestion on acute hormonal response during a single bout of resistance exercise in untrained men. *Nutrition*, 22, 367-375.
- [3] Bird, S.P., Tarpinning, K.M., Marino, F.E. (2006 b) Liquid carbohydrate/essential amino acid ingestion during a short-term bout of resistance exercise suppresses myofibrillar protein degradation. *Metabolism Clinical and Experimental*, 55, 570-577.
- [4] Bird, S.P., Tarpinning, K.M., Marino, F.E. (2006 c) Independent and combined effects of liquid carbohydrate/essential amino acid ingestion on hormonal and muscular adaptations following resistance training in untrained men. *Eur J Appl Physiol*, 97, 225-238.
- [5] Bohé, J., Low, A., Wolfe, R.R. & Rennie, M.J. (2003). Human muscle protein synthesis is modulated by extracellular, not intramuscular amino acid availability: a dose-response study. *Journal of physiology*, 552 (1), 315-324.
- [6] Børsheim, E., Tipton, K.D., Wolf, S.E. & Wolfe, R.R. (2002). Essential amino acids and muscle protein recovery from resistance exercise. *American journal of physiology – endocrinology and metabolism*, 283 (4), E648-E657.

- [7] Cribb, P.J., Hayes, A. (2006) Effects of supplement timing and resistance training on skeletal muscle hypertrophy. *Med Sci Sports Exerc*, 38 (11), 1919-1925.
- [8] Dreyer, H.C., Drummond, M.J., Pennings, B., Fujita, S., Glynn, E.L., Chinkes, D.L., Dhanani, S., Volpi, E., Rasmussen, B.B. (2008) Leucine-enriched essential amino acid and carbohydrate ingestion following resistance exercise enhances mTOR signaling and protein synthesis in human muscle. *Am J Physiol Endocrinol Metab*, 294, 392-400.
- [9] Fleck, S.J., Kraemer, W.J. (2004) Designing resistance training programs. Human kinetics, U.S.A.
- [10] Greiwe, J.S., Kwon, G. McDaniel, M.L. & Semenkovich, C.F. (2001). Leucine and insulin activate p70 S6 kinase through different pathways in human skeletal muscle. *American journal of physiology – endocrinology and metabolism*, 281 (3), 466-471.
- [11] Hara, K., Yonezawa, K., Weng, Q-P., Kozlowski, M.T., Belham, C & Avruch, J. (1998). Amino acid sufficiency and mTOR regulate p70 S6 kinase and eIF-4E BP1 through a common effector mechanism. *The journal of biological chemistry*, 273 (23), 14484-14494.
- [12] Hartman, J.W., Tang, J.E., Wilkinson, S.B., Tarnopolsky, M.A., Lawrence, R.L., Fullerton, A.V., Phillips, S.M. (2007) Consumption of fat-free fluid milk after resistance exercise promotes greater lean mass accretion than does consumption of soy or carbohydrate in young, novice, male weightlifters. *Am J Clin Nutr*, 86, 373-381.
- [13] Hulmi, J.J., Kovanen, V., Selänne, H., Kraemer, W.J., Häkkinen, K., Mero, A.A. (2009) Acute and long term effects of resistance exercise with or without protein ingestion on muscle hypertrophy and gene expression. *Amino acids*, 37, 297-308.
- [14] Hulmi, J.J., Lockwood, C.M., Stout, J.R. (2010) Effect of protein/essential amino acids and resistance training on skeletal muscle hypertrophy: A case for whey protein. *Nutrition and metabolism*, 7 (51) (Review)
- [15] Karlsson, H.K.R., Nilsson, P-A., Nilsson, J., Chibalin, A.V., Zierath, J.R & Blomstrand, E. (2004). Branched-chain amino acids increase p70s6k phosphorylation in human skeletal muscle in resistance exercise. *American journal of physiology – endocrinology and metabolism*, 287 (1), E1-E7.
- [16] Kerksick, C., Harvey, T., Stout, J., Campbell, B., Wilborn, C., Kreider, R., Kalman, D., Ziegenfuss, T., Lopez, H., Landis, J., Ivy, J.L., Antonio, J. (2008) International society of sports nutrition stand: Nutrient timing. *Journal of the international society of sports nutrition*, 5, 17. (Review)
- [17] Lemon, P.W.R., Berardi, J.M., Noreen, E.E. (2002) The role of protein and amino acid supplements in the athlete's diet: Does type or timing of ingestion matter? *Current sports medicine reports* 4, 214-221)
- [18] Mazetti, S.A., Kraemer, W.J., Volek, J.S., Duncan, N.D., Ratamess, N.A., Gómez, A.L., Newton, R.U., Häkkinen, K., Fleck, S.J. (2000) The influence of direct supervision of resistance training on strength performance. *Med Sci Sports Exerc*, 32(6) 1175-1184.
- [19] McArdle, W.D., Katch, F.I., Katch, V.L. (2010) Exercise physiology. Lippincott, Williams & Wilkins, China.
- [20] Phillips, S.M., Hartman, J.W., Wilkinson, S.B. (2005) Dietary protein to support anabolism with resistance exercise in young men. *Journal of the American college of nutrition*, 24 (2), 134-139. (Review)
- [21] Rankin, J.W., Goldman, L.P., Puglisi, M.J., Nickols-Richardson, S.M., Earthman, C.P., Gwazdauskas, F.C. (2004) Effect of post-exercise supplement consumption on adaptations to resistance training. *Journal of the American college of nutrition*, 23(4), 322-330.
- [22] Rennie, M.J. (2005). Body maintenance and repair: how food and exercise keep the musculoskeletal system in good shape. *Experimental physiology*, 90, 427-436.
- [23] Rennie, M.J., Tipton, K.D. (2000) Protein and amino acid metabolism during and after exercise and the effects of nutrition. *Ann Rev Nutr*, 20, 457-483
- [24] Smith, E.M., Finn, S.G., Tee, A.R., Browne, G.J. & Proud, C.G. (2005) The tuberous sclerosis protein TSC2 is not required for the regulation of the mammalian target of rapamycin by amino acids and certain cellular stresses. *The journal of biological chemistry*, 280 (19), 18717-18727.
- [25] Tortora, G.J. & Derrickson, B. (2006). Principles of anatomy and physiology. Wiley & sons, inc: Hoboken.
- [26] Weinert, D.J. (2009) Nutrition and muscle protein synthesis: a descriptive review. *J Can Chiropr Assoc*, 53 (3), 186-194. (Review)

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Electrical Resistivity as a Geophysical Mapping Tool; A Case Study Of The New Art Department, Knust- Ghana

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ABSTRACT

Continuous vertical electrical sounding (CVES) surveys were carried out on KNUST campus to ascertain the electrical properties of the formations in the area in order to determine its suitability for the construction of heavy structures. Eight 2D CVES profiles were conducted at the site in the study area with a Wenner array using electrode separations of 1, 2.5 and 4 m. The apparent resistivity data were inverted using the least square inversion technique into subsurface electrical structures. The results on the profiles running N-S indicate a well defined boundary in the electrical resistivity structure between the wet granites at the base and the dry undifferentiated granites on top of it.

Keywords; *continuous vertical electrical sounding (CVES), KNUST, resistivity, Wenner array, inversion, imaging*

INTRODUCTION

Electrical resistivity surveys are based on the response of the earth to the flow of electrical current. Artificially generated electric currents are introduced into the ground and the resulting potential differences are measured at the surface (Telford et al., 1990; Lowrie 2007). All materials, including soil and rock, have an intrinsic property- resistivity that governs the relation between the current density and the gradient of the electrical potential. In general, the main principle in any geophysical explorations is to non-intrusively gather data on the area of interest (Scollar et al., 1990). Variations in the resistivity vertically or laterally produces variations in the relation between the applied current and the potential distribution as measured on the surface and thereby reveal something about their composition, extent, and physical properties of the material. Resistivity is therefore, one of the most variable physical properties (Keary et al., 2002) **-ranging between $1.6 \times 10^{-8} \Omega\text{m}$ for native silver to about $10^{16} \Omega\text{m}$ for pure sulphur.**

The resistivity method has varied applications in mining, groundwater detection, and subsurface geological structure among others. The use of geoelectrical method as an effective tool for gaining knowledge into the subsurface structure, in particular, for identifying anomalies and defining the complexity of the subsurface geology and is fast gaining grounds (Lapenna et al., 2005; Siddiqui and Osman, 2012). This may mainly be due to the fact that on electrical resistivity tomographies, faults lines and other geological formations such as fractures etc, easily stand out due to their low resistivity values compared to the surrounding (Aning et al., 2013). These features are normally identified as anomalies in the electrical resistivity tomographies as they differ from the host material.

Field studies by Ozegin et al., (2011) predicted that a geologic structure which was most probably a fracture was established and confirmed to be a potential source of building failure in a site, and this happens when building is constructed across the geologic structure. Garg (2007) found that if a building is constructed at a site, without properly considering the underground strata or its load-bearing capacity, it may settle excessively or differentially, causing development of cracks in the building which may ultimately lead to its failure and collapse. Subsurface geological features such as fractures, voids, and nearness of water table to the surface are among the inconveniences that pose constraint to building constructions especially to their foundations (Andrews et al., 2013).

The electrical resistivity method is very good tool for resolving geological problems ranging from the delineating of hidden underground structures (i.e. fractures, faults water accumulation etc.). It has also made the spatiotemporal evolution of groundwater flow relative to landslide occurrence to studies improve greatly (Aning et al., 2013).

In this work, the electrical resistivity distribution of the subsurface of the site would be measured by the application of the CVES method for imaging the subsurface of study area.

STUDY AREA

The survey site can be located behind the Engineering labs close to the new college of Arts building at the Kwame Nkrumah University of Science and Technology in Kumasi – Ghana. The project site falls within the wet sub-equatorial setting with mean minimum temperature of about 21.5 °C and maximum average temperature of 30.7 °C. The estimated area of the site is (160x100) m² with the land sloping gently in the South-North direction.

The area is underlain by Dahomeyan formation, mainly granitoid undifferentiated rocks as shown on fig. 1 and can be located on 6.6849083 °N and 1.5705194 °W. The Dahomeyan formation, consisting of mainly metamorphic rock such as gneiss and schist, occupies the south-southeastern corner of Ghana and occurs as four alternate belts of acid and basic gneisses, trending south-southwest to northeast direction (Griffis et al, 2002).

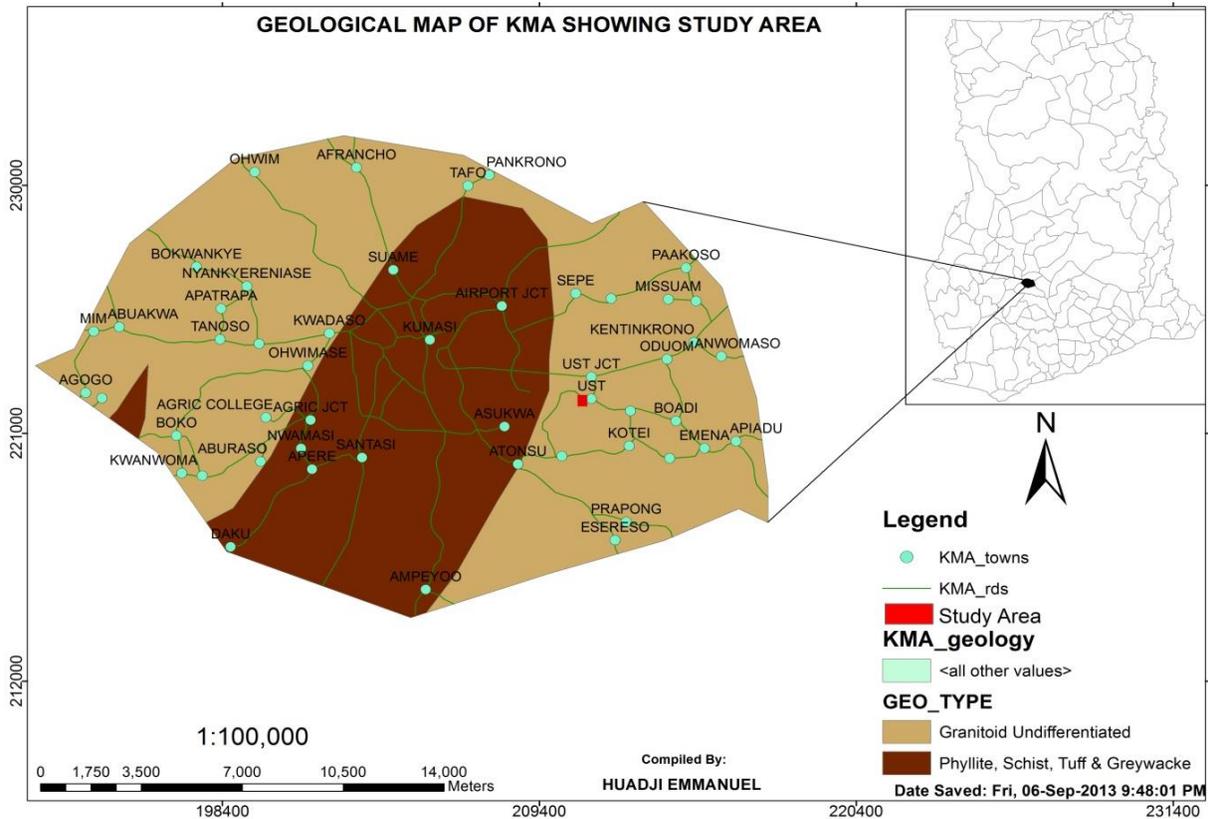


Fig. 1: Geological map of Kumasi Metropolis showing the study area in red (Geological Survey Department, Ghana, 2009)

DATA ACQUISITION AND PROCESSING

The multi-electrode ABEM Lund Resistivity Imaging System was used to carry out the electrical resistivity measurements on 8 profiles (Fig.2). The system operates automatically once the geometrical parameters (array type, electrode separation and minimum current) are set. The Wenner array with 41 electrodes connected to four 40 m long multi-core cables was used to collect the data. This configuration (Wenner array) is able to give better resolution of the subsurface resistivity distribution (Hamzah et al., 2006). The Continuous Vertical Electrical Sounding (CVES) was used to acquire the data on the field. The equipment used for the survey includes the ABEM terrameter SAS 4000, power supply (car battery), electrodes and multi-conductor cables. For this survey, the electrode separations were as shown in Table 1.

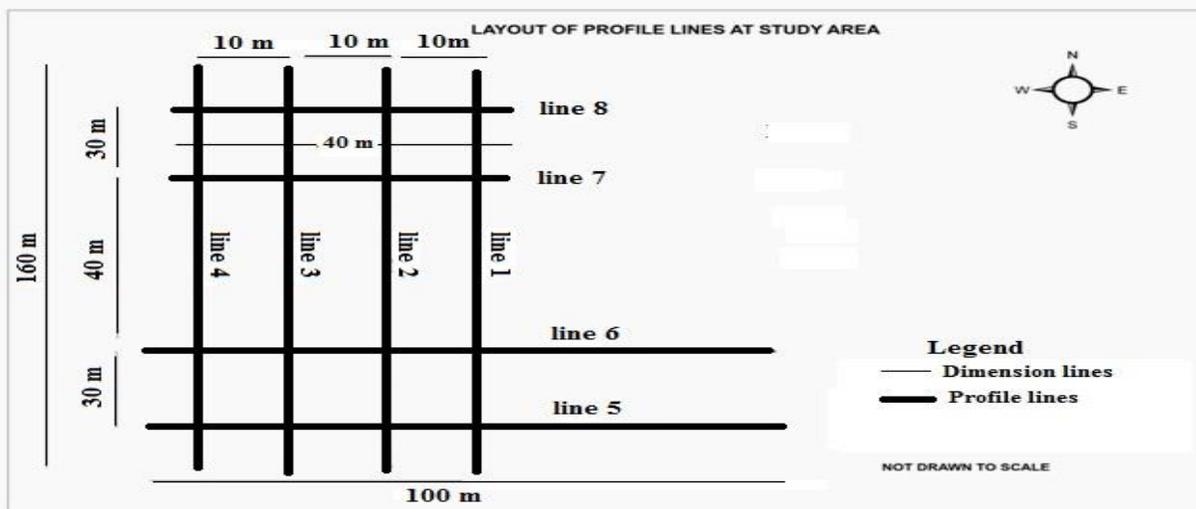


Figure 2 Profile layout

Table 1: Table showing electrode spacing and length of profile lines

Lines	Electrode separation /m	Length of line /m
1, 2, 3 and 4	4	160
5 and 6	2.5	100
7 and 8	1	40

The electrode separation was chosen in order to get a better resolution of the near surface structures so as to properly interpret the resistivity tomograph and advise the authorities on where to put up structures in future.

The resistivity measurements were taken along the profile lines as shown in Fig. 2, with 4 automatically selected electrodes according to the configuration protocols set on the ABEM terrameter. Each electrode position is uniquely identified at a takeout on the cable. This helps in identifying the required current and potential pairs during the measurement at various data levels as 'a' (electrode separation) is increased by a factor.

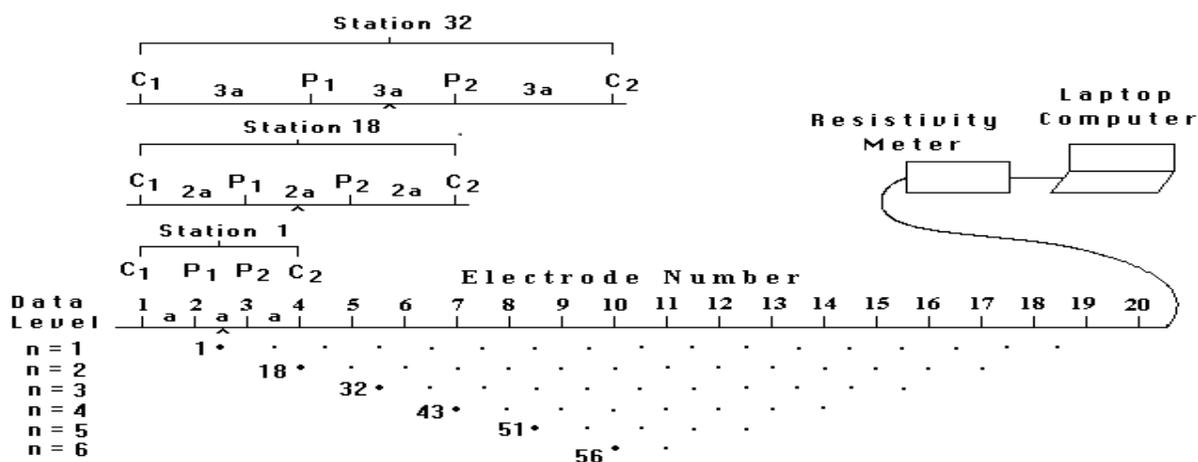


Fig. 3: Sketch of the electrodes for 2D geoelectrical resistivity survey and the sequence of measurement for building the pseudosection (Loke, 2011)

As a precaution for the acquisition of reliable and accurate resistivity data, the cables are checked for cuts and on every line, the electrodes are checked for contact resistance. Where the ground contact resistance is bad, salt water is sprinkled around the electrodes and lowered deeply into the ground.

The processing of the electrical resistivity measurements was done using the Res2DINV software, after the data was topographically corrected. The data was first read in and bad datum point (which usually shows as spikes) were then exterminated to enhance the data. Inversion was then carried out to estimate the true resistivity structure of the subsurface. The L_1 norm (robust inversion technique) of the least square inversion technique was used to allow the modeling of relatively sharp changes in resistivity because the inversion algorithm aims to minimize the absolute value of data misfit (Loke et al. 2003).

Model refinement option of the “Inversion” menu was used to take care of the large resistivity variations near the ground surface. With this option, the program automatically reduces the unit electrode spacing it uses by half of that given in the data. The user defined logarithmic contour intervals option was used for easier comparison of the images.

RESULTS AND DISCUSSION

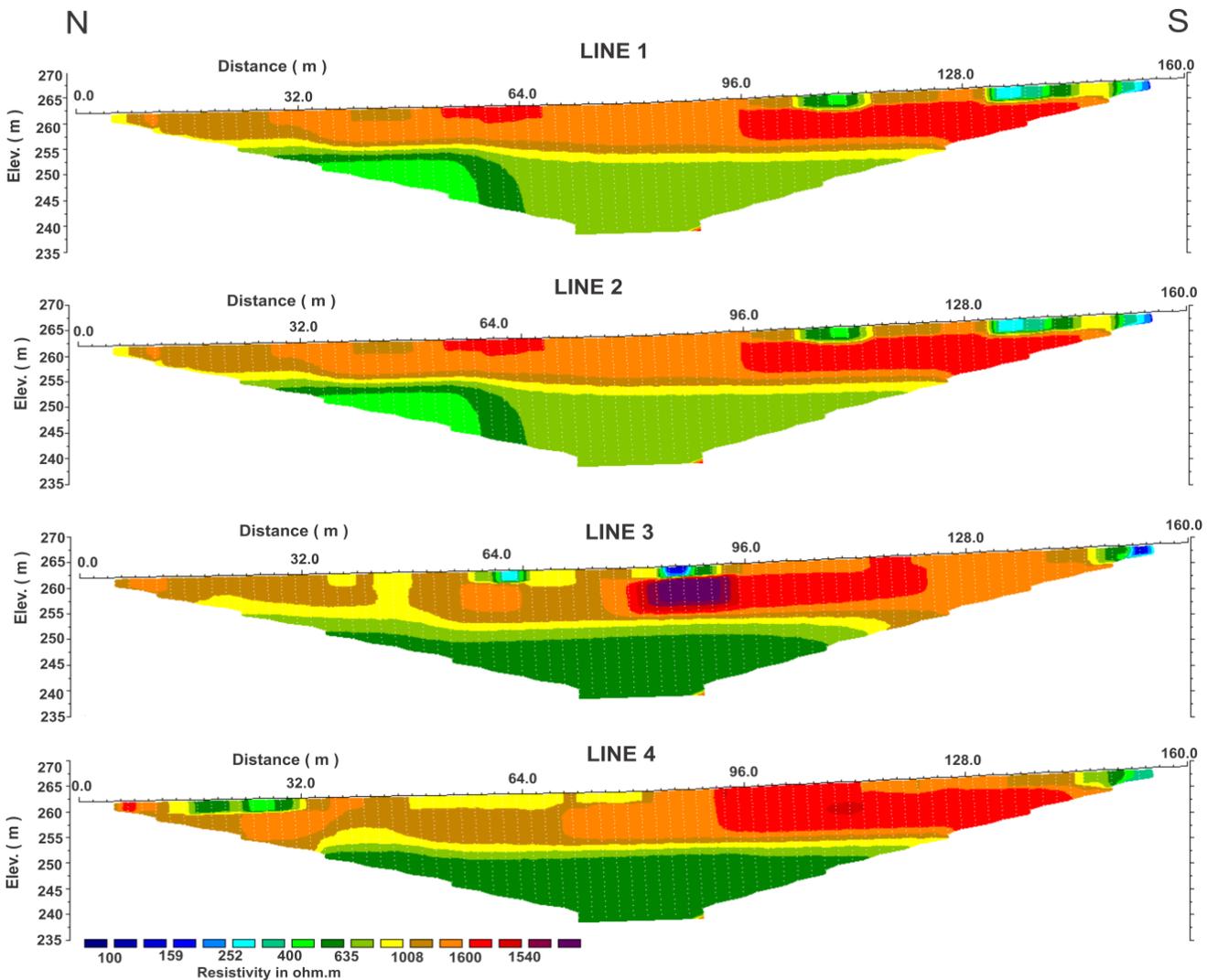


Fig. 4: Models for lines running North-South

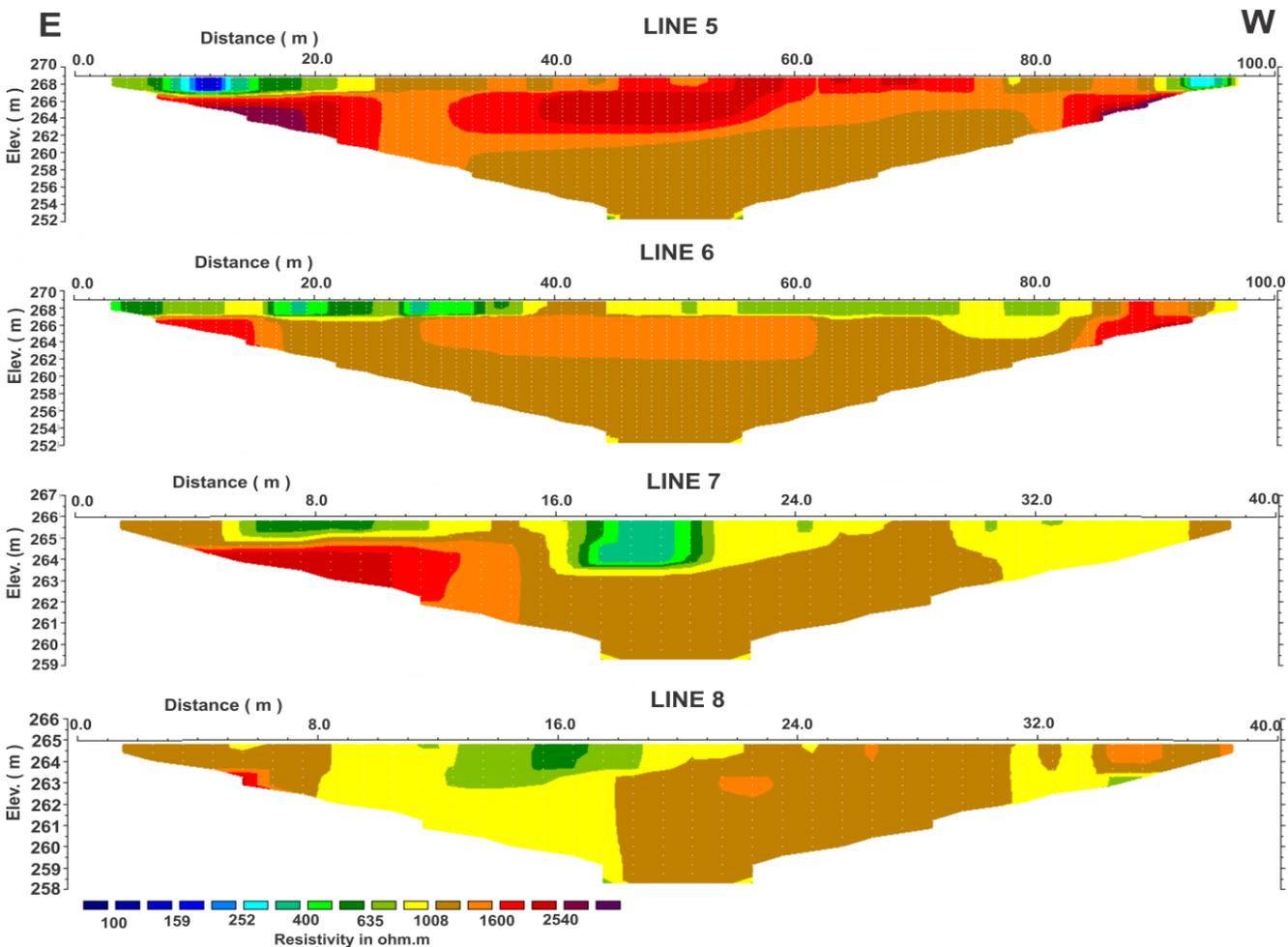


Fig. 5: Models for lines running East-West

On lines 1 and 2, apparent resistivity generally decreases with depth. High resistive materials are found at the top with patches of low resistivity materials on the surface to an elevation of about 260 m. The high resistive materials in the subsurface can be found to depths of about 10 m. A slab-like material of a very high resistivity situated beneath the 96 m and 128 m marks occurs at an elevation of about 262 m to 255 m above sea level.

Line 3 however, shows the high resistive material exposed at the surface at depths of about 0.3 m at the 92 m mark through to the 140 m mark in the south. The most resistive material on the site is recorded on this line at 88 m and found at depths of 3 m to 7 m. However, low resistivity is recorded directly above this material. The fourth line records high resistivity at the center of the profile line and stretches to the end of the line to depths of about 10 m.

The profile lines 5, 6, 7 and 8 in Fig. 5, run from the East to the West at varied depths due to the profile lengths. Line 5 probes to a maximum depth of 15.5 m. It therefore does not provide any information on the low resistivity layers encountered in the first four lines. However, the high resistive materials are exposed at the surface on this line. The most resistive material in the area is found at the 15 m mark.

At about 30 m from line 5 in the north direction, profile line 6 shows relatively low resistivity materials on the surface at an average depth of about 3 m with the high resistive material directly below it. This line also provides information to depths of about 15.5 m.

The seventh line which is 40 m from the sixth shows similar resistivity distribution as line 6. Low resistivity materials encountered at the center and the depth of probe is about 6.7 m from the surface. The final line, line 8 at the north shows low resistivity distribution in the region.

In general, the resistivity values of the subsurface materials at the site are in the range of resistivity of granitic materials. The upper layer is made of highly resistive materials to a depth of about 10 m and it can be inferred to be disseminated granitic material. From careful observation, the yellowish feature that stretches from north to south at a depth of approximately 10 m is likely to be the water

table. Beneath this feature is fresh granitic material. The top part of the fresh granite just below the water table is saturated with water giving it a low resistivity as compared to the whole fresh granite.

The models that stretch from east to west could not provide information on the water table and the fresh granite owing to their short lengths, in other words the depth of investigation of these profiles were shallow (<16m). Resistivity values of materials from these models correspond with that of the upper part of the models that runs from north to south which are in the range of the resistivity of granites.

It is very evident, especially, from the profiles at the south that the area is made up of high resistive materials and towards the north, resistivity decreases.

CONCLUSION

The following conclusions can be drawn from this study conducted at the site in front of the new college of Art Building, KNUST.

- The relatively low resistivity data recorded below 10m depths at these areas were generally due to a highly conductive material likely water saturated granitic rocks.
- The highly resistive materials area could be the undifferentiated granitoids (resistivity of $100\Omega\text{m}$ to $1 \times 10^6\Omega\text{m}$).
- Possible weathering of the granitoid could have resulted in formation of lateritic soils especially at the south of the site forming a hardpan in which the soil grains become cemented by iron-oxides.
- The cemented soils contain few pores hence are resistive to the flow of current and can be said to be the most compacted areas on the site.
- At an elevation of 255 m can be inferred to be a water table and it runs across the four lines (1, 2, 3, and 4).
- The southern section of the site can be said to be mechanically stable to hold a heavy surface structure compared to the north and is highly recommended for construction.

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REFERENCES

- Andrews N.D, Aning A.A, Danuor S.K and Noye R.M (2013) Geophysical investigations at the proposed site of the KNUST teaching Hospital building using the 2D and 3D resistivity imaging techniques. *International Research Journal of Geology and Mining (IRJGM)* (2276-6618) Vol. 3(3) pp. 113-123, April 2013
- Aning A. A. Tucholka, P. and Danuor, S. K. (2013) The Bosumtwi Meteorite Impact Crater, Ghana: New Results on the impact direction of the meteorite from 2D Electrical Resistivity Tomography (ERT) Survey.
- Dahlin, T., (1996) 2D Resistivity surveying for environmental and engineering applications. *First Break*, 14, 275-284.
- Garg S. K. (2007), "Physical and Engineering Geology", Khanna Publisher, Delhi, India pp. 338 – 348
- Ghana Geological Survey (2009). Geological map of Kumasi Metropolis.
- Griffis J. R, Barning K., Agezo L. F, Akosah K.F (2002). Gold Deposit of Ghana, mineral commission. Gandalf Graphics Limited, 605 Alden Rd., Markham, Ontario, Canada L3R 3L5.
- Griffiths D.H. and Barker R.D.,(1993). Two-dimensional resistivity imaging and modelling in areas of complex geology. *Journal of Applied Geophysics*, 29, 211-226.
- Hamzah, U., Yaacup, R., Samsudin, A. R. and Ayub, M. S. (2006). Electrical Imaging of the Groundwater Aquifer at Banting, Selangor, Malaysia, *Environmental Geology* 49, Issue 8, pp. 1156–1162.
- Kearey, P. and Brooks, M., (2003), *An Introduction to Geophysical Exploration*: Blackwell Scientific Publications
- Lapenna V, Lorenzo P, Perrone A, Piscitelli S, Rizzo E, Sdao F (2005). 2D electrical resistivity imaging of some complex landslides in the lucanianapennine chain, southern Italy. *Geophysics*, 70(3).
- Loke M. H. (2011). *Tutorial: 2-D and 3-D Electrical Imaging Survey Manual*.
- Loke M. H, Acworth I, Dahlin T (2003). A comparison of smooth and blocky inversion methods in 2-D electrical imaging surveys. *Explora. Geophysics*, 34:183–187.
- Lowrie W. (1997). *Fundamental of geophysics*, Cambridge University Press, Switzerland, pp. 254
- Ozezin K. O., Oseghale A., Okolie E. C. & Ujuanbi O. (2011), "Integration of very low-frequency electromagnetic (VLF-EM) and electrical resistivity methods in mapping Sub-surface geologic structures favourable to road failures", *Int'l Jour. of Water Res. and Environ. Eng.* 3(6): 126-131.
- Scollar, I., Tabbagh, A., Hesse, A., Herzog, I., (1990). *Archaeological Prospecting and Remote Sensing*. pp. 674.
- Siddiqui, F. I. and Osman, S .B.A.B .S.,(2012). Integrating Geo-Electrical and Geotechnical Data For Soil Characterization, *International Journal of Applied Physics and Mathematics*, Vol. 2, No. 2
- Telford W. M., Geldart, L.P, Sheriff, R.E. (1990). *Applied geophysics*, Cambridge University Press, pp. 522.
- Telford, W. M., Geldart, L. P., Sheriff, R. E., and Keys, D. A., (1976). *Applied geophysics*: Cambridge University Press.

Ward, S. H., (1990) Resistivity and induced polarization methods: in Geotechnical and Environmental Geophysics, Vol. 1, Ward, S. H., Ed: Society of Exploration Geophysicists.

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Packaging as an Attractive Language to Stimulate Consumer Preference on Perfume: A Survey on Young Adult Respondents in the Area of Jabodetabek (Jakarta, Bogor, Depok, Tangerang, Bekasi) Indonesia

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Abstract- Indonesia is one of the biggest exporters of perfume raw materials to the world. However the local industry of perfume cannot compete with international imported brand. This journal research is supposed to find out the role of packaging on consumer preference on perfume, and was conducted in the area of Jakarta, Bogor, Depok, Tangerang and Bekasi (Jabodetabek) by spreading the questionnaire with the utilization of electronic mail and conventional way. From this research, relationship between independent variables (design, color and innovation, information specified and material used) towards dependent variable (consumer preference) was found and can be conclude that packaging has an important role to increase purchase decision of perfume, not for women only but also for men in young adult. Therefore, by paying more attention to perfume packaging, opportunity to increasesales of perfume that targeting young adult consumer will be higher.

Index term- Color and Innovation, Consumer preference, Design, Information specified, and Material used.

1. Introduction

Packaging is a serious issue nowadays because it can influence buying decision of consumer until 74% (Harminingtyas, 2013). Previously, people perceived “the cover” or commonly known as the packaging as only for the sake to protect the product it wrapped from damage and hazardous materials, but its function now hadevolved as the marketing tools(Silayoi & Speece , 2007). One product could have mirror characteristics with its competitors, but the thing that can differentiate them is the packaging (Grundvåg & Østli, 2009).

According to Schulz (2003), the best way to have a communication with the consumer is through packaging. There is some information attached in the packaging to communicate the consumers what the products stands for. Consumers buy perfume not only for making them smell good, but also there is a tendency of people to keep the bottle of their perfume as a collection mostly for the decorative and commercial ones (Husfloen, 2009).

Speaking of perfume, Indonesia as a big country has a huge ability to make a world-class perfume as one of prime industries that can compete with other world well-known perfume makers. Indonesia has huge number of natural resources for making perfume, such as patchouli essential oil which is a the most important ingredient in the process of making perfume (Suhendra, 2009). More importantly, competing with China, India, and Brazils, Indonesia’s export of this particular oil can reach ninety percent (90%) of the total production, reaching the number of USD42.185.294,00 in 2004(Tresnasih, 2011). Since the packaging can influence the consumer to make a purchase up to 74% summed up with the fact the Indonesia has huge number of exported patchouli essential oil to abroad to be produced as perfume, this excites the authors to help the local perfume producers to be able to win the local market through packaging. Therefore, this journal research would like to find out what are the factors of the packaging that consumers like for the packaging of perfume.

This research journal will contain the literature review that discuss about the importance of packaging and the things contains in the packaging, which makes packaging become unique factor for marketing andhow the influence of this packaging related with consumer behavior and preferences. This journal will contain of the data and quantitative methodology which will help the writer to support the analysis about the relationship between the packaging and consumer preference since the first time they see the product from its packaging.

II. Literature Review

In the eyes of people, the first thing they will see when they are looking around for something is the outer appearances of a product. This outer appearance is the packaging, which wraps the product and has main function to hold and protect the product(Kotler & Gary, 2008). In recent days, packaging holds even more responsibility as one of marketing tools in marketing mix. In the era when consumers have many varieties of product to choose, packaging is becoming the communication language that are attracting consumer to making purchase decision through it(Keegan & Green, 2012).

2.1 An overview of perfume and its packaging

Packaging in its marketing roles can gain people awareness and recognition which give the class differentiation of the product and the competitors, create reinforce favorable attitude toward the product, encourage the willing of people to purchase and occasionally increase the amount of purchase (Ampuero & Vila, 2006).

2.2 Variables that are contained in the packaging

As promotional tools, design, color and innovation, information specified and material used are several major ingredients that can lead to the successful and effective packaging.

2.2.1 Design of Packaging

This visible language communicates thoughts and information through human sights (Carter, Day, & Meggs, 2007). A good design should be able to give additional value to the product. Marketers should manage the design process in packaging because it shows professionalism of the product and sets its target (Design Council, 2013).

2.2.2 Color and Innovation of Packaging

According to Raisanen (2010), some specific color remind consumer to specific brand. So, in choosing color for packaging of product, company should prefer to what color can stimulate consumer to sophisticated experiences which people usually attracted to. Together with color, Innovation is the change and development of new product and services which supposed to fulfill the unmet or unknown needs of consumer that have not been found by product or service before (Brand Packaging, 2013). As a great and innovative packaging, packaging should result in higher sales, multifunctional, durable and efficient because people respect more value in every purchase (Lockman, 2012).

2.2.3 Information specified on Packaging

Packaging typically has three information which are; first, guidance how to use the product which tell the consumer the instruction of usage. Second is legal recruitments such as official label and environmental friendly and other symbols which proving the product is meet regulatory rules. The third information is about the net weight of the contain (Stewart, 2004).

2.2.4 Material used

Paper box, and crystal bottle often used as elegant perfume packaging. Considering about the function of packaging as the protector of the product, high quality, performance and functionality are the requirement for the material used in order to influence consumer purchase decision (Deliya & Parmar, 2012).

2.3 Consumer Preference

In International Communications Research, consumer preference is defined as "The power or ability to choose one thing over another with the anticipation that the choice will result in greater satisfaction, greater capability or improved performance." (53 West Baltimore Pike). In order to understand the preference and the function of it; the desire emotive outcomes and primary assumption that influence consumer to make purchase are what important here as well as consumer behavior.

2.4 Hypothesis

H1: There is a relationship between Consumer Preference and packaging design

H2: There is a relationship between Consumer Preference and packaging color and innovation.

H3: There is a relationship between Consumer Preference and packaging information specified

H4: There is a relationship between Consumer Preference and packaging material used

III. Methodology

3.1 Sampling

The targeted population of this research journal consisted of young adult in Jabodetabek who use perfume on daily basis and praise the aesthetic of the packaging of perfume. The unit analysis was end consumers. In gathering the data through spreading questionnaires, the researchers were using non-probability sampling method. The researchers combined several branches of non-probability sampling method, which were judgmental sample and snowball sample.

Those two method samplings were combined because they were suitable and supported this research journal. The respondents required were selective limited to people who use perfume from limited age, therefore judgmental sampling was chosen because it can eradicate people who did not meet the criterions. Since the number of the population is unknown, according to (Van Voorhis & Morgan, n.d), the sample size suggested can be determined by Statistical Rule of Thumbs where the number of respondent can be got using this formula; $N > 50 + 8m$ where N is the respondents and m is the number of questions in variable. Here are 16 questions so, $50 + 8(16) = 178$. Based on this formula, the number of sample size is rounded up to 300 respondents to overcome response error as well. The socio-demographic information of the respondents could be seen in table 1.1.

1.2 Data Collection

To gather the data, it was approximately needed six weeks started from October until November of 2013 with the utilization of electronic mail and conventional way, which Authors spread questionnaire directly to the respondents. In the process, there were no incentives given to the correspondents.

The data were measured by using likert scale from one to five with five as strongly agree, four as agree, three as moderate, two as disagree, and one as strongly disagree. This is how to measure how big the influence of the variables following: design, color and innovation, size, and material used of packaging towards the consumers' preference. In making the questionnaire, the researchers relied in several sources like online journal, neither English nor Bahasa Indonesia and also from online survey.

3.3 Measures

3.3.1 Validity

To check the validity of data, the researchers must check the data convergent and data divergent. Data convergent is when two same likely questions have the same answer and data divergent is when two conflicting questions have conflicting result (Survey Method Blog, 2011). Factor Analysis is a method to reducing and removing the redundancy or the variable which actually duplicate from another variable. These factors will become relatively independent from each other (Mayer, 2006).

3.3.2 Reliability

Reliability is processes to check whether the questions that are being asked are reliable or not. Since the data gathered was five hundred in total the result of Cronbach's alpha must show at least 0.6 to state if the questions are valid and reliable to be asked and can be used for further process (Sekaran & Bougie, 2013).

3.3.3 Multiple Regressions

Multiple Regressions is a statistical method used to measure the values of the independent variables toward dependent variable.

3.3.4 F-Test and T-Test

F-test is used to show if the independent variable can give significant influence to dependent variable (Levigne, 2004). T-Test is used to find out whether individually independent variable influences the dependent variable Invalid source specified.

IV. Implication and Discussion

4.1 Data Analysis

Before running the statistic data analysis and multiple regression, KMO and communalities test should be conducted before. Here are the result for both independent and dependent variables.

4.1.1 Kaiser-Meyer-Olkin Test

KMO test tells whether the sample size used for the research is enough or not to covered the questions in the variable. If the KMO is greater 0.5, it means the sample size used for this research is enough for factor analysis and reliability. The significant of Barlett's test should be less than 0.05 in order to prove null hypothesis as stated are correct. In this result the KMO value is 0.771 and barlett's value is 0.00 which means that the factor model is appropriate for further analysis process. KMO Test result for Four Independent Variables and Dependent Variable could be seen in the table 1.2.

4.1.2 Communalities

Communalities test is used to test whether the questions for the variable is sufficient to explain the variable itself. Value of communalities of each questions must be greater than 0.5, and from the table above shows that the value of communalities is all greater than 0.5. Therefore, the variable is highly represented by the questions.

4.1.3 Total Variance Explained

The Variance is to explain the eigenvalue of the factors. That eigenvalue itself having a relation with the number of variables. SPSS extract only total value more than 1.0, because if the total value less than 1.0 it means the contribution of the variance is not sufficient or it causing redundancy. From the figure 1.3, the variables is explained with strong relationship as 64.7% and can be extracted because the total value is greater than 1.0.

4.2 Factor Loading and Cronbach Alpha

To see the close relationship between the questions in the same group variable, Cronbach Alpha is used as the standard measurement. As high the result, it means the relationship is measuring real parts to form something as a whole. The value of Chronbach Alfa and Loading factors in rotated component matrix is all above 0.6, showing close relationship between the questions in variables.

4.3 Multiple Regression

As stated before in chapter 3, Multiple regression is used to measure the value created from independent to dependent variable. However, before Multiple regression executed, the data should passed three Classical Assumptions.

4.3.1 Normality

To ensure that the inferences of F-test and T-test are valid, the distribution of residuals should follow a normal distribution. Second measurement is called as normal probability plot. Without the exact calculation, the assumption of normal probability plot must supported the normal distribution of residuals by the plot point close to the straight line from which is drawn from the lower left to the upper right of the graph.

4.3.2 Heterocedasticity

The residuals scatterplots are spread randomly above and under zero line which means the data have no heterocedasticity problem. Heterocedasticity can make the statistical test of significant become invalid. Since there is no heterocedasticity, the next process need to be done is the multiple regression.

4.3.3 Multicollinearity

Multicollinearity is a correlation between all independent variables. It makes difficulty in the process of making inferences and multiple regression. There is a strong relationship between independent and dependent variables if the value of tolerance close to 1 and the VIF should be around 1.

The values of all VIFs are around 1 which means the independent and dependent variable have strong relationship. The significant interval on the table shows the significant possibility of the independent variable in influencing the dependent variable. Looking at the numbers constanta of the variables, those numbers are all positive, means that those four variables giving positive impact toward the dependent variables.

From the variables that shows in the coefficient table 1.4, started from design, color and innovation, information specified and material used, all have the significance below $>.005$ which means that all of these variables has a really strong affect to the consumer preference.

4.3.4 F-test and T-Test

F-test or simultaneous test which used to check whether all the independent variable simultaneously influence the dependent variable. The requirement is P-value or the significant of the variables must be less than 0.05. With this result of significant, the hypothesis stated before is accepted. The F-test result could be seen in table 1.5. T-test is used to test whether partially of each independent variables are influenced the dependent variable. The requirement is that the significance in Coefficient Table 1.4 is less than 0.05 means each independent variable strongly influenced dependent variable.

4.3.6 Adjusted R-square Table

Table 1.6 shows the relationship between all the independent variables's portion contributed for dependent variable. In Multiple regression, the percentage shown by Adjusted R-square. The value is 0.415 which means all the independent variables (design, color and innovation, information specified, material used) contributed 41,5% to dependent variable (consumer preferences).

V. Conclusion and Recommendation

5.1 Conclusion

Hypothesis H_1 , H_2 , H_3 , and H_4 are focussing on the factors that affecting why packaging can attract consumer preferences. The variables are design, color and innovation, information specified, and material used. To prove that the research result is supporting the variables, as mentioned before, the T-test values should be less than 0.05.

According to the result of the T-Test, Authors came to the conclusion of hypothesis. With the significance about .00, all the hypothesis is accepted. As the result in R-square table, the percentage of overall variables is influencing 41.5% of consumer preferences. It means, in buying a perfume, consumer's decision on preferences is 41.5% influencing by the packaging meanwhile the rest 58.5% is influenced by other factors (it could be original fragrance, brand, etc).

5.2 Recommendation

The result of this research is proving that the packaging takes 41.5% of 100% consumer preferences toward perfume packaging. Considering there are still many factors outside this model that influencing consumer buying decision towards perfume (such as fragrance, brand, etc), this result is giving quite strong influences. Therefore, to the local perfume producer, here are some future recommendation that can be applied to secure the 41.5% opportunity of increasing the sales of perfume.

First, man and woman young adult who use perfume are considering the design, color and innovation, material used, and information specified. Authors recommend that the design of perfume should adjust with the gender of the user. If the target user is women make sure to have elegant and feminine packaging. while for men, the packaging should give masculine impression.

Second, the opportunity to make sales of perfume that targeting young adult consumer is high. Therefore, if local perfume producer is targeting young adult consumer which mostly student, price is need to be considered because their income and allowance is not so high. The producer can set cheaper price for the perfume, but the packaging should not give poor impression. The packaging should be nice in order to build competitive advantages for local perfume producer. Especially in this research location which covered Jakarta, Bogor, Depok, Tangerang, and Bekasi, the most populated cities in Indonesia.

Compare to the one research of role of packaging on consumer behavior in Patan district, Western India by Deliya and Palmar (2012), it is also stated that packaging contribute 50.7% of consumer buying decision for any product and commodity. In this research, for only perfume product, packaging contribute 41.5%, and it is not far from what was established by Deliya and Palmar. Based on this discovery, the authors believe that Packaging contribute stable influence of customer preference. Therefore, the authors strongly suggested to local perfume producer to take care better of the packaging because it must bring significant progress on the sales.

References

- Ampuero, O., & Vila, N. (2006). *Consumer Perception of Product Packaging*. Spain: Emerald Group Publishing Limited.
- Brand Packaging. (2013 йил 20-Май). *Articles: Study Expands Innovation's Definition in Packaging Industry*. Retrieved 2013 йил 20-October from Brand Packaging: <http://www.brandpackaging.com>
- Castilo, J. (2009 йил September). Retrieved 2013 йил 17-October from Explorable: <http://www.explorable.com>
- Carter, R., Day, B., & Meggs, P. (2007). *Form and Communication*. In *Typographic Design*. United States of America: John Willey and Sons Inc.
- DC Velocity Staff. (2013 йил 3-September). *Packaging: from cost center to competitive advantage*. Retrieved 2013 йил 20-october from DC Velocity: <http://www.dcvelocity.com>
- Deliya, M., & Parmar, B. (2012). *Role of Packaging on Consumer Buying Behavior*. Patan District: Global Journal of Management and Business Research.
- Design Council. (2013). *About Design: The Power Of Packaging Design*. Retrieved 2013 йил 20-October from Design Council: <http://www.designcouncil.com>
- DS Smith Packaging. (2013 йил 1-august). *Design and Innovation*. Retrieved 2013 йил sunday-october from DS Smith Packaging: <http://www.dssmithpackagingeurope.com>
- Gobé, M. (2005). *Emotional branding: paradigma baru untuk menghubungkan merek dengan pelanggan*. (B. Mahendra, Trans.) Jakarta: Erlangga.
- Grundvåg, G. S., & Østli, J. (2009). Consumer evaluation of unbranded and unlabelled food products: The case of bacalhau. , *European Journal of Marketing*, 43.
- Husfloen, K. (2009). *Antique Trader Perfume Bottles Price Guide*. United States of America: Krause Publications.
- Hair Jr, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis 7th Edition*. Pearson Prentice Hall.
- Harminingtyas, R. (2013). Analisis Fungsi Kemasan Produk Melalui Model View Dan Pengaruhnya Terhadap Keputusan Pembelian Konsumen Pada Produk Rokok Kretek Merek Dji Sam Soe Di Kota Semarang . *Jurnal STIE Semarang* , 5 (2), 3.
- How Can Packaging Increase Sales*. (2013, January 2). Retrieved October 14, 2013, from Business Marketing Press: <http://www.businessmarketingpress.com>
- Keegan, W. J., & Green, M. (2012). In P. Policy, *Global Marketing*. New Jersey: Pearson Prentice Hall.
- Kotler, P., & Gary, A. (2008). *Consumer Markets and Consumer Buyer Behavior*. In *Principles of Marketing 12th Edition*. United States of America: Pearson Prentice Hall.
- Ksenia, P. (2013). *Packaging Design as a Marketing Tool and Desire to Purchase*.
- Levigne, D. M. (2004). In *Statistic for Managers Using Microsoft Excel*. New York: McGraw Hill.
- Lockman, J. (2012 йил 2012-November). *Creative Packaging Design: Live Creatively*. Retrieved 2013 йил 20-October from M-Theory: <http://www.mogultheory.com>
- Mayer, E. G. (2006). *Factor Analysis 1. Statistical in Psychosocial Research*.
- Market Research Group, LLC. (2004). *Convenience Foods Packaging and Serving Size Trends, Volume 3 in the Series, The U.S. Market for Convenience Foods. Packaging Facts*.
- Peter, P. J., & Olson, J. C. (2005). *Consumer Behavior and Product Strategy*. In *Consumer Behavior and Marketing Strategy*. New York: McGraw Hill.
- Polyakova, K. (2013). *Packaging design as a Marketing tool and Desire to purchase*. Saimaa University of Applied Sciences, Faculty of Business Administration, Lappeenranta. <http://www.Publications.Theseus.Fi>.
- Suhendra. (2009, 10 26). *Pemasok 90% Bahan Baku Dunia, Tapi RI Masih Impor Parfum*. Retrieved 10 14, 2013, from detikFinance : <http://www.finance.detik.com>
- Sekaran, U., & Bougie, R. (2013). *Research Method for Business* (6th Edition ed.). Italy: John Wiley.
- Silayoi, P., & Speece, M. (2007). *The Importance of Packaging Attributes: A Conjoint Analysis Approach*. *European Journal of Marketing*.
- Stewart, B. (2004). In *Packaging Design Strategies Second Edition*. United Kingdom: Pira International Ltd.
- Rundh, B. (2009). *Packaging Design Creating Competitive Advantage with Product Packaging*.
- Tresnasih, W. (2011). *Pemanfaatan Methylobacterium spp. untuk meningkatkan pertumbuhan bibit tanaman nilam (Pogostemon cablin Benth.) dalam kultur in vitro*. Thesis , Institut Pertanian Bogor, Fakultas Pertanian.
- VanVoorhis, C., & Morgan, B. (n.d). What Authors Don't Want to Forget About Sample Sizes. *Statistical Rule of Thumbs* . (2011 йил 6-November). Retrieved 2013 йил 10-October from Survey Method Blog : <http://www.blog.surveymethods.com>
- 53 Authors Baltimore Pike. (n.d.). *Developing Consumer Insight: The Determination of Consumer Preference*. *International Communications Research*.

Notes:

Table 1.1

	N	%	Income			Occupation		
Gender			1,000 k -	205	68.7	Student	189	83
Female	139	46.3	2,000 K			Employee	54	18
Male	161	53.7	2,000 K -	64	21.3	Entrepreneur	17	5.7
Total	300	100	5,000 K			Professional	18	6
Age			5,000 K -	-		Housewife	8	2.7
20-30	300	100	10,000 K			Others	14	4.6
Total	300	100	> 10,000 K	30	10	Total	300	100
			Total	300	100			

Table 1.2

KMO Dependet Variable Sig	.771
KMO Independent Variable Sig	.683

Table 1.3Total Variance Explained

Extraction Sums of Squared Loadings (Total)	Rotation Sums of Squared Loadings (Cumulative %)
1.131	64.778

Table 1.4

Coefficients^a

Model	Sig
1 (Constant)	-.892
AVERAGE D	.000
AVERAGE C I	.000
AVERAGE IS	.002
AVERAGE M	.000

Dependent variable: AVERAGE Y

Table 1.5

Annova^a

Model	F	Sig
1. Regression	54.226	.000 ^b
Residual		
Total		

a. Dependent Variable: AVERAGE CONSUMER PREFERENCE

b. Predictors: (Constant), AVERAGE MATERIAL USED, AVERAGE INFORMATION SPECIFIED, AVERAGE DESIGN, AVERAGE COLOR AND INNOVATION

Table 1.6

Model	R	R Square	Adjusted R Square	Std. Error of the Estimated	Change Statistics				
					R Square Change	F Change	Df 1	Df 2	Sig. F Change
1	.650 ^a	.423	.415	.52094	.423	54.226	4	296	.000

a. Predictors: (Constant), AVERAGE MATERIAL USED, AVERAGE INFORMATION SPECIFIED, AVERAGE DESIGN, AVERAGE COLOR AND INNOVATION

b. Dependent Variable: AVERAGE CONSUMER PREFERENCE

The Impact of Marketing Promotion through Social Media on People's Buying Decision of Lenovo in Internet Era: A Survey of Social Media Users in Indonesia

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Abstract- In today's marketing, promotion has become one of the most important factors in doing business. Hereby, the aim of this research is to identify and find out how is the social media have impact on marketing promotion in Indonesia. This survey has been done with a descriptive analysis, with reliability test, classical analysis which includes normality test, heteroscedasticity test, as well as the multicollinearity test, with the data from 205 samples. With the result of this survey, the impact of marketing promotion through social media is not positive for Lenovo this far. The survey shows that Lenovo has not done an effective marketing promotion through social media in Indonesia, as we compare it to the studies before that shows great influence of social media to people's buying decision from the other brand. Thus, Lenovo's marketers have to do a better job in order to attract Indonesian attention to their brand and products in the social media.

Index Terms- Buying Decision, Indonesia, Marketing, Promotion, Social Media

I. INTRODUCTION

Marketing is considered as one of the most important aspects in retail business. Many of companies all over the world are using internet to promote their products and social media is one of their biggest role in internet marketing. Social media are being used to promote or advertise their products. With high number of social media users, it has great advantage for the company as a lot of people will recognize or see what their markets. The previous studies show that social media have really huge impact in human lifestyle (Clarfloaty, 2012)[1], thus marketing in the social media is an easy mass communication for the company's marketing.

By knowing that social media have a big impact in marketing (Brittanyh, 2013)[2], the authors would like to show the power of social media in Indonesia. Internet in Indonesia is spreading very quickly towards most of the part of the country (Pitoyo, 2013)[3]. Even though it has spread at a good pace, the development of the technology itself is not as sophisticated as other countries, even compared to their neighboring countries (DailySocial, 2013)[4]. Even with their lacks of supporting technology, Indonesian has used social media daily. Social media contributed big part of internet usage, as most of Indonesian like to communicate and socializing with each other. With 96% of Indonesian are social media users (Reed, 2013)[5], Lenovo

having a big opportunity in promoting their brand or product through social media. Not only advertising, social media also enable Lenovo to have more personalized relationship with their customers which can increase their brand image as well as brand awareness to Indonesian as they like to have more personal relation (Brittanyh, 2013)[2]. Lenovo are also able to give knowledge about their products to the customers who have less knowledge and wanted to know more.

In this research paper the authors used descriptive research. The authors have spread the questionnaire through several social media such as Facebook, Twitter, and Instagram, so the authors are able to show that social media is a good way for Lenovo to market their products and brand. The questionnaire was made with Google Drive.

There are four parts of this research paper. First part is the abstract and introduction of the impact of social media on marketing in Indonesia. Second part the authors share the literature review of the research. Third part the authors share the descriptive review that the authors get from the questionnaire. Lastly the authors have conclusion from the research and future implementation.

II. LITERATURE REVIEW

2.1 Promotion

Promotion is the way of communicating between product and customers to influence their buying decision (Kotler & Armstrong, 2010)[6]. Another definition of promotion is to communicate with customer with the similar caption like advertisement, sales promotion, public relation, exhibitions, and direct mail (Baker, 2003)[7].

Nowadays promotion has really big impact towards people's buying decision. A good promotion can help a company to be success in doing business. A good company will always have a lot of promotion in order to attract their customers so that they are able to recognize the brand awareness of the company as well as their products. In this internet era, social media is one of the best ways that can be used to promote the company's brand awareness as social media is used throughout the world, and Indonesia is one of the biggest social media users in the world with 96% of social media users in Indonesia (Reed, 2013)[5], so that it will be good opportunity for company to implement social media as their marketing strategy.

The authors have considered some social media that mostly used in Indonesia and can be used to promote their image or product in each media:

2.1.1 Promotion through Facebook

Facebook is one of the most popular social media in the world with around 1.15 billion users worldwide. According to kompas.com (Deliusno, 2013)[8] there are 33 million users logged in to Facebook everyday and 28 million of them access it through their mobile device. People used Facebook to connect and communicate with other users. In Facebook people are able to upload their photos and videos, play games, join groups, chatting, personal message, like (Facebook terms to show your favorite page) a fan page. With the help of Facebook, people are able to reach and stay connected with millions of users and shares information amongst them (Gurnelius, 2011)[9].

There are two advantages of Facebook that really useful for company's marketing promotion. First, through social media such as Facebook, the company is able to promote their products to customers who use Facebook, and it only requires a little amount of expense. Second, it is easier to identify the target market by joining the groups which has similar needs and interests, and there are some features that really helpful for companies which are, status updates, photos and videos upload, wall, and chat (Puntoadi, 2011)[10].

2.1.2 Promotion through Twitter

Twitter emerged as a social media that enables its users to send a 140 character text to express their thoughts and share it to their friend, or in twitter they call it 'tweets'. Twitter is the second largest social media in the world with their more than 500 million users tweeting 58 million tweets in a day. Twitter was launched in 2006 by Jack Dorsey and now it is included in the top ten most visited websites in the world (Huffington Post, eMarketer, 2013)[11]. Indonesia is the fourth largest twitter users worldwide, and Jakarta is the number one city in terms of number of tweets per second as 87% of twitter users in Indonesia are using mobile devices to access their twitter account (Reed, 2013)[5]. There are some features that are provided by twitter, such as following, which enables the users to follow other users, twitting, so that the users can express about what happened. There are others features such as replies, retweets, and trending topics (Brown, 2011)[12]. The benefit that users can have from twitter is that they can share contents and get involved in conversations thus it gives values to the users.

2.1.3 Promotion through Instagram

Instagram was founded by Kevin Systrom and Mike Krieger in October 2010. Instagram is social media that specialized in sharing pictures. The purpose of instagram itself is to share moments that happened around the user. Instagram have grown very quick, as they already have around 150 million users to date (TeknoUp, 2013)[13]. They also have a rapid growth as the only had 100 million users in February 2013 (Panji, 2013)[14]. Instagram have some features that attracts the users, one of the feature is to help the users to have better looking photos with their specialized photo filter. Another feature is the ease of sharing photos and fast & efficient photo upload (Stephanie, 2012)[15].

2.2 Buying Decision

Customer buying decision is the important factor for company's revenue and it is important for the marketer to

understand about it. To understand the factors that influence buying decision the company should figure out through research. By doing research the company will understand about what the customers will buy, when they buy, where they buy, and why they buy the products (Kotler & Armstrong, 2010)[6]. There are some elements that affect on customer's buying decision, which are the consumer's consciousness of a product so that they are willing to find more information, the consumer's consideration of many alternative products to choose, and the process from consciousness through consideration until purchasing the product (Dave, 2008)[16].

III. METHODOLOGY

3.1 Sampling

The population used for this survey is the users of Facebook, Twitter, and Instagram in Indonesia. The unit of analysis is the users of Facebook, Twitter, and Instagram that ever looked at Lenovo's promotion in Facebook, Twitter, and Instagram. The authors spread the questionnaire throughout the internet, through social media such as Facebook, Twitter, and Instagram. There is a problem that faced by the authors which is the difficulty to have valid respondents because the authors do not know each respondents profile before the respondents filled the questionnaire. To know the minimum number of questionnaires, the authors will use the following formula:

$$(N > 50 + 8m)$$

Explanation:

N = Sample Size

m = number of questions available in the questionnaire

There are 16 questions available in the questionnaire, so $N > 50 + 8(16)$. The result is $N > 178$, it means the authors have to find more than 178 respondents. Therefore, the authors prepare minimum number of 200 questionnaires.

The authors asked about the respondents' name, age, and gender. The authors also asked about the frequency of the respondents visiting each social media and if they had followed or liked Lenovo's official account in Facebook, Twitter, and Instagram. Lastly, the respondents were asked if they owned a Lenovo's smart phone.

3.2 Data Collection

To collect the data, the questionnaire was spread through internet with third-party survey, which is Google Drive. The questionnaire shared in social media which are Facebook, Twitter, and Instagram and the qualified potential correspondents are those who use Facebook, Twitter, and Instagram and had seen Lenovo's promotion on each social media.

IV. RESULT

4.1 Descriptive Analysis

This descriptive analysis is to explain the result of the data from the questionnaires that have been fulfilled by survey's respondents. The total sample of this survey is 205 respondents which have seen Lenovo's promotion in Facebook, Twitter, and Instagram. The variables that will be discussed are gender, age, the frequency of visited Facebook, the frequency of visited Twitter, the frequency of visited Instagram, like-ing the Lenovo's

fan page or not, following the Lenovo's twitter or not, following the Lenovo's Instagram or not, and owning a Levono's smartphone or not.

4.1.1 Respondents' Description Based on Gender

The respondents' data from the surveys' questionnaire shows that there are 103 male respondents and 102 female respondents which have seen Lenovo's promotion on Facebook, Twitter and Instagram. This shows that the ratios of male and female respondents are almost equal.

4.1.2 Respondents' Description Based on Age

The age is categorized as below 20 years old, 21 to 25 years old, 26 to 30 years old, and above 30 years old. The respondents' data from the survey's questionnaire shows that there are 120 respondents are below 20 years old, 61 respondents are categorized as 21 to 25 years old group, 16 respondents are categorized as 26 to 30 years old group, and lastly there are 8 respondents are above 30 years old. This shows that the majority of the respondents are people who aged below 20 years old.

4.1.3 Respondents' Description Based on the Frequency of Visiting Facebook

The frequencies of visiting Facebook are separated into three options, which are everyday, 2 – 4 times in a week, and 1 – 2 times in a month. The respondents' data from the survey's questionnaire shows that there are 79 respondents are visiting Facebook everyday, 74 respondents are visiting Facebook 2 – 4 times in a week and 52 respondents are visiting Facebook 1 – 2 times in a month.

4.1.4 Respondents' Description Based on the Frequency of Visiting Twitter

The frequencies of visiting Twitter are separated into three options, which are everyday, 2 – 4 times in a week, and 1 – 2 times in a month. The respondents' data from the survey's questionnaire shows that there are 159 respondents are visiting Twitter everyday, 30 respondents are visiting Twitter 2 – 4 times in a week and 16 respondents are visiting Twitter 1 – 2 times in a month. Most of the respondents are visiting twitter daily.

4.1.5 Respondents' Description Based on the Frequency of Visiting Instagram

The frequencies of visiting Instagram are separated into three options, which are everyday, 2 – 4 times in a week, and 1 – 2 times in a month. The respondents' data from the survey's questionnaire shows that there are 77 respondents are visiting Instagram everyday, 44 respondents are visiting Instagram 2 – 4 times in a week and 84 respondents are visiting Instagram 1 – 2 times in a month.

4.1.6 Respondents' Description based on like-ing Lenovo's Facebook Fan Page

The result of the survey shows that there are 42 out of 205 respondents are like-ing Lenovo's Facebook fan page and the rest, 163 respondents have not like-ing Lenovo's Facebook fan page.

4.1.7 Respondents' Description based on following Lenovo's Twitter

The result of the survey shows that there are 38 respondents are following Lenovo's Twitter and 167 respondents have not following Lenovo's Twitter.

4.1.8 Respondents' Description based on following Lenovo's Instagram

The result of the survey shows that there are 9 respondents are following Lenovo's Instagram and 196 respondents have not following Lenovo's Instagram

4.1.9 Respondents' Description based on Ownership Status

The result of the survey shows that there are 45 respondents own Lenovo's smartphone while the other 160 respondents do not have Lenovo's smartphone. From the data, the majority of the respondents do not own Lenovo's smartphone.

4.2 Variable Descriptive Analysis

The purpose of descriptive analysis is to figure out the reaction of respondents from the answers that respondents have fulfilled from the questions in the questionnaire. The variable of promotion through Facebook (X₁) consist of 4 questions, variable of promotion through Twitter (X₂) consist of 3 questions, variable of promotion through Instagram consist of 3 questions, and Buying Decision (Y) consist of 6 questions.

To interpret the average, the interval is made with this following formula:

$$\left(\text{interval} = \frac{\text{highest score} - \text{lowest score}}{\text{total class}} = \frac{5-1}{5} = 0.8 \right)$$

With the interval, the range scale can be made to find out how the respondents average grade of every differentiation and variation element. The range scale is as follows:

- 1.00 – 1.80 = very unsuitable
- 1.81 – 2.60 = unsuitable
- 2.61 – 3.40 = adequate
- 3.41 – 4.20 = suitable
- 4.21 – 5.00 = very suitable

4.2.1 Promotion Variable through Facebook

The distribution of respondents answer on promotion variable through Facebook can be seen in the table below:

Table 4.1

Question	1		2		3		4		5		Score Average
	F	%	F	%	F	%	F	%	F	%	
1	13	7,3%	26	14,5%	76	42,5%	69	38,5%	21	11,7%	3,29
2	11	5,7%	13	6,8%	84	43,8%	62	32,3%	35	18,2%	3,47
3	13	6,8%	15	7,9%	83	43,7%	63	33,2%	31	16,3%	3,41
4	12	6,8%	28	15,8%	78	44,1%	53	29,9%	34	19,2%	3,34
										Total Average	3,38

From Table 4.1 there are some statements made, which are:

1. In the first question, the average score is 3.29 which means *Lenovo's promotion in Facebook is made consumer and potential consumer connected easier with Lenovo marketing* is adequate with respondents' answers
2. The average of the second question is 3.47 which means *Lenovo inform their products by posting status and upload photos* is suitable with the respondents answers
3. The average of the third question is 3.41 which means *illustration/pictures in Lenovo advertisement in Facebook are interesting* is suitable with the respondents answers

4. The average of the forth question is 3.34 which means *banner is one of the advertisement media in Facebook to show Lenovo's latest product* is suitable with the respondents answers
5. Overall, the respondents' response of promotion through Facebook is 3.38 which mean it is adequate with respondents' answers. Thus, *Lenovo's promotion through Facebook is not effective enough to grab Facebook's users' attention.*

4.2.2 Promotion Variable through Twitter

The distribution of respondents answer on promotion variable through Twitter can be seen in the table below:

Table 4.2

Question	1		2		3		4		5		Score Average
	F	%	F	%	F	%	F	%	F	%	
1	12	6,7%	25	13,9%	80	44,4%	54	30,0%	34	18,9%	3,36
2	10	5,5%	23	12,6%	67	36,8%	59	32,4%	46	25,3%	3,53
3	12	6,7%	27	15,2%	69	38,8%	66	37,1%	31	17,4%	3,38
Total Average											3,42

From table 4.2 there are some statements made, which are:

1. In the first question, the average score is 3.36 which means *Lenovo promotion in Twitter made consumer and potential consumer connected easier with Lenovo marketing* is adequate with respondents' answers
2. The average score of the second question is 3.53 which means *Posting tweets, retweet, are used by Lenovo to inform their products* is suitable with the respondents' answers
3. The average score of the third question is 3.38 which means *Twitter is one of the advertisement media used by*

Lenovo to give benefit to their followers is adequate with respondents' answers

4. Overall, the respondents' response of promotion through Twitter is 3.42 which mean it is suitable with respondents' answers. *Lenovo's promotion through Twitter have drawn enough attention from Twitter's users, but it could be improve*

4.2.3 Promotion Variable through Instagram

The distribution of respondents answer on promotion variable through Instagram can be seen in the table below:

Table 4.3

No. Item	1		2		3		4		5		Score Average
	F	%	F	%	F	%	F	%	F	%	
1	13	7,4%	29	16,5%	92	52,3%	48	27,3%	23	13,1%	3,19
2	12	6,5%	19	10,2%	82	44,1%	73	39,2%	19	10,2%	3,33
3	14	7,9%	27	15,2%	88	49,4%	51	28,7%	25	14,0%	3,22
Total Average											3,25

From table 4.3 there are some statements made, which are:

1. In the first question, the average score is 3.19 which means *Lenovo promotion in Instagram made consumer and potential consumer connected easier with Lenovo marketing* is adequate with respondents' answers
2. The average score of the second question is 3.33 which means *Posting photos in Instagram are used by Lenovo to inform their products* is adequate with respondents' answers
3. The average score of the third question is 3.22 which means *Photos shared by Lenovo is interesting* is adequate with respondents' answers

4. Overall, the respondents' response of promotion through Instagram is 3.25 which mean it is adequate with respondents' answers. *Lenovo's promotion through Instagram has drawn the least attention compared with Facebook and Twitter. Lenovo need to readjust their promotion strategy through Instagram to gain more attention from Instagram users.*

4.2.4 Buying Decision Variable

The distribution of respondents answer on buying decision variable can be seen in the table below:

Table 4.4

No. Item	1		2		3		4		5		Score Average
	F	%	F	%	F	%	F	%	F	%	
1	26	15,9%	41	25,0%	67	40,9%	38	23,2%	33	20,1%	3,05
2	28	16,4%	34	19,9%	74	43,3%	45	26,3%	24	14,0%	3,01
3	40	24,4%	41	25,0%	71	43,3%	38	23,2%	15	9,1%	2,74
4	18	10,8%	39	23,5%	64	38,6%	51	30,7%	33	19,9%	3,20
5	20	11,4%	29	16,5%	59	33,5%	45	25,6%	52	29,5%	3,39
6	29	16,3%	27	15,2%	61	34,3%	60	33,7%	28	15,7%	3,15
										Total Average	3,09

From table 4.4 there are some statements made, which are:

1. In the first question, the average score is 3.05 which means the statement of *I observed Lenovo's promotion in Facebook to get updated news of Lenovo* is adequate with respondents' answers
2. The average score of the second question is 3.01 which means the statement of *I observed Lenovo's promotion in Twitter to get updated news of Lenovo* is adequate with respondents' answers
3. The average score of the third question is 2.74 which means the statement of *I observed Lenovo's promotion in Instagram to get latest news of Lenovo* is adequate with respondents' answers
4. The average score of the fourth question is 3.20 which means the statement of *I am interested with Lenovo after seeing Lenovo's promotion in the social media* is adequate with respondents' answers
5. The average score of the fifth question is 3.39 which means the statement of *I have the self cautions to look for further information of Lenovo after seeing Lenovo's promotion in the social media* is adequate with respondents' answers
6. The average score of the sixth question is 3.15 which means the statement of *I have attracted to buy Lenovo*

after seeing Lenovo's promotion in the social media is adequate with respondents' answers

7. Overall, the respondents' response of Buying Decision Variable is 3.09 which mean it is adequate with respondents' answers. Thus, Lenovo's promotion through Facebook, Twitter and Instagram did not effective enough to attract and influence people buying decision of Lenovo.

Based on Grace's study on 2013[17] about promotion through social media of Samsung, it shows that Samsung's promotion through social media has good impact on people's buying decision of Samsung. It means that Lenovo has a good opportunity to be successful in promoting their products through social media as well. In order to be successful in promoting through social media, Lenovo has to improve by being more aggressive and giving more promotion through social media just like Samsung or if possible be better than Samsung's promotion.

4.3 Reliability Test

Reliability test is done with SPSS and it is considered as reliable if the Cronbach's Alpha value is more than 0,7

Table 4.6 Reliability Test

Variable	Cronbach's Alpha	0,7	N of Item	Reliability
Promotion through Facebook	0,877	0,7	4	Reliable
Promotion through Twitter	0,871	0,7	3	Reliable
Promotion through Instagram	0,823	0,7	3	Reliable
Buying Decision	0,886	0,7	6	Reliable

According to Table 4.6, the reliability test shows that all four variable are reliable since all four variable have Cronbach's Alpha value more than 0,7 which means the questionnaire are reliable.

V. CONCLUSION AND SUGGESTION

5.1 Conclusion

Based on the result of the survey there are some conclusion that has been made by the authors. The survey result shows that promotions through social media which are Facebook, Twitter, and Instagram simultaneously have no significant effect for Lenovo's promotion. Many people have not known about Lenovo's activities and have no attraction in social media. From the three social media that the authors used for this research, Twitter have the most impact towards Lenovo's promotion, because Twitter have the most active users amongst other social

media in Indonesia, whereas, Instagram have the least impact as not many people visit Instagram as much as Facebook and Twitter.

From the survey the authors can conclude that Lenovo's promotion is social media have made some people recognize their brand and influence their buying decision, although some of the people show no interest in buying Lenovo's product even after they have seen Lenovo's promotion in social media.

5.2 Suggestion

The authors have made some suggestions so that Lenovo are able to perform better. First, the authors suggest Lenovo to make more attractive promotion in social media. It is true that Indonesia have a big number of social media users, unfortunately it is not easy to make them get attracted to a specific promotion. However, if Lenovo are able to make some attractive promotion, it will spread very quickly as they tend to promote whatever they like to the social media. Second, there are other promotional tools to help them to increase their brand awareness and it can influence people's buying decision. Other promotional tools such as billboards, TV, Radio, Magazine advertisement are very popular in Indonesia

Lastly the authors would like to recommend for those who want to do research with similar topic, it is best to include other variables that have not been taken in our concern that might affect buying decision, for example promotion through other social media such as, Youtube, Forums, Blogs, and Instant Messenger.

REFERENCES

- [1] Clarfloaty. (2012, November). StudyMode. Retrieved October 10, 2013, from The Impact of Social Media on Human Resources: <http://www.studymode.com/essays/The-Impact-Of-Social-Media-On-1229381.html>
- [2] Brittanyh. (2013, July 31). SocialSpark. Retrieved October 10, 2013, from Social Media Marketing: Benefits and Impact: <http://socialspark.com/social-media-marketing-benefits-and-impact/>
- [3] Pitoyo, A. (2013, September 12). merdeka.com. Retrieved October 10, 2013, from IGF, Indonesia bisa jadi contoh perkembangan internet dunia: <http://m.merdeka.com/teknologi/igf-indonesia-bisa-jadi-contoh-perkembangan-internet-dunia.html>
- [4] DailySocial. (2013, October 17). TRENOLGY. Retrieved October 20, 2013, from Kecepatan Internet Indonesia Meningkatkan Dua Kali Lipat, Masih Tertinggal di ASEAN: <http://www.trenologi.com/2013101726052/kecepatan-internet-indonesia-meningkat-dua-kali-lipat-masih-tertinggal-di-asean/>
- [5] Reed, C. (2013, May 9). Indonesia – the world's most social mobile centric country. Retrieved October 10, 2013, from The Wall Blog: <http://wallblog.co.uk/2013/05/09/indonesia-the-worlds-most-social-mobile-centric-country/>
- [6] Kotler, P., & Armstrong, G. (2010). Principles of Marketing 13th edition. New Jersey: Pearson Education, Inc.
- [7] Baker, M. (2003). The Marketing Book Fifth Edition. London: Butterworth Heinemann.
- [8] Deliusno. (2013, September 20). Tiap Hari, 33 Juta Orang Indonesia Buka Facebook. Retrieved October 10, 2013, from <http://tekno.kompas.com/read/2013/09/20/1629066/Tiap.Hari.33.Juta.Orang.Indonesia.Buka.Facebook>
- [9] Gurnelius, S. (2011). 30-minute Social Media Marketing. United States: McGraw-Hill Companies.
- [10] Puntoadi, D. (2011). Menciptakan Penjualan Melalui Social Media. Jakarta: PT Elex Komputindo.
- [11] Huffington Post, eMarketer. (2013, July 13). Twitter statistics. Retrieved October 10, 2013, from Statistic Brain: <http://www.statisticbrain.com/twitter-statistics/>
- [12] Brown, A. (2011). The Tricky Business of Business Tweeting. The Irish Time.
- [13] TeknoUp. (2013, September 9). Yahoo News Indonesia. Retrieved october 10, 2013, from Instagram Tembus 150 Juta Pengguna: <http://id.berita.yahoo.com/instagram-tembus-150-juta-pengguna-043001923.html>
- [14] Panji, A. (2013, February 28). Kompas.com. Retrieved October 10, 2013, from Pengguna Aktif Instagram Tembus 100 Juta: <http://tekno.kompas.com/read/2013/02/28/16120251/pengguna.aktif.instagram.tembus.100.juta>
- [15] Stephanie, B. (2012, May 29). Yahoo news. Retrieved October 20, 2013, from The Beginner's Guide to Instagram: <http://news.yahoo.com/beginners-guide-instagram-220028085.html>
- [16] Dave, E. (2008). Social Media Marketing An Hour A Day. Canada: Wiley Publishing.
- [17] Grace, A. (2013). PENGARUH PROMOSI MELALUI MEDIA SOSIAL TERHADAP MINAT BELI SAMSUNG BERBASIS ANDROID PADA MAHASISWA UNIVERSITAS SUMATERA UTARA. 51-54

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The Influence of Family Backgrounds toward Student's Saving Behavior: A Survey of College Students in Jabodetabek

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Abstract- Parents are the primary community for their children, and parents are the key education of their children. Poor management income is related to how parents teach their children on doing saving. They often confident about their saving whereas they do not focus on educating their children on managing income. This research is conducted to find the influence of family's backgrounds toward student's saving behavior, which in this research college student in Jabodetabek, Indonesia is chosen as the source of information. Using quantitative data analysis, 300 questionnaires are spread to Jabodetabek area to obtain information about their saving behavior. The discussion is the correlation of family's background, including parents, toward their children's saving behavior.

Index Terms- Saving behavior, Family's background, Cash management, Finance, Financial experience.

I. INTRODUCTION

Common people usually do not have the access of knowledge about saving behavior in their activity; specifically youth generations do not aware about the uncertainty in the future life (Benartzi, 2012). As students nowadays, they often forget that they also grow up whereas they do not prepare themselves for their future, especially in term of material things.

The backgrounds that come from the family are one of the aspects that can influence student to make a saving behavior (Purwanto, Prinsip-Prinsip dan Teknik Evaluasi Pengajaran, 2009). Students that are coming from a wealthy family have already get the support to do saving, while other students with lower parent's income are having a poor source to do saving.

Some motivations that can become the reason why student do saving, meanwhile they still have their parents to support their allowance are pre-caution and foresight (Keynes, Johnson, & Moggridge, 2012). The meaning of pre-caution by Keynes et al. itself is kind of preventive action, in case they will use it in the future and foresight as an imagination of future life so they can prepare themselves to face it. A research in Indonesia that has been done by Brata found that income, education level, and gender can influence positive saving behavior, but age and amount of income do not have any correlation to the saving behavior. Other factors are job classification and job level can lead to negative influence, means it can reduce the willingness of saving behavior (Harrington, 2005).

This research has come up with the research question of: "To what extent do family's backgrounds can influence the

saving behavior to the children? In this case, students in President University" and also lead to its study objective, which is to analyze the correlation of student's economic background with their saving behavior.

In addition, this research is expected to be used as comparative source for those who study the related topic or for parents that may start teaching their children to do saving from early stage. Since from Benartzi's research (2012) found that many youth generations do not know the importance of saving and they are also less aware with their future consumptions.

In this research, quantitative analysis is used as the method and also some supporting valid data from some experts to help the research. Because this data is using quantitative data analysis, questionnaires are used and spread to college students in Jabodetabek. Questionnaires are spread directly by using random sampling and by the help of Google Drive application to reach 300 respondents.

As the guidance, this article is structured as mentioned here. First, the idea and literature of family's backgrounds in daily life, then followed by the literature of saving behavior. Second, the research methodology and data analysis that are using quantitative analysis method is showed and discussed. The last is conclusion of the research based on the analysis that has been done, supported by the secondary data from the related research, not to mention all theories from the literature also used to support the data result and conclusion. From the data result, conclusion is expected can be used for those who want to do further research.

II. LITERATURE REVIEW

2.1 Saving

Many researches have been done to find out the influences of student saving behavior. But parents are the major influence for the children toward their saving behavior (Purwanto, Prinsip-Prinsip dan Teknik Evaluasi Pengajaran, 2009). The research found that family education is the foundation for their children in their future, so they become something based on what they got from the family. This matter becomes important since university students are righteously mature and they are not supposedly good in knowledge and skill only, but also they have to control themselves in controlling their financial problems (Salikin, Wahab, Masruki, Zakaria, & Nurulhuda, 2012). Other research about saving behavior that has been done by Sabri M. and Macdonald M. (2010) said that people who have earlier consumer behavior (since the childhood) are likely to have more saving behavior, but also they face more financial problems.

2.1.1 Definition

Saving in a simple definition is 'the excess of income over all expenditures', where the expenditures are also mentioned as consumption, which is life contributions and insurance (if any), and the saving behavior is the money keeping activity after they use it for their own wealth (Denton, Fretz, & Spencer, 2011). But in the further explanation, there are more clarifications needed for the 'income'. For instance, money that a student finds in the way back home is included as income or not.

2.1.2 Problems of Saving

There are many aspects that related to the saving behavior. Research about students' saving behavior in Malaysia that has been done by Salikin, et al. (2012) mentioned about the problems of doing saving in university life, such as the uncertain about where the money spent, or even about taking money from parents or others without permission for the spending that driven by their desires than their economic needs. From previous research, students have some reasons of doing saving, such as to achieve goal, do saving until the end of semester (most are for vacations), and do saving for paying down debts.

2.1.3 Factors That Influence Saving Behavior

In this research, some aspects that may influence student's saving behavior are given as the variable. Aspects for this research are from the family's background of the student, and it has come up with parents' income, parents' age, number of siblings, and student's gender. Those are the demographic aspects from the respondent.

Variables used in this research are parents' motivation, parents' experience, and family lifestyle. Those variables are chosen based on the theory of saving, which is influenced by them (Sheldon, 2006).

2.2 Family's Background

2.2.1 Definition

Family is the first environment of every individual human. They also the first teacher for the children, where there is a quote from The Westcoast Reader (2012) said "A child becomes a good reader because people at home read to him, and read often. A child learns to speak when family members talk with him." With interfacing the saving behavior, family becomes the first source for student to learn it, the more family members, the more sources for the children to learn (Cronqvist & Siegel, The Origins of Savings Behavior, 2010).

2.2.2 Family's Background Variables

Parents' Motivation

Generally, motivation defines itself as guidance and an orientation to reach the goal behavior (Shah & Gardner, 2008). It also refers to the action or activity that people do often to get kind of reward.

Based on the definition of motivation, parents' motivation to their children is more like guidance to their children to reach certain goals. Perhaps parents want their children to get a good grade and they come up with actions in order to make their children reach the parents want, which is good grade.

Parents' Experience

Parents are the first children's teacher; the education that children receive at the first time is more dependent on the education that his or her parents received when they are children (Gratz, 2006). Research says this is important to give at least the children the adequate education following their age. The higher

education the parents have, the more likely they can teach the children toward the pressures and stresses of life, because the parents have at least the experience of being in the same position.
Lifestyle

Lifestyle is kind of human consumption behavior to decide their identity in the environment toward the product they can afford (Krishnan, 2011). Research done by Krishnan (2011) found that in the market segment, lifestyle becomes the tool to define target customer by classifying the level of the product.

2.3 Relations and Hypothesis

In this chapter, all variables are related from the independent variables (X_n) to the dependent variable (Y). Here independent variables are mentioned as followed: Parents' Motivation (X_1), Parents' Experience (X_2), and Lifestyle (X_3). Hypothesis is explained in the each relation between X_n and the dependent variable, which is Saving Behavior (Y).

2.3.1 Parents' Motivation

Parents are the primary teacher for their children, they teach their children to be something in mind. In this research, parents' motivation is considered as one aspect which influence student's saving behavior. Whether more motivation from parents can make their children to do saving or not.

H₁: Parents' motivation (X_1) affected the saving behavior (Y).

2.3.2 Parents' Experience

Parents with high educational background are supposedly tend to teach the children about the importance of do saving. Advises about saving from them might slightly lead their children to do saving, or at least they remember that their parents has give the advise. With more knowledge about saving, parents ought to have more experiences and knowledge about financial problems and the pressure about it that can be shared to their children.

H₂: Parents' experience (X_2) affected the saving behavior (Y).

2.3.3 Lifestyle

As an adult, saving has to be common in their mind. When students get older, so does their consumption, which means when they want to fulfill their needs, they need more financial support. In this research, saving as lifestyle means students think their needs and consumptions are lifestyle, as well as their way to fulfill it.

H₃: Lifestyle (X_3) affected the saving behavior (Y).

III. METHODOLOGY

3.1 SAMPLING

This study is targeting college students in Jabodetabek area as the respondents. Each individual becomes the unit analysis with range border between batches 2011 until batch 2013 students to know their saving behavior in the university life. Respondents are chosen by using purposive selection, which is each respondent is willing to answer the questionnaire, and also by using Google Drive application. The variables in this research include the saving behavior and the characteristic of each individual.

In this research, random sampling is used to collect the respondents. In the random sampling, each individual has equal probability to be chosen in the sampling process (Yates, Moore,

& Starnes, 2008). Thus, 300 questionnaires are given on the sampling frame.

3.2 DATA COLLECTION

In this research, data is targeted to be collected from 24th October 2013 until 3rd November 2013 and spreads randomly for college students by directly give the questionnaire to them and by using Google Drive as the third party agent to collect respondents. Respondents are only for those who are willing and qualified to become the potential correspondents, which are college students in Jabodetabek area. This research also uses random sampling that conducted in President University area, as Yates et al. (2008) mentioned that by using random sampling, each President University student has the same probability to become the respondent.

3.3 VALIDITY AND RELIABILITY

Validity refers to the compatibility between the research idea and concept with the containing of the questionnaire. Questionnaire validity can be seen from the correlation value (r) between total score and score from each question. After validity testing, it is followed by reliability testing just after the questions are affirmed as valid. Reliability itself reflects the consistency of correspondent in responding the question. To test the reliability, this research is using *Cronbach's Alpha* technique. The founder, Lee Cronbach (1951), mentioned that reliability of the research can be stated when the alpha (α) is more than 0.7. There are many ways to measure validity of data. One of the ways is by using factor analysis. Factor analysis is one method to measure whether the independent variables that have been given are linearly correlated with the dependent. Factor analysis is a data reduction tool to removes redundancy or duplication from a set of correlated variables (Mayer, 2006). There is a KMO (Kaiser-Meyer-Olkin) test in the factor analysis, which represents the correlation between pairs of variables. If the value of KMO is below .5 factory analysis is not necessary needed.

3.4 MULTIPLE REGRESSION

The purpose of multiple regressions is to analyze more about the relationship between several independent variables with the dependent variable (Keith, 2006). In this research, multiple regressions is used to analyze the influence of independent variables, which is *parents' motivation* (X_1), *parents' experience* (X_2), and *lifestyle* (X_3) toward student's saving behavior (Y). The formula of multiple regressions is:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + e$$

Explanation:

- Y : dependent variable
- a : constant number
- X_1 - X_3 : independent variable
- e : error term

In this research, there are two classical assumption tests to be used, first by using normality test, and second by using multicollinearity test. To see whether the residual values are normally distributed or not is by using normality test. The residual value can be justified as normally distributed if it has the critical value closed to .049. Some steps can be done if the value

is far from .049 such as by using data transformation or adding observation data.

Multicollinearity test also be conducted to see the correlation between the free independent variables in multiple linear regression model. If there is a high correlation between two or more variables, the alternatives are either replacing or removing the variables with high correlation, or by adding more respondents.

3. Hypothesis Test

T-Test

T-test is used to analyze the correlation value of each independent variable as individual, toward the dependent variable. The T-test result can be seen by using SPSS, in the *Coefficient* table in the SPSS output. To find each of independent variable's t-test, can be found in 'Sig' column. T-test formula can be written as below:

$$t = \frac{\bar{x} - \mu_0}{s / \sqrt{n}}$$

F-Test

F-test result is used to test whether each independent variable affects the dependent variable or not. By using SPSS software, F-test can be found in ANOVA table. Each independent variable is stated as linier relationship with dependent variable if the value in *Sig* table is below 0.05.

IV. DATA ANALYSIS

4.1 Questionnaire distribution

It had been started from the beginning of October to November 2013 in conducting this research. In the previous chapter mentioned the total sample is 300 and for that, 300 questionnaires spread to around Jabodetabek and 276 were given back to be used for the analysis. The respondents are university students around 19 to 22 years old that lived around Jabodetabek. To reach the area, the author used Google Drive application and spread the link to forum of some Universities around Jabodetabek. For the samples that lived in Bekasi, the author also gave the questionnaire directly to them.

4.2 Instrument test

The questionnaire was spread once to each university's forum, and to determine the validity and reliability of the questionnaire, SPSS 20 software was used. Below are the result of instrument test of validity and reliability.

4.2.1 Validity test

Validity test is used to find out whether the independent variables can be used to determine the correlation with the dependent variable or not. Factor analysis is chosen as the method to determine the validity, which includes KMO (Kaiser Meyer Olkin), Bartlett's Test and communalities. KMO and communalities value are used as the standard of validity, with the standard value $KMO \geq 0.5$ (Pett, Lackey, & Sullivan, 2003).

Table 4.1

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.625
--	------

	Approx. Chi-Square	208,522
Bartlett's Test of Sphericity	Df	15
	Sig.	,000

Table 4.4
Parent's experience

In the table 4.1 KMO value of sampling adequacy is .625 which is above its standard (.05). Bartlett's Test value can be seen in *Sig.* (Significant) column, which is .0001. This data is determined as valid data and proper to follow the next test, which is Communalities of the questions of each variable.

Table 4.2

Communalities

	Initial	Extraction
support1	1,000	,740
support3	1,000	,708
support4	1,000	,582
exp1	1,000	,672
exp3	1,000	,869
exp4	1,000	,673

Extraction Method: Principal Component Analysis.

From the previous chapter, there are 3 independent variables related with the dependent variable. After doing the analysis, one independent variable was determined as not has high correlation with the dependent variable; therefore that on *Table 4.6* independent (*Lifestyle*) was deleted. In table 4. support3, and support4 represent one variable which *Support* and so the exp1, exp3, and exp4 represent th *Parents' Experience*. All variables have value more determined as valid data.

Table 4.3

Rotated Component Matrix^a

	Component	
	1	2
support1		,859
support3		,826
support4	,646	
exp1	,781	
exp3	,919	
exp4	,804	

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

Table 4.3 is showing the rotated component matrix that shows all factors loading in each variable. In the table, each factor represents in one variable and it means those factors have strong load in the variable of the factor belongs.

4.2.2 Reliability test

SPSS 20 software is used to find the reliability, which is using *Cronbach's Alpha*. This reliability test has purpose to find the level of consistency of respondents in answering the questions. Data can be considered as acceptably reliable if

Cronbach's Alpha value is more than 0.6, and if more than 0.7 can be considered as good (George & Mallery, 2011).

Table 4.8

Case Processing Summary

		N	%
Cases	Valid	276	100,0
	Excluded ^a	0	,0
	Total	276	100,0

a. Listwise deletion based on all variables in the procedure.

Table 4.5

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,621	,625	2

Parents' support

Case Processing Summary

		N	%
Cases	Valid	276	100,0
	Excluded ^a	0	,0
	Total	276	100,0

a. Listwise deletion based on all variables in the procedure.

Table 4.7

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,648	,664	4

From the result of reliability, variable *parents' experience* (table 4.4 and table 4.5) has value of 0.621, and variable *parents' support* (table 4.6 and table 4.7) has value of 0.648 after spread it to 276 respondents. Because of the value of *Cronbach's Alpha* is more than 0.6 ($\alpha \geq 0.6$), this shows that the indicators are reliable and the analysis can be continued.

4.3 Demographic

In this research, all the 276 respondents are from Jabodetabek (Jakarta, Bogor, Depok, Tangerang, and Bekasi). The demographic data that spread to the respondents are genders, age, allowance, average spending, father's and mother's occupation, and the number of siblings.

4.3.1 Genders and age

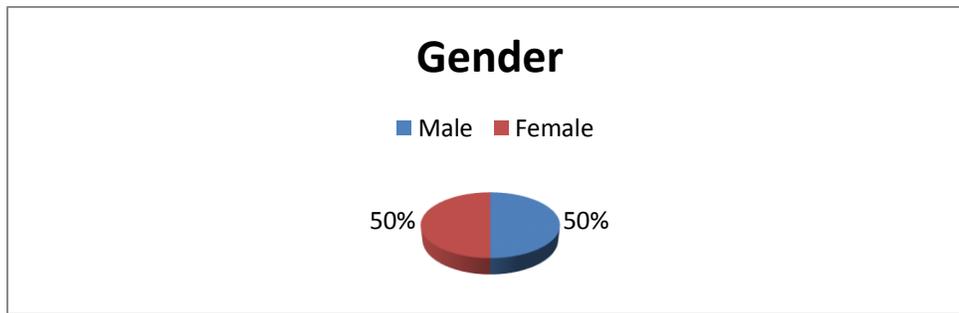


Table 4.9

Age	Frequency	Percentage
< 20	53	19%
20	184	67%
21	25	9%
22	1	4%
> 22	3	1%
Total	276	100%

From 276 respondents, genders were spread equally 50% male and 50% female which is 138 respondents. The 19% respondents are below 20 years old, and mostly respondents are 20 years old with the percentage of 67%. The rest respondents are 21 years (9%), 22 years old (4%), and more than 22 years old (1%).

4.3.2 Allowance

Table 4.10

Respondents' allowance

Allowance	Frequency	Percentage
≤ IDR 1,000,000	114	41%
IDR 1,000,001 – IDR 1,500,000	91	33%
IDR 1,500,001 – IDR 2,000,000	42	15%
> IDR 2,000,000	39	11%
Total	276	100%

From the table 4.10 found that mostly respondents have allowance of IDR 1,000,000 or less (41.67%), respondents with allowance around IDR 1,000,001 to 1,500,000 are 98 (32.67%), this means less than 30 percents of respondents have allowance around IDR 1,500,001 to IDR 2,000,000 (15.67%) and only few respondents who have allowance more than IDR 2,000,000 (10%).

4.3.3 Average spending

Table 4.11

Respondents' average spending

Spending	Frequency	Percentage
< IDR 500,000	62	22%
IDR 500,000 – IDR 1,000,000	99	36%
IDR 1,000,001 – IDR 1,500,000	69	25%

IDR 1,500,001 – IDR 2,000,000	24	9%
> IDR 2,000,000	22	8%
Total	276	100%

Based on table 4.11 from 276 respondents, mostly they have spent around IDR 500 – IDR 1,000,000 (36%). Only 22% of the respondents spent less than IDR 500,000. From the table also can be found that respondents who spend around 1 million to one and half million are 25%, and who spend money around IDR 1,500,001 to 2,000,000 are 8% and 9% for those who spend more than 2 million.

4.3.4 Parents' occupation

Table 4.12

Father's occupation

Occupation	Frequency	Percentage
State employee	63	23%
Private employee	88	32%
Entrepreneur	82	30%
Other	43	16%
Total	276	100%

Table 4.13

Mother's occupation

Occupation	Frequency	Percentage
State employee	31	11%
Private employee	33	12%
Entrepreneur	49	18%
Other	163	59%
Total	276	100%

In table 4.12 there are 23% of father's respondent who work in state employee, 32% work in private employee, 30% work as entrepreneur, and others contribute 17% which mostly respondents' father who already retired from working. Different with father, respondents' mother mostly work as house wife (represented in table 4.13, 'other' column) with the rate of 59%, the rest are state employee (11%), private employee (12%), and as entrepreneur (18%).

4.1 Number of siblings

Table 4.14

Number of siblings	Frequency	Percentage
0	27	10%
1	95	34%
2	99	36%
3	45	16%
4	10	4%
Total	276	100%

From 276 respondents, the result showed that 10% of the respondents are the only children, 34% have one sibling, 36% have two siblings, 16% have three siblings, and only 4% of them who have 4 siblings in the family.

V. CONCLUSION AND RECOMMENDATION

5.1 Conclusion

This research found a high correlation between parents' support and parents' experience of saving toward students' saving behavior. The result is approved by regression analysis which showed the coefficient of correlation (R) value is near to 1. Furthermore, there is a positive impact of independent variables to dependent variable ($p < 0.05$). Therefore, university students' saving behavior is can be influenced by their parents' support of doing saving and parents experience in doing saving. Which both parents are one of the major actors in the family related saving behavior (Keynes, Johnson, & Moggridge, 2012).

5.2 Recommendation

This research had been conducted to find the influence of family's background toward students' saving behavior. From previous researches related to saving behavior, children behavior will affect their potential of cash management, which is in this research parents are recommended for parents to have a good experience about saving. In addition, parents should give more attention about their saving behavior, as related to this research, their behavior and support in saving lead to their children in doing saving for their future. For the future research, it is recommended to add more variables and questions. Furthermore, selecting higher educated respondents can be used for the future research.

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Bekasi, 23th October 2013
Danny Firmansyah

REFERENCES

- [1] Benartzi, S. (2012). Save More Tomorrow: Using Behavioral Economics to Increase Employee Saving. *The Anderson School* , 1-24.
- [2] Cronqvist, H., & Siegel, S. (2010). The Origins of Savings Behavior.
- [3] Denton, F., Fretz, D., & Spencer, B. (2011). *Independence and Economic Security in Old Age*. Toronto: UBC Press.
- [4] George, D., & Mallery, P. (2011). SPSS for Windows Step by Step: A Simple Guide and Reference 18.0 Update. Boston: Allyn & Bacon/Pearson.
- [5] Gratz, J. (2006). The Impact of Parents' Background on their Children's.
- [6] Harrington, M. (2005). *The Other America: Poverty in the United States*. New York: Touchstone.
- [7] Keith, T. (2006). Multiple Regression And Beyon.
- [8] Keynes, J. M., Johnson, E., & Moggridge, D. (2012). *The Collected Writing of John Maynard Keynes*. Cambridge: Cambridge Academic.
- [9] Krishnan, J. (2011). Lifestyle - A Tool for Understanding Buyer Behavior. 283-298.
- [10] Mayer, E. G. (2006). Factor Analysis 1. *Statistics in Psychosocial* .
- [11] Pett, M. A., Lackey, N. R., & Sullivan, J. J. (2003). Making Sense of Factor Analysis: The Use of Factor Analysis for Instrument Development in Health Care Research. California: Sage Publications, Inc.
- [12] Purwanto, N. (2009). Prinsip-Prinsip dan Teknik Evaluasi Pengajaran.
- [13] Salikin, N., Wahab, N. A., Masruki, R., Zakaria, N., & Nurulhuda, S. (2012). The Influence of Parents' Background on Students' Savings. *International Proceedings of Economics Development and Research* , 1-6.
- [14] Sclafani, J. D. (2004). *The Educated Parent: Recent Trends in Raising Children*. Praeger Publishers.
- [15] Shah, J. Y., & Gardner, W. L. (2008). *Handbook of Motivation Science*. New York: Guilford Press.
- [16] Sheldon, C. (2006). Savings Behavior and Asset Choice of Households in Germany. *Munich Center for the Economics of Aging* , 21-103.
- [17] Yates, D. S., Moore, D. S., & Starnes, D. S. (2008). *The Practice of Statistics*. Freeman.

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A Case Report of treatment of a 16-year old girl with Amelogenesis Imperfecta

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I. CASE REPORT

Amelogenesis Imperfecta is a developmental disturbance that interferes with normal enamel formation in the absence of a systemic disorder. In general, it affects all or nearly all of the teeth in both the primary and permanent dentitions¹. A 16-year old patient with a history of brown-stained teeth reported to the Dental office. She complained of stained teeth ever since it erupted and parents noticed similarly stained teeth with her deciduous teeth as well. On clinical examination the teeth were found to have yellowish to brown stains (internal) that did not remove with gentle probing. She was found to have Amelogenesis Imperfecta Hypoplastic Type (Witkop's classification)² with pitting and flakes of enamel chipping off on probing. The enamel exposed the underlying whitish dentine in some areas and made it sensitive to the patient. In terms of investigation, there was no DNA analysis done to isolate the defective gene, due to non-feasibility and non-compliance of the patient with regards to drawing blood. The condition was analyzed purely on the basis of clinical analysis. Since she had no other systemic abnormality, any syndrome(s) was ruled out. Her dental age was corroborated to her chronological age and she had complete set of 28 permanent teeth erupted with a Class I occlusion and no orthodontic anomaly recorded.

II. TREATMENT

Since the patient was 16 years old and had complete set of permanent teeth with 2nd molars erupted and Class I Molar relation, Porcelain fused to Metal (PFM) crowns were chosen to provide respite to the patient in terms of aesthetics, masticatory abilities, relief of sensitivity and comfort and happiness^{4,5}. The shade was chosen based on the skin tone of the patient⁶. The treatment was carried out in a phased manner- First, preparing the upper anterior teeth from canine to canine⁶, after injecting the required nerve blocks and then a coat of varnish was applied with cotton wool sticks to prevent sensitivity. Within 24 hours a 6-unit PFM crown and bridge was fabricated in the laboratory and cemented. This gave adequate psychological advantage to the patient and motivated her for further appointment(s). Then this was followed by the required nerve block, preparation of crown structure and cementation of the lower anterior segment with PFM crown and bridge and occlusion was established with the upper and lower 6-unit PFM bridges. Thereafter, the upper left posterior segment was prepared and cemented with PFM crown and bridge followed by lower left posterior segment and occlusion was established. Followed by, upper right and lower

right posterior segments and occlusion established. Within two weeks the entire set of PFM's were cemented. Occlusion was established, with good aesthetics and patient satisfaction was seen. Follow up was done for nearly up to 8 months post operatively and patient was given oral mouth rinses and was reiterated with the oral hygiene measures especially brushing technique and brushing frequency. After which patient moved to another location and was not in touch.

III. DIFFERENTIAL DIAGNOSIS

This condition can be easily diagnosed as a fluorosis lesion but they can be clearly differentiated since AI cases have discoloration at random points or on all areas of the tooth as compared to teeth with fluorosis and family history wherein only one or few specific members of the family may phenotypically exhibit this condition whereas fluorosis is seen with all members of the family who may or may not be genetically linked, it is geographical. AI will affect all teeth similarly and can have a familial history. Fluorosis can mimic AI, but usually the teeth are not affected uniformly, often sparing the premolars and second permanent molars. A history of fluoride intake can aid in the diagnosis¹.

The treatment for such conditions is best recommended after occlusion is properly established after eruption of all the permanent teeth.

IV. COMMENT

Patient's oral condition was good due to adequate oral hygiene measures that was stressed and impressed upon periodically during the follow up of 8 months post operatively. There were instances of gingival inflammation due to non-compliance on part of the patient in maintaining oral hygiene but was rectified soon with adequate oral hygiene measures. The point to be learned from this case is that since multiple crowns and bridges have tendency for accumulation of food and can cause halitosis if not properly maintained and since they require quite a lot of maintenance and compliance from the patient, it would be better if individual crown(s) be given to the teeth which would be easier to maintain and would cause less accumulation of food and lesser tendency to cause halitosis and deterioration of oral health in general.

ACKNOWLEDGMENT

I would like to thank the patient Muthulakshmi (name changed for protecting privacy of the patient) and her parents for their constant support and compliance with the treatment. Also would like to thank the Dental Laboratory in delivering the crown and bridges on time for every appointment. I would like to thank all concerned in helping me publish this study. Lastly, I would like to thank my parents and my brother in helping me inspire and fund this study.

REFERENCES

- [1] AAPD Guideline on Oral Health Care/Dental Management of Heritable Dental Developmental Anomalies 2012-13; 4(7): 252-257.
- [2] CJ Witkop Jr. Amelogenesis Imperfecta, Dentinogenesis Imperfecta and Dentin Dysplasia Revisited: Problems in Classification. J Or Pathol and Med 1988; 17(9,10): 547-553.
- [3] Aldred MJ, Savarirayan R, Crawford PJ. Amelogenesis Imperfecta: A Classification and Catalogue for the 21st Century. Oral Dis 2003; 9(1): 19-23.
- [4] Tugrul Sari, Aslihan Usumez. Restoring function and esthetics in a patient with Amelogenesis Imperfecta: A Clinical Report. J Prosthetic Dent 2003; 90(6): 522-525.
- [5] Yip HK, Smales RJ. Oral Rehabilitation of Young Adults with Amelogenesis Imperfecta. Int J Prosthodont 2003; 16(4): 345-349.
- [6] Rosensteil. Contemporary Fixed Prosthodontics 2006.

ABBREVIATIONS

1. AAPD: American Academy of Pediatric Dentistry
2. AI: Amelogenesis Imperfecta
3. PFM: Porcelain fused to metal

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Figure 1: Pre operative image



Figure 2: Intra operative image



Figure 3: Post operative image

in x, y coordinates, respectively. The significance of calculating first derivative is to observe the change in the trajectory at current point. A window size of two is considered for calculating first derivative. The second derivative is calculated in order to examine the change of change in trajectory at current point. Here also, a window size of two is considered.

2.3 HMM Modelling and Testing

The variations in each stroke class are modeled using Hidden Markov models (HMM). One HMM is constructed for each stroke, by training on example strokes. Seven state HMM is used to test and train the models which is determined experimentally. The number of Gaussian mixture is optimized to the better recognition accuracy. HTK tool is used to test and train the models [3].

HMM models a doubly stochastic process, one observable and the other hidden [4]. The observable stochastic process contains information about the hidden stochastic process. In our work, the sequence of feature vectors from the online handwriting is the observable stochastic process and the underlying hand movement is the hidden stochastic process. The basic assumption for using HMM for handwriting recognition is that there are unique handwriting movements for writing each of the basic components, namely stroke [5]. Further, the left to right structure is used assuming unique directions of handwriting movements. In the present work, one left to right, continuous density HMM is developed for modelling each stroke.

2.3.1 Training

A HMM consists of a set of states and the transitions associated with it and are trained using Baum-Welch re-estimation or expectation maximization (EM) approach [4]. The procedure starts with some initial model and improved model parameters are re-estimated using the given set of feature vectors. For the next iteration, the most recent model is the initial model and again re-estimation is done using the same set of feature vectors. This process is repeated until model parameters become static and the model of the last iteration is stored as the model for the given class.

2.3.2 Testing

Testing involves finding out the class information for the examples that are unknown to the trained model. The likelihood probability of the given testing example against each of the trained HMM models are found out and the model with the highest likelihood is hypothesized as the class. The process is repeated for all the testing examples and the class information is noted.

2.4 Stroke Classifier

The basic block diagram of the stroke recognizer is shown in Figure 5.

The stroke classifier has been built using HMM modelling technique. 203 HMM models have been built for each of the 203 strokes finalized during script analysis prior to which the database is annotated with the annotation tool at stroke level

and six dimensional features are extracted from the preprocessed coordinates. All the test examples corresponding to each stroke class are tested against all the stroke models. If misclassification arises due to similarity in shape between two strokes those stroke classes are merged stroke classifier performance is evaluated. A stroke classifier with 181 HMM models is finally developed.

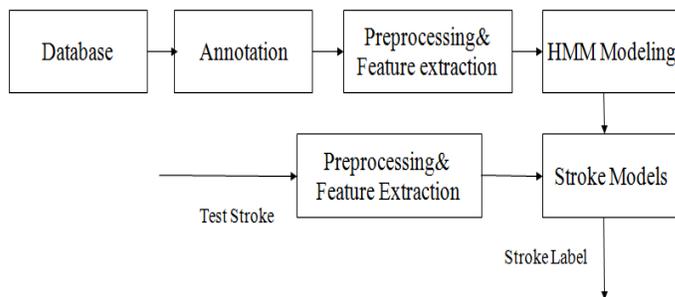


Figure 5: Block diagram of stroke classifier

2.5 Akshara Recogniser using HMM Stroke Classifier

The basic block diagram of akshara recognizer is shown in Figure 6.

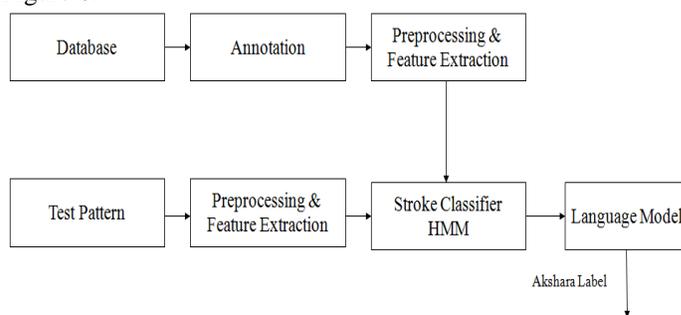


Figure 6: Block diagram of Akshara Recognizer

An Akshara is a combination of different strokes. During testing of akshara, the strokes of an akshara are preprocessed and the features are extracted. The features of preprocessed coordinates are then tested against the developed stroke classifier. The recognized stroke labels along with the language models are used for the recognition of an akshara. Language model refers to the combination of strokes which form the akshara. The isolated Akshara recognizer makes use of a language rule model for the recognition of the akshara label. First the strokes of the akshara are recognized and then the akshara, using the language rule. If the stroke classifier recognizes all the strokes correctly then only we consider it as recognized akshara.

2.5.1 Language Rule for Akshara Recogniser

An akshara can be a single stroke or a combination of multiple strokes. Also the same akshara can be written as a combination of two strokes, three strokes, four stroke and so on. It is observed that all aksharas can be formed using a maximum of 8 strokes. Hence 8 language rule models have been created. For this the combination of strokes that form a particular akshara are

found out by studying the handwritten data of a large number of users. Of all the combinations only those are retained that have been used by more than 5 % writers.

Akshara	Probable Stroke Combinations
আ	— ৩ ২ ৭ — ৩ ২ ৭
গা	৭ ১ — ৭ ৭ ১ — ৭

Figure 7: Handwritten Assamese Akshara with different stroke combination

But this level of akshara recognition gives poor recognition accuracy as the individual strokes that form an akshara regularly confuses with other strokes. So a refined language model is created which includes the combination obtained by considering the confused stroke. Confusions of individual strokes of each akshara are determined. If one stroke regularly confuses with other stroke then the new combination obtained by considering the confused stroke is added into the refined language model. Hence the final language rule model includes the combination of confused strokes as well.

Akshara no. 1	Stroke Combination		
আ	—	৩	২
	Stroke 1	Stroke 2	Stroke 3
	—	৩	২
	Stroke 1	Stroke 144	Stroke 3
	/	৩	২
	Stroke 61	Stroke 144	Stroke 3

Figure 8: Akshara 1 with primary stroke combinations and stroke confusions

For eg, ak1 can be written as a combination of st1, st2, st3. Here st2 is confused with st144 in majority cases. And st1 is confused with st4, st61, st32, etc. hence according to the new language rule ak1 is not only a combination of st1,st2, st3 but also of (st1,st144,st3), (st4,st2,st3), (st61,st2,st3),(st4,st144,st3) and so on as shown in Figure 8

2.6 Graphical User Interface (GUI)

GUI of testing tool developed by Center for Development of Advanced Computing Graphics and Intelligence based Script Technology Group (CDAC), Pune, India is provided with API. We have integrated our stroke and akshara recognition system with the GUI using a dynamic linked library (DLL). Figure 9

shows the interaction of GUI with the Dynamic linked library (dll).

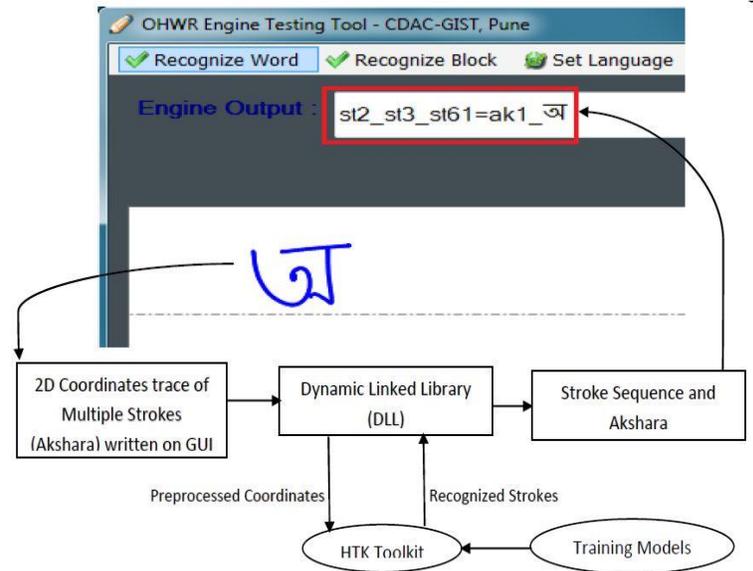


Figure 9: Block Diagram of Akshara Recognition with GUI and DLL. Akshara 1 recognized with stroke 2, 3 and 61.

2.6.1 Akshara Recognition using Graphical User Interface

When an akshara is written on GUI the parameters of API provide the basic data like 2-dimensional coordinate traces of each stroke, the number of stroke etc. Our recognition system is integrated with the GUI using a dynamic linked library (dll). The dynamic linked library when provided with handwritten trace, performs classification tasks with HTK toolkit and delivers the recognized stroke sequence along with a Unicode character of valid akshara (if any) to the API for display. Figure 9 shows the entire process.

The essential functions performed with the dynamic linked library are as follows:

- i) Preprocessing of the coordinate trace given by the API of GUI. Preprocessing involves removing duplicate points, size normalization, smoothing, interpolation of missing points & re-sampling.
- ii) Features extraction.
- iii) Binaries of HTK Classifier is executed with the training model file & the extracted features.
- iv) The recognized strokes by HTK classifier are then read from .rec file.
- v) Language rules prepared for the language are searched for a valid akshara using the set of strokes recognized by HTK classifier.
- vi) Stroke sequences recognized by HTK classifier with a Unicode symbol of the akshara (if a valid akshara exists for the stroke sequence) are stored in a string data type and displayed into the GUI.

III. EXPERIMENTAL RESULTS

For the stroke classifier, initially data is collected from 100 native writers in two sessions using a data collection tool provided by CDAC, Pune in a Tablet PC with stylus by HP Labs. Strokes from first session aksharas are used for training and strokes from second session aksharas are used for testing. Later on another two sessions of data are collected so that we have a minimum of 200 examples per akshara for training and 200 for testing. Strokes from this session of collected data are added with the previous set of data to increase the number of examples per stroke. A stroke classifier is built using HMM technique with 181 stroke classes. Hidden Markov Models are trained & tested by considering number of states as seven and Gaussian mixtures are optimized for best recognition accuracy Average recognition accuracy of the stroke classifier is 94.91 %. The confusion matrix for the first 10 classes out of 181 classes is shown in Figure 9.

stroke no.	st1	st2	st3	st4	st5	st6	st7	st8	st9	st10
	—	୨	୩	୪	୫	୬	୭	୮	୯	୧୦
st1	69.68	0	0	8.30	0	1.21	0	0	0.75	0.15
st2	0	92.58	0	0	0	0	0	0	0	0
st3	0	0	94.67	0	0	0	0	0	0	0
st4	0.15	0	0	94.93	0	0.31	0	0	0.77	0
st5	0	0	0	0	85.71	0	0	0	0	0
st6	0.24	0	0	0	0	86.03	0	0	0.12	0
st7	0	0	0	0	0	0	95.06	0	0	0
st8	0	0	0	0	0	0	0	90.03	0	0
st9	0	0	0	0	0	0	0	0	98.31	0
st10	0	0	0	0	0	0	0	0	0	96.98

Figure 9: Confusion matrix for the first 10 classes of stroke classifier

For evaluation of akshara recognizer performance, users are asked to give handwritten data in the data collection tool provided by CDAC. The data saved in .xml format are annotated by which the actual class labels are attached to the akshara. A confusion matrix has been made comparing the output class label predicted by our system with actual class label using a script. The akshara level performance is 84.2% for all Assamese akshara used by our study.

CONCLUSION

This work describes the development of online Assamese character recognition system using HMMs. A large database of handwritten Assamese numerals is collected and partitioned into two parts. One part is used for developing HMMs. The states and number of Gaussians per state are optimized by conducting large number of experiments. Finally, 7 states and 20 mixtures per state are used in the HMMs. The performance evaluation is then made for different choices of feature set, namely, only (x, y) coordinates, (x, y) coordinates and their first and second order temporal derivatives. The last case provided the best performance. Again, bottom-up approach is used in the development of akshara recognizer. First strokes corresponding to aksharas are recognized and then the aksharas. The final stroke classifier is developed for 181 distinct stroke classes and this final stroke classifier is used for Akshara recognition. The developed stroke classifier gives an average recognition accuracy

of 94.14 % which is used to test combination of strokes from isolated aksharas. The akshara recognizer is evaluated by considering all strokes in an akshara. The reported recognition accuracy is 84.2 %. It is observed that, the performance is high at stroke level in comparison to akshara level performance as misclassification of the complete akshara may occur due to the single stroke mismatch. The possibility of akshara misclassification reduces with less number of strokes.

REFERENCES

- [1] V. J. Babu, L. Prasanth, R. R. Prasanth, R. R. Sharma, G. V. P. Rao and A. Bharath, "HMM-based online handwriting recognition system for telugu symbols," in Proc. of 9th Int. Conf. on Document Analysis and Recognition Brazil, 2007, pp. 63-67..
- [2] X. Li and D. Y. Yeung, "Online handwritten alphanumeric character recognition using dominant points in strokes", Pattern Recognition, vol. 30, no. 1, pp. 31-44, 1997.
- [3] <http://htk.eng.cam.ac.uk/>
- [4] L. R. Rabiner, "A tutorial on Hidden Markov Models and selected applications in speech recognition," Proc. Of IEEE, vol. 79, no. 2, pp. 257-286, 1989.
- [5] S.K.Parui,K.Guin,U.Bhattacharya,andB.B.Chaudhuri, "Online Bangla Handwritten Character Recognition using HMM," in Proc. Of 19th Int. Conf. on Pattern Recognition, pp.1-4, 2008.
- [6] G. S. Reddy, P. Sharma, S. R. M. Prasanna, C. Mahanta and L. N. Sharma, "Combined Online and Offline Assamese Handwritten Numeral Recognizer", in Proc. of 18th National Conference on Communications, pp. 1-5, 2011.
- [7] G. S. Reddy, B. Sarma, R. K. Naik, S. R. M. Prasanna and C. Mahanta, "Assamese Online Handwritten Digit Recognition System using Hidden Markov Models", accepted at the Workshop on Document Analysis & Recognition, 2012.
- [8] Sarma, Bandita, et al. "Handwritten Assamese numeral recognizer using HMM & SVM classifiers." *Communications (NCC), 2013 National Conference on.* IEEE, 2013.

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A Research Study on Software Quality Attributes

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Abstract- Software quality is becoming an important part in software design, helping the designer to handle the complexity of large systems. While designing, the architect should analyze the system requirements before committing the resources to it. The analyzing process helps us to ensure the high quality of architecture design. For the past decade, there were many analyzing methods are used, which in turn to analyze only the views of single stakeholder. By doing so, there are many limitations that lead to critical situation in the development process. They elaborated this situation to excessive amount of time to perform the complete analysis. The scope of finding the key architectural decision is very difficult. Intend of these types of analysis gives the detailed information only after the designing phase, which makes the software unusable and not satisfied by the end-users. Generally, unusable software is useless. Customers and users won't accept un-usable software, even if it provides the required features with the required operations.

This paper gives the survey on software quality attributes. It is also used to manage the conflicts in views by analyzing it, with finest software quality attributes such as Performance, Dependability and Safety concerns. It represents one or more structural aspects, which illustrate how the architecture addresses the concerns such as requirements, objective, intention of stakeholders for the architecture design. This paper also gives the stakeholder's views with preeminent quality attributes, which meets the non functional requirements (such as reliability, usability, maintainability and portability). Thus by having the centric-view of stakeholders with superlative software quality attributes, guarantees an optimum quality for software architecture design.

Index Terms- Quality Attributes

I. INTRODUCTION

There are many different definitions of quality. For some it is the "capability of a software product to conform to requirements." (ISO/IEC 9001) while for others it can be synonymous with "customer value" (Highsmith, 2002) or even defect level.

The first definition of quality history remembers is from Shewhart in the beginning of 20th century: There are two common aspects of quality: one of them has to do with the consideration of the quality of a thing as an objective reality independent of the existence of man. The other has to do with what we think, feel or sense as a result of the objective reality.

In the context of [software engineering](#), software quality refers to some relations but distinct notions that exist wherever quality is defined in a business context:

Software functional quality reflects how well it complies with or conforms to a given design, based on functional requirements or specifications. That attribute can also be described as the fitness for purpose of a piece of software.

Software structural quality refers to how it meets non-functional requirements that support the delivery of the functional requirements, such as robustness or maintainability, the degree to which the software was produced correctly.

Quality Attributes

Software quality is defined as the degree to which software possesses a desired combination of attributes. [1]The quality requirements to build the software architecture have to fulfill the stakeholders. They are commonly divided in two main groups based on the quality they are requesting, i.e., development and operational qualities. A *development quality requirement* is a requirement that is of importance for the developers work, e.g., maintainability, understandability, and flexibility. *Operational quality requirements* are requirements that make the system better from the user's point of view, e.g. performance and usability. Depending on the domain and priorities of the users and developers, quality requirements can become both development and operational, such as performance in a real-time system.

A quality attribute is the property of a software system. A quality requirement is a requirement that is placed on a software system by a stakeholder; a quality attribute is what the system actually presents once it has been implemented. During the development of the architecture it is therefore important to validate that the architecture has the required quality attributes, this is usually done using one or more architecture evaluations.

Quality Attributes in Focus

The focuses are on the following quality attributes: performance, maintainability, testability, and portability.

The IEEE standard 610.12-1990 [2] defines the four quality attributes as:

Maintainability: This is defined as: "The ease with which a software system or component can be modified to correct faults, improve performance or other attributes, or adapt to a changed environment."

Maintainability is a multifaceted quality requirement. It incorporates aspects such as readability and understandability of the source code. Maintainability is also concerned with testability to some extent, as the system has to be re-validated during the maintenance.

Performance: Performance is defined as:

“The degree to which a system or component accomplishes its designated functions within given constraints, such as speed, accuracy, or memory usage.”

There are many aspects of performance, e.g., latency, throughput, and capacity.

Testability: Testability is defined as: “The degree to which a system or component facilitates the establishment of test criteria and the performance of tests to determine whether those criteria have been met”.

The effort needed to validate the system against the requirements. A system with high testability can be validated quickly.

Portability: Portability is defined as: “The ease with which a system or component can be transferred from one hardware or software environment to another.”

The portability is not only between different hardware platforms and operating systems, but also between different virtual machines and versions of frameworks.

II. RELATED WORK

The quality attributes are very important for the software design to satisfy the users. The quality attributes are measured in different ways as follows,

A. Architecture Quality Revisited

Frank Buschmann, David Ameller, Claudia P. Ayala, Jordi Cabot, and Xavier Franch [3], a study that says “Non-Functional Requirements in Software Architecture Practice,” investigates how architects deal with nonfunctional requirements (NFRs) in their daily practices. The results appear contradictory to the common belief that nonfunctional quality is fundamentally important for architecture sustainability and project success. They raised some questions as,

- *What types of NFRs are relevant to software architects?*
- *How are NFRs elicited?*
- *How are NFRs documented?*
- *How are NFRs validated?*

They also suggest that nonfunctional quality is of little relevance to users and customers but mainly a concern for architects. Nontechnical constraints appear to be driving design as prominently as quality requirements.

B. Defect Tracking Systems

Jan M.W. Kristiansen, Steria [4], introduced Defect Tracking Systems (DTS), to facilitate software quality improvement. The focus is mainly on either revising the values of existing defect classification attributes in an existing DTS or introducing new attributes. Primarily, they wanted to give project managers and developers more current, relevant, correct, and easy-to-analyze defect data for assessing software quality and finding potential SPI measures in a cost-effective way. A case study is done by collecting some data from companies to track the defects in the quality attributes. None of the companies recorded the actual effort used to fix a defect, so they perform

root-cause analysis to prevent further defects, especially for those that were most costly to fix. Other problems included as incomplete data, inconsistent data, mixed data. The DTS improvement aimed to reduce the defect density and to improve defect-fixing efficiency. To achieve this goal, the DTS must provide supplementary information that the quality assurance (QA) managers could use to answer the following questions:

- *What are the main defect types?*
- *How the companies prevent defects in a project's early stages?*
- *What are the reasons for the actual defect-fixing effort?*

C. Guideline-Based Approach

Malik Hneif and Sai Peck Lee[5], their approach is to achieving Non-Functional Attributes (NFA) quality is preventive, as opposed to curative- that is, it focuses on preventing defects associated with NFAs during the software development life cycle, rather than identifying and correcting defects after testing. Practical implementation is done through an optimal set of prioritized guidelines that software engineers can identify and apply efficiently throughout system development. The approach has two steps as

- *Selecting Guidelines*
- *Using Guidelines to Prevent NFA Defects*

Three factors affect the guideline selection - NFA priorities, Guideline effects on NFAs, Guideline interrelationships. After selecting guidelines there should not be any overlapping or conflicts. Then there are two stages to prevent NFA defects as preparation stage and application stage.

D. Software Components Quality in Bayesian Networks

M. F. Bertoa, M. A. Moraga, M. C. Morcillo and C. Calero[6], they suggests to improve the quality of software products, which traditionally focused on improving the Internal or External Quality based on the idea that a good External Quality guarantees a good Quality in Use. To analyze the relationships between External Quality and Quality in Use with the external quality sub characteristics *Bayesian Networks* is used to model these relationships and provide a method to define them in a measurable way.

E. Risk-based requirements model

Martin S. Feather, Steven L. Cornford, and Kenneth A. Hicks, James D. Kiper, Tim Menzies[7], they proposed the Defect Detection and Prevention(DDP) model to make the early decision of requirements in the software development phases. They populate this model with three concepts as *Requirements*: What are the functional and nonfunctional requirements of the project, system, or technology? *Risks*: What might delay attaining these requirements? *Mitigations*: What to reduce risks?

F. Issue-Oriented Approach

Norman F. Schneidewind [8], suggested this approach is to measure the software quality in two ways that address nine issues in software companies. The first approach derives knowledge requirements from a set of issues identified during two standards efforts—IEEE Std. 1061-1998 for a Software Quality Metrics Methodology and the American National Standard

Recommended Practice for Software Reliability (ANSI/AIAA R-013-1992). The second approach ties these knowledge requirements to phases in the software development life cycle. Together, these approaches define a body of knowledge that shows software engineers why (issue-oriented) and when (phase-oriented) to measure quality. By answering these issues the software engineers perform the function in life-cycle quality management plan. *The issues are goals, Cost and risk, context, Operational profile, model, data requirements, Measurement types and granularity, Product and process test and evaluation, Product and process quality prediction.* It also accounts for time, with measurements obtained during the early part of the life cycle being generally less quantitative than those obtained later. Both the product and process evolve over the lifecycle phases, so the objects measured during test and operation are not the same objects measured during requirements analysis. Not only are the objects different but requirements and design approaches can change many times during the life cycle.

G. Software Quality Measurement

Ho-Won Jung and Seung-Gweon Kim, Chang-Shin Chung [9], a survey is made on software quality measurement and to address the issues of software product quality, which is defined by the *Joint Technical Committee 1 of the International Organization for Standardization and International Electro technical Commission published a set of software product quality standards known as ISO/IEC 9126.* These standards specify software product quality’s characteristics and sub characteristics and their metrics. However, some in the software engineering community have expressed concerns about a lack of evidence to support such standards. User satisfaction is often considered a critical outcome of quality management, and studies show it as having a positive impact on organizational cost, profit, and sales growth. The defined Characteristics are Functionality, Reliability, Usability, Efficiency, Maintainability, and Portability.

Table I. Scope and Limitations of Existing Methods

Method Name	Scope	Limitations/Future Enhancements
Architecture Quality Revisited [3]	the study suggests that nonfunctional quality is of little relevance for users and customers, and is instead primarily a concern for Software architects.	The practitioners consider non-functional qualities as an afterthought, rather than as a prime driver of architecture design. Development teams underestimate the contribution of nonfunctional qualities to a system’s success
Defect Tracking Systems(DTS) [4]	The improved DTS provided valuable information to initialize and justify software process improvements and	In future it continuous the work to collect more cost and benefit data of these DTS improvements to get a comprehensive understanding of their

	software quality assessment.	Return On Investment (ROI)
Guideline-Based Approach [5]	an approach for improving NFA quality by identifying guide -lines to help software engineers better meet non functional requirements during system design, implementation, and deployment.	However, some NFAs might require a specific quality level. Quantification techniques could enable achievement of a targeted NFA quality level though not necessarily the highest level.
Software Components Quality in Bayesian Networks [6]	The aim is to avoid un -necessary costs or irrelevant characteristics for the end users who un -necessarily raise the cost and effort of product development.	Sometimes there will be confusion in choosing sub characteristics of quality attribute, that lead to more cost, which dissatisfy the end users.
Risk-based requirements model [7]	The method’s name reflects its purpose: to help developers cost-effectively select assurance activities and thereby both prevent the introduction of hardware defects and detect and correct existing ones.	As a future research, they planned to continue in studying the requirements needs of a wide variety of technologies as software, hardware, and combinations of the two.
Issue-Oriented Approach [8]	The approach derives knowledge requirements from a set of issues identified and ties these knowledge requirements to phases in the software development life cycle. Together, it define a body of knowledge to software engineers why and when to measure quality.	They suggested in giving the requirements a high priority in the core body of knowledge for software engineering, adding it to the requirements for certification and licensing. So doing would help advance quality measurement from a craft to a profession
Software Quality Measurement [9]	A survey is made to empirically investigate whether the ISO/IEC 9126 categorization is correct and reliable	The survey data should be augmented with more comprehensive measures of product quality in future studies. Replications of study

	in evaluating user satisfaction with the judgment of a packaged software product's quality.	using other statistical analytic methods such as confirmatory factor analysis are also necessary to substantiate or clarify the present results.
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III. PROBLEM STATEMENT

From the above study of various people's views, it is clearly shown that quality attributes are very important for the software development phase. The main purpose of the quality is to satisfy the users and it is precious in all products. But in most of the time the software architects are not serious with this quality attributes. So here the problem is to

1. Identify the preminent quality attribute to evaluate efficient software architecture which also to meet the non-functional requirements
2. Identify the measuring tools to estimate the non functional quality attributes.

Proposed Solution

According to the problem statement, a view "Quality Centric Architectural Views (QCAV) " is proposed in which there is a need to identify potential issues in an architecture, its feasibility and to evaluate its ability to meet its quality requirements and to generate the centric view for designing the architecture with the improved quality attributes to satisfy the stakeholders.

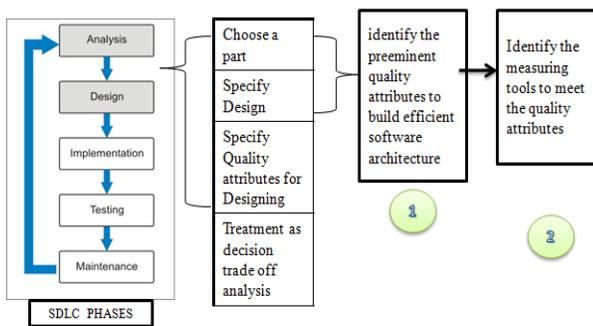


Figure 1. Proposed Model

IV. CONCLUSION

Quality is the main focus of any software engineering project, because it is transparent when presented, but easily recognized in its absence [10]. Software quality is the degree to which software possesses a desired combination of attributes. A quality attributes is a property of a work product by which its quality be judged by stakeholders [10]. Without measuring, we cannot be sure of the level of quality in software architecture design. So a model is proposed to identify preminent quality attribute and to identify the measuring tools to estimate the non functional quality attribute.

REFERENCES

- [1] L. S. Maurya et al, "Comparison of Software Architecture Evaluation Methods for Software Quality Attributes", Journal of Global Research in Computer Science, 1 (4), November 2010.
- [2] IEEE std 610.12-1990 (n.d.), "IEEE Standard Glossary of Software Engineering Terminology", 1990. Retrieved January 19, 2006. Web site: <http://ieeexplore.ieee.org/>.
- [3] Frank Buschmann, David Ameller, Claudia P. Ayala, Jordi Cabot, and Xavier Franch, "Architecture Quality Revisited", IEEE Software | published by the IEEE computer society, 2012.
- [4] Jan M.W. Kristiansen, Steria, "Enhancing Defect Tracking Systems to Facilitate Software Quality Improvement", IEEE Software www.computer.org/software, 2012.
- [5] Malik Hneif and Sai Peck Lee, University of Malaya, "Using Guidelines to Improve Quality in Software Nonfunctional Attributes", IEEE Software | Published by The IEEE Computer Society, 2011.
- [6] M. F. Bertoa, M. A. Moraga, M. C. Morcillo and C. Calero, "An Analysis of the Software Components Quality in Use using Bayesian Networks", IEEE Latin America Transactions, vol. 8, no. 2, April 2010.
- [7] Martin S. Feather, Steven L. Cornford, and Kenneth A. Hicks, James D. Kiper, Tim Menzies, "A Broad, Quantitative Model for Making Early Requirements Decisions", IEEE software, March/April 2008.
- [8] Norman F. Schneidewind, Naval Postgraduate School, "Body of Knowledge for Software Quality Measurement", IEEE research feature, 2002.
- [9] Ho-Won Jung and Seung-Gweon Kim, Korea University, Chang-Shin Chung, "Telecommunications Technology Association, Measuring Software Product Quality: A Survey of ISO/IEC 9126", IEEE software - IEEE computer society", 2004.
- [10] Leire Etxeberria MU, "Method for analysis-aided design decision making and quality attribute prediction", Embedded System for energy efficient building, 2010.
- [11] Juha Savolainen, "Conflict - Centric Software Architectural Views: Exposing Trade - Offs in Quality Requirements", IEEE 2010.
- [12] Alexander Egved, "Automatically Detecting and Tracking Inconsistencies in software Design models", IEEE 2010.
- [13] Frank Buschmann, "Unusable Software is Useless, Part1", IEEE 2011.
- [14] Frank Buschmann, "Unusable Software is Useless, Part2", IEEE 2011.

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Prosthodontic Rehabilitation of Different Clinical Situation

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Abstract- The goal of dentistry is for patients to keep all of their teeth throughout their lives in health and comfort. If the teeth are lost despite all efforts to save them, a restoration should be made in such a manner as to function efficiently and comfortably in harmony with the stomatognathic system and the temporomandibular joints. Tremendous progress has been made in procedures for rehabilitation over the past few decades. Swift increase in research work in the recent past leaves many options for clinicians, to be updated and to possess optimum knowledge to select the use of materials and techniques that are employed for rehabilitation in proximity to both health as well as comfort.

Index Terms- Metal based dentures, Stomatognathic system, Hollow denture, Anthropoidal pouch technique, Precision attachments, Hemimandibulectomy

I. INTRODUCTION

The success of any Prosthesis depends upon many factors of a purely technological nature, some of which are carried out at the chairside and some in the laboratory. It is dependent also upon the knowledge of the practitioner and technician, and upon the skill with which they each carry out their respective tasks. However, unless the mouth upon which they work presents conditions favourable for denture construction, there is little that their efforts will be successful. The problems that should receive attention before actual Prosthesis construction is commenced, must therefore be considered. The ultimate success or failure of the Prosthesis may well depend upon the initial diagnosis and treatment planning (1).

Consideration must be given not only to the purely dental factors involved but also to the personal factors appertaining to the particular patient, for any one of the following reasons:

- (a) To restore or improve the ability to masticate;
- (b) To restore or improve appearance;
- (c) To maintain the oral tissues in as healthy a condition as possible.

Obviously there will be many situations where a combination of two or all of these requirements are met by the provision of dentures.

When teeth have been lost or it is planned to remove them there are five alternatives:

1. Complete upper and/ or lower dentures.
2. Removable Partial dentures.
3. Fixed Partial Dentures (Bridges).

4. Implant supported prosthesis-Removable or Fixed Prosthesis.
5. Any combination of 1,2,3 and 4.

II. METHODS FOR VARIOUS CLINICAL SITUATIONS

[1] FULL DENTURES: Made Easy, Predictable, and Successful

The life expectancy of the Indian population is steadily increasing, which could lead to a rise in the number of complex complete denture cases. The treatment of these complex cases may need to move away from traditional denture construction. While the copy technique serves an excellent role, there is a need for an alternative approach when continued bone resorption has led to a progressively unsatisfactory denture or in cases where dentures have been lost (2).

A. Immediate and conventional complete dentures

Complete dentures can be either "conventional" or "immediate." Made after the teeth have been removed and the gum tissue has begun to heal, a conventional denture is ready for placement in the mouth about 8 to 12 weeks after the teeth have been removed.

Unlike conventional denture (fig.1), immediate dentures (fig.2) are made in advance and can be positioned as soon as the teeth are removed. As a result, the wearer does not have to be without teeth during the healing period. However, bones and gums shrink over time, especially during the healing period following tooth removal. Therefore a disadvantage of immediate dentures compared with conventional dentures is that they require more adjustments to fit properly during the healing process and generally should only be considered a temporary solution until conventional dentures can be made.

B. Balanced complete dentures

Balanced complete dentures are required for the bilateral, simultaneous anterior and posterior occlusal contacts of the teeth in centric and eccentric positions. To minimize the dislodging forces, the occlusion should be balanced throughout the functional range of movements of the patient (fig.3).

C. Metal-based denture

a. Metal-based denture is one in which a portion of the denture body is made of a substantial metal casting rather than all plastic (acrylic resin). There are two types of metal-based dentures. a. Standard metal-based denture: The metal base portion of the denture is in direct contact with underlying supporting tissues. (fig.4)

b. Modified metal-based denture: The metal base portion of the denture is not in direct contact with underlying supporting tissues. A soft or hard plastic liner may be interposed between the metal and supporting tissues.

The additional weight of a metal base also contributes to lower denture stability by causing the denture to settle down onto a jaw ridge.

Treatment options for Resorbed Ridges

In the highly atrophic mandible muscular control over the denture is the main retentive and stabilising factor during function (3). Dental implants may provide stabilisation of mandibular complete dentures for the atrophic mandible, however there may be situations when it is not possible to provide implants on the grounds of medical, surgical or costs factors. The severely atrophied jaw can have various treatment options such as:

A. Anthropoidal pouch technique

The neutral zone (NZ) technique is an alternative approach for the construction of lower complete dentures. It is most effective for dentures where there is a highly atrophic ridge and a history of denture instability. The technique aims to construct a denture that is shaped by muscle function and is in harmony with the surrounding oral structures (4). The technique is not new but is one that is valuable and yet not often practiced (Fig.5). The dentures will have other advantages: (a) Improved stability and retention (b) Posterior teeth will be correctly positioned allowing sufficient tongue space (c) Reduced food trapping adjacent to the molar teeth (d) Good aesthetics due to facial support.

B. Hollow denture technique

For more than 150 years, it was believed that the weight of the lower denture contributes to both retention and stability. However, studies have shown that retention and stability can be achieved by improving the fit of the denture bases rather than addition of extra weight to the dentures and also the weight of the lower denture may not affect its retention and stability (5).

Hollowing the denture so as to reduce the weight of the denture, thereby enhancing stability and retention, reducing the further resorption of the jaws. (Fig.6)

[2] PARTIAL DENTURES

Basic principles of dental treatment for a partially edentulous arch are 1. to stabilize the individual arch and 2. to organize interarch function by control of interarch contacts (6).

Achieving these conditions requires use of all methods of dental treatment including 1. Periodontal therapy 2. Orthodontic treatment to reposition the teeth 3. Individual tooth restorations to stabilize the arch 4. Fixed partial dentures 5. Orthognathic surgery where indicated 6. Establishment and control of the occlusal plane 7. Removable partial dentures.

A. Interim Removable partial denture or Transitional Removable partial denture

The more common type of removable partial denture is the interim removable partial denture or transitional removable partial denture. Partial denture construction should be relatively

simple in design and should permit the easy addition of further teeth, which may be immediate replacements of condemned teeth. This type of denture has been aptly called the "additive" partial denture by De Van (fig 7).

B. Planned partial dentures/ Cast partial dentures

Proper treatment planning is essential for cast partial denture. The concepts of guiding planes, rigid major and minor connectors, and indirect retention are important components in cast partial denture designs. In addition, the correctable cast impression procedure that maximizes the areas of soft tissue coverage without impinging on movable tissue attachments is also a most important adjunct to the use of cast partial dentures (fig 8).

C. Flexible dentures (Soft dentures)

Polymerization shrinkage encountered in conventionally cured PMMA led to the development of a special injection moulding technique. Soft dentures are an excellent alternative to traditional hard-fitted dentures. It is an alternative denture prosthesis design in which optimal flange height and thickness can be achieved by using flexible denture base material. Flexible dentures use a special flexible resin that prevents them from chafing the gums, allows the wearer to chew properly (7). It also provides a soft base that prevents the gums from being rubbed raw. Some of the commercially available products are Duraflex, Flexite (fig.9), Proflex, Lucitone, Impak, valplast (fig.10).

D. Precision attachments

Misconceptions about the use of attachment retained removable partial dentures have discouraged many practitioners from using these kinds of prostheses in their dental practices. The desire to balance between functional stability and cosmetic appeal in partial dentures gave rise to the development of Precision Attachments. The precision attachment is sometimes said to be a connecting link between fixed and removable partial denture as it incorporates features common to both types of construction.

The decision to use an intracoronal or extracoronal attachment should be based on the size and shape of the abutment teeth. Intracoronal attachments require more tooth preparation and tooth reduction than extracoronal attachments. If intracoronal attachments are used where there is insufficient space, the abutment retainer will be overcontoured on the proximal surface, resulting in a restoration that can create periodontal problems.

When there is adequate space available, intracoronal attachments are preferred to extracoronal attachments because intracoronal attachments more ideally direct the forces of function along the long axis of the abutment teeth. When there is inadequate space, an extracoronal prosthesis (fig 11) may be employed (8).

[3] FIXED PARTIAL DENTURES (BRIDGES)

In many cases a fixed bridge is superior restoration to a partial denture. In many cases more efficient mastication is possible than with any removable type of restoration (9). A fixed bridge will give superior splinting and will prevent increasing

tooth mobility (fig.12.a & 12.b). Metal free ceramic crowns and bridges have high esthetic value where patients “feel natural”.

[4] IMPLANT SUPPORTED PROSTHESIS

Modern Implantology has moved into the mainstream and has lit up the lives of millions of individual across the world.

Implant supported prosthesis can be of following types:

- a. Implant supported crown (Screw or cement retained) (fig.13.a & 13.b)
- b. Implant supported bridge (Screw or cement retained) (fig.14.a & 14.b)
- c. Tooth-Implant supported bridge (fig.15.a & 15.b)
- d. Implant supported overdenture (fig.16.a & 16.b)
- e. Fixed complete denture (fig.17.a & 17.b)

Treatment options for Complex Clinical Situation

Use of a Guide plane for maintaining the residual fragment in partial or Hemimandibulectomy

Mandibular resection leads to altered mandibular movements, disfigurement, difficult in swallowing, impaired speech and articulation, and deviation of the mandible towards the resected site (10). Numerous prosthetic methods employed to reduce or minimize deviation and improve function include maxillomandibular fixation, implant supported prosthesis, palatal based guidance restoration and removable mandibular guide flange prosthesis (fig.18.a & 18.b).

III. DISCUSSION AND SUMMARY

For many years, traditional complete denture designs have been modified to gain additional support and stability from a few retained and suitably prepared natural teeth. The argument was made that, if the prosthesis were inseparable from the patient, it would be perceived as part of the patient and would therefore be the best solution to the problem of unsatisfactory adaptation of the complete denture experience. The biotechnological achievement of osseointegration was justifiably heralded as a major therapeutic breakthrough for edentulous people. Experience and observation had taught prosthodontists that the vast majority of their patient’s early years of denture wearing were without major problems. With the use of implants more stable and retentive dentures can be given to the patient preserving the underlying alveolar bone and increasing the proprioception.

REFERENCES

- [1] Binkley TK, Binkley CJ. A Practicle approach to full mouth rehabilitation. J Prosthet Dent 1987, 57: 216-6.
- [2] Charles M. Heartwell – Syllabus of complete dentures – 4th Edition.
- [3] McCord JF, Tyson K.W. A conservative prosthodontic option for the treatment of edentulous patients with atrophic mandibular ridges. BDJ 1997, 182: 469-72
- [4] M.J.Gahan and A.D.Walmsley. The neutral zone impression revisited. BDJ 2005, 198: 269-272.
- [5] Raleigh A. Holt Jr. A hollow complete lower denture . J Prosthet Dent. 1981, 4: 452-45.
- [6] DeVan MM: The nature of the partial denture foundation: suggestions for its preservation. J prosthet Dent 1952, 2: 210.

- [7] Lowe LG. Flexible denture flanges for patients exhibiting undercut tuberosities and reduced width of the buccal vestibule: A clinical report. J Prosthet Dent 2004, 92(2): 128-31.
- [8] Preiskel, H.W.: Precision attachments in dentistry, ed. 3, St. Louis, 1979, The C.V. Mosby Co.
- [9] Hausman M, Hobo S. Occlusal reconstruction using transitional crowns. J Prosthet Dent 1961, 11: 278-87.
- [10] Robinson JE, Rubright W.C. Use of a guide plane for maintaining the residual fragment in partial or hemimandibulectomy. J Prosthet Dent 1964, 14: 992 -9.

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FIGURES



Fig.1: Conventional complete denture



Fig.2: Immediate complete denture



Fig.3: Extra oral Gothic arch tracers attached to occlusal rims



Fig.4: Standard metal-based denture



Fig.5: Establishing the correct occlusal height



Fig.6: Hollow denture



Fig.7: Removable partial denture



Fig.8: Cast partial denture



Fig.9: Flexite plus sectional partial



Fig.10: Valplast RPD showing thickness and clasps of same material

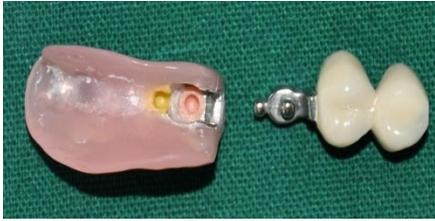


Fig.11: Male and female parts of extracoronal attachment



Fig.12.a: Pre-op without crown and bridge



Fig.12.b: post-op with crown and bridge



Fig.13.a: Missing anterior



Fig. 13.b: Implant supported crown



Fig. 14.a: Abutments placed on implants



Fig.14.b: Implant supported bridge



Fig.15.a: Pre-op (tooth-Implant supported bridge)



Fig.15.b: post-op (tooth-Implant supported bridge)



Fig.16.a: Implant supported overdenture



Fig.16.b: Dentures for Implant supported overdenture



Fig.17.a: Fixed complete denture (screw retained)



Fig.17.b: Fixed complete denture after Ceramic build-up (screw retained)



Fig.18.a: Deviated mandible towards left



Fig.18.b: Removable mandibular guide flange prosthesis

Theoretical Study of the effects of solvents on global properties of 1,10-phenanthroline

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Abstract- Quantum mechanical calculations of different energies components of 1,10-phenanthroline in ground state were carried out by DFT method, in isolated state and in various solvents to study the effects of solvents on various energy components and global properties. The solvation energy, chemical potential, hardness, electrophilicity of 1,10-phenanthroline were calculated with the help of computed HOMO-LUMO gap of 1,10-phenanthroline in different solvents in the ground state. The plots of energy components and thermodynamic parameters against the dielectric constant of the corresponding solvents were found to be polynomial of higher order. The solvation energy of 1,10-phenanthroline is found to be highest in acetonitrile.

Index Terms- DFT, Ground state, 1,10-phenanthroline, energy components, HOMO, LUMO, solvation energy, dielectric constants.

I. INTRODUCTION

Physical and chemical properties of a molecule depend on the structure and the various kinds of energies of the molecule. Chemical reaction of a molecule in solution is affected by the nature of the solvent; solvent affects not only the energies of HOMO and LUMO of the molecule, but also other kinds of energies. Energy of a molecule may be considered to have various energy components such as reaction field energy, total zero-electron terms, Nuclear-nuclear, Nuclear-solvent, total one-electron terms, Electron-nuclear, Electron-solvent, Kinetic, total two-electron terms, Electronic energy, total quantum mech. energy, Gas phase energy, Solution phase energy, total solute energy, total solvent energy, Solute cavity energy, Reorganization energy, Solvation energy total internal energy, total enthalpy, total Gibbs free energy, and zero point energy.

1,10-phenanthroline is a white crystalline solid, It is used in preparation of Charge transfer complexes[1-5] of various utilities. 1,10-phenanthroline is also one of the most versatile reagent because it forms complexes with metals and organic acceptors. 1,10-phenanthroline has a rigid framework and possesses a superb ability to chelate many metal ions via two nitrogen donors, which show potential for technological applications, due to their high charge transfer mobility, bright light-emission and good electro- and photo-active properties [6-11]

Keeping in view the utility of 1,10-phenanthroline various kinds of energies of 1,10-phenanthroline in the ground state in gaseous phase and in different kinds of solvents have been

theoretically calculated in this paper.

II. COMPUTATIONAL METHODS

The initial structure of 1,10-phenanthroline was built with Chem-Draw ultra 8.0 and the structure was optimized on Chem3D ultra 8.0. The structure was exported to Maestro 9.3 of Schrodinger 2012 version. The optimization of the structure was done on the Jaguar panel of the Maestro 9. The DFT-B3LYP method of theory was chosen. 6-31g^{##} basis set was selected and 255 basis functions were created for calculation. The molecule was assigned net zero charge and singlet multiplicity. In the solvent menu of the jaguar panel PBF solver was used for optimization of the structure in both the gaseous and solution phase. The optimization the gaseous state and in the different solutions were done in ground state of the molecule.

III. GEOMETRY OPTIMIZATION

for perform a geometry optimization one needs to guess at the geometry and the direction in which to search, a set of co-ordinates to optimize, and some criteria for when to optimization is complete. The search direction is obtained from the gradient of the energy and the initial Hessian. An initial Hessian (second derivative matrix or force constant matrix) and the gradient are used to define search direction that should result in lowering of energy. The choice if co-ordinate systems have a substantial impact on the convergence of the optimization. The ideal set of Co-ordinate is one in which the energy change along each co-ordinate is maximized, and the coupling between co-ordinates is minimized. Jaguar chooses the coordinate system by default. It has two options Cartesian and z-matrix that produces an efficient optimization requires an understanding of the coupling between simple internal co-ordinates

For optimization to minimum energy structures, the convergence criterion for SCF calculation is chosen to assure accurate analyses gradients. For these jobs, a wave function is considered converged when the root mean square (RMS) change in density matrix element is less than the RMS density matrix element change criterion, whose default value is 5.0×10^{-6} . The geometry is considered to have converged when the energy of successive geometries and the elements of analyze gradients of the energy and the displacement has met convergence criteria. For optimization in solution, the default criteria are multiplied by a factor of three, and a higher priority is given to the energy convergence criterion. Thus if the energy change criterion is met

before the gradient and displacement criteria have been met, the geometry is considered converged. The optimized geometry may not have a local minimization energy i.e it may have reside on a saddle. To know whether it is global minimization we look for the value of vibrational frequencies. If all the vibrational frequencies are real (i.e +ve) then it represents global minimum, but if any of the vibrational frequencies is negative (i.e imaginary) then it is local minimum.

IV. PERFORMING A SOLVATION CALCULATION

It involves several iterations in which the wave functions for the molecule in the gas phase are calculated. The program ch performs electrostatic potential fitting, which represents the wave function as a set of point charges on the atomic centers. The interactions between the molecule and the solvent are evaluated by Jaguar's Poisson-Boltzmann solver [12-13], which fits the field produced by the solvent dielectric continuum to another set of point charges. These charges are passed back to scf, which performs a new calculation of the wave function for the molecule in the field produced by the solvent point charges. Electrostatic potential fitting is performed on the new wave function, the solvent-molecule interactions are reevaluated by the Poisson-Boltzmann solver, and so on, until the solvation free energy for the molecule converges.

For solvation calculations on neutral systems in water the program pre evaluates the Lewis dot structure for the molecule or system and assigns atomic van der Waals radii accordingly. These van der Waals radii are used to form the boundary between the solvent dielectric continuum and the solute molecule. The Lewis dot structure and van der Waals radii information both appear in the output from the program pre. The radii are listed under the heading "vdw2" in the table of atomic information below the listing of non-default options. After the pre output, the usual output appears for the first, gas-phase calculation, except that the energy breakdown for the scf output also describes the electron-nuclear and kinetic contributions to the total one-electron terms in the energy, as well as the virial ratio $-V/T$, where V is the potential energy and T is the kinetic energy. This ratio should be -2 if the calculation satisfies the virial theorem. After the first scf output, the output from the first run of the program ch appears. Since performing a solvation calculation enables electrostatic potential fitting to atomic centers, the usual output for that option is included every time output from the program ch appears in the output file. The post program writes out the necessary input files for the Poisson-Boltzmann solver; this step is noted in the output file. The next output section comes from the Poisson-Boltzmann solver. The output includes information on the area (in \AA^2) of the molecular surface formed from the intersection of spheres with the van der Waals radii centered on the various atoms; the reaction field energy in kT (where $T = 298$ K), which is the energy of the interaction of the atom-centered charges with the solvent; the solvent-accessible surface area (in \AA^2), which reflects the surface formed from the points whose closest distance from the molecular surface is equal to the probe radius of the solvent; and the cavity energy in kT, which is computed to be the solvation energy of a nonpolar solute whose size and shape are the same as those of the actual solute molecule. The output from the program

solv follows the Poisson-Boltzmann solver results, giving the number of point charges provided by the solver to model the solvent, the sum of the surface charges, the nuclear repulsion energy already calculated by Jaguar, the nuclear-point charge energy representing the energy of interaction between the molecule's nuclei and the solvent point charges, and the point-charge repulsion energy, which is calculated but not used because it is irrelevant to the desired solvation results. After this output, the output for the second solvation iteration begins. The output from scf comes first, giving the results for the molecule-and-solvent-point-charges system. Total quantum mech. energy corresponds to the final energy from the scf energy table for that iteration, and includes the entire energies for the molecule-solvent interactions. The output next includes the gas phase and the solution phase energies for the molecule, since these terms are, of course, necessary for solvation energy calculations. The first solution phase energy component is the total solute energy, which includes the nuclear-nuclear, electronnuclear, kinetic, and two-electron terms, but no terms involving the solvent directly. The second component of the solution phase energy is the total solvent energy, which is computed as half of the total of the nuclear-solvent and electron-solvent terms, since some of its effect has already changed the solute energy. Third, a solute cavity term, which computes the solvation energy of a nonpolar solute of identical size and shape to the actual solute molecule, as described in reference [12], is included. This is only done for water as solvent. The last solution phase energy component (shown only if it is nonzero) is term (T), the first shell correction factor, which depends on the functional groups in the molecule, with atoms near the surface contributing most heavily. Finally, the list ends with the reorganization energy and the solvation energy. The reorganization energy is the difference between the total solute energy and the gas phase energy, and does not explicitly contain solvent terms. The final solvation energy is calculated as the solution phase energy described above minus the gas phase energy. The solvation energy is listed in Hartrees and in kcal/mol,

Chemical potential (μ) [14]

HOMO as ionization energy(IE) and LUMO as electron affinity (EA) have been used for calculating the electronic chemical potential (μ) which is half of the energy of HOMO and LUMO

$$\mu = (E_{\text{HOMO}} + E_{\text{LUMO}}) / 2$$

Hardness (η) [15]

The hardness (h) as half of the gap energy of HOMO and LUMO has been calculated using the following equation

$$\text{Gap} = E_{\text{HOMO}} - E_{\text{LUMO}} \\ \eta = \text{Gap} / 2$$

Electrophilicity (ω) [16]

The electrophilicity (ω) has been calculated using equation

$$\omega = \mu^2 / 2 \eta$$

Reaction field energy (in KT)

This gives us the energy of the interactions of atom centred charges with the solvent; Solvent accessible surface area (SASA in Å^2) reflects the surface formed from the points whose closest distance from the molecular surface is equal to the probe radius of the solvent.

Cavity energy (in KT)

This is solvation energy of a non-polar solute whose size and shape are the same as those of actual solute molecule.

Quantum mechanical energy

This term corresponds to the entire energies for the molecule solvent interaction and is equal to the sum of total zero electron terms and electronic energy.

Reorganisation energy

This is the difference between the total solute energy and the gas phase energy, and does not explicitly contain solvent terms.

I. RESULTS AND DISCUSSION

Solvent parameters:

Table-1 summarizes the solvent parameters such as dielectric constants, molecular weight, density and polarity of the solvents used for the present theoretical study by Poisson-Boltzmann solver.

Table1. Physical parameters of various solvents

Solvents	M.W g/mol	Density g/ml	Dielectric constant	Probe radius Å^0
1.Acetonitrile	37.5	0.777	37.5	2.19
2.Benzene	78.12	0.87865	2.284	2.6
3.Carbontetrachloride	153.82	1.594	2.238	2.67
4.Chloroform	119.38	1.4832	4.806	2.52
5.Cyclohexane	84.16	0.77855	2.023	2.78
6.Dichloromethane	84.93	1.3266	8.93	2.33
7.DMF	73.09	0.944	36.7	2.49
8.methanol	32.04	0.7914	33.62	2
9.THF	72.11	0.8892	7.6	2.52
10.Water	18.02	0.99823	80.37	1.4

Table2 summarizes values of HOMO-LUMO energy, μ , η , ω of 1,10-phenanthroline calculated by DFT -B3LYP/6-31G- level

In table-3 the energy components calculated by DFT method on Jaguar panel of the Maestro 9.3 with 6-31g^{##} basis set utilizing 255 basis functions for 1,10-phenanthroline in the ground state have been incorporated. The pictures of HOMO and LUMO of 1,10-phenanthroline in gaseous state and in various solvents have been shown in fig.6.

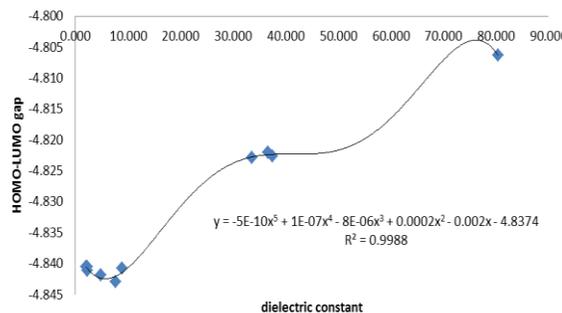
An electron acceptor represents the ability to obtain an electron in the LUMO and HOMO represents the ability to donate electron.

The ($E_{HOMO}-E_{LUMO}$) gap is an important scale of stability [17] and compounds with large ($E_{HOMO}-E_{LUMO}$) gap value tend to have higher stability. The perusal of the table-2 indicates the stability of 1,10-phenanthroline increases in the solvents in the ground state in the order; *water>dmf>*

ethanol>benzene=carbontetrachloride=cyclohexane=dichloromethane >chloroform>THF,

Therefore, if it is desired to stabilize 1,10-phenanthroline in the ground state then out of ten solvents studied water is the best. The plot of the energy gap between HOMO and LUMO versus dielectric constant of solvents in ground state have been shown in the fig 1. The dependence of the energy gap (y) on dielectric constant (x) in ground state follows the equation $y = -5E-10x^5 + 1E-07x^4 - 8E-06x^3 + 0.0002x^2 - 0.002x - 4.8374$, ($R^2 = 0.9988$)

Figure 1. Effect of dielectric constant on the HOMO-LUMO gap of 1,10-phenanthroline in the GS

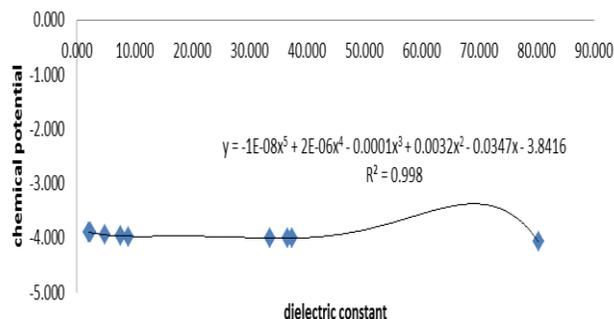


The chemical potentials (μ) of 1,10-phenanthroline in the ground state increases in the order; *Cyclohexane>carbontetrachloride>benzene>chloroform>THF>dichloromethane >dmf>methanol>acetonitrile>water.*

Therefore, if it is desired to have highest chemical potential, 1,10-phenanthroline in the ground state, then out of ten solvents studied cyclohexane is the best.

The plot of the chemical potential versus dielectric constant of solvents in ground state have been shown in the fig2. The dependence of the chemical potential (y) on dielectric constant(x) follows the equation $y = -1E-08x^5 + 2E-06x^4 - 0.0001x^3 + 0.0032x^2 - 0.0347x - 3.8416$, ($R^2 = 0.998$)

Figure 2.Effect of dielectric constant on the chemical potential of 1,10-phenanthroline in the GS

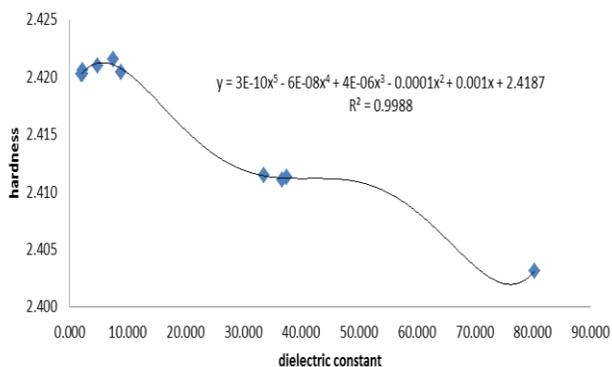


The hardness(η) of 1,10-phenanthroline increases in the ground state in the following order;
THF=benzene=chloroform>cyclohexane>carbontetrachloride=dichloromethane >dmf=methanol=acetonitrile>water

The 1,10-phenanthroline molecule has been found to be hardest in THF,,benzene and chloroform in the ground state. Therefore, if it is desired to increased hardness of 1,10-phenanthroline to largest extent in the ground state then out of ten solvents studied THF,,benzene and chloroform are the best

The plot of hardness versus dielectric constant of solvents in the ground state have been shown in the fig3. The dependence of hardness (y) on dielectric constant(x) follows $y = 3E-10x^5 - 6E-08x^4 + 4E-06x^3 - 0.0001x^2 + 0.001x + 2.4187$, ($R^2 = 0.9988$)

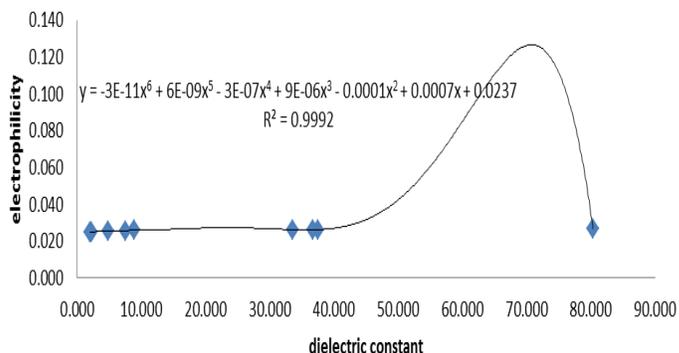
Figure 3.Effect of dielectric contant on the hardness of 1,10-phenanthroline in the GS



The electrophilicity (ω) of 1,10-phenanthroline molecule has been found to possess high electrophilicity in the ground in acetonitrile, methanol,dmf, dichloromethane and THF
Therefore, if it is desired to increase electrophilicity of 1,10-phenanthroline to larger extent in the ground state, then out of ten solvents studied acetonitrile, methanol,dmf, dichloromethane and THF are the best.

The plot of electrophilicity (y) versus dielectric constant(x) of solvents in ground state have been shown in the fig4. The dependence of the electrophilicity on dielectric constant follows the $y = -3E-11x^6 + 6E-09x^5 - 3E-07x^4 + 9E-06x^3 - 0.0001x^2 + 0.0007x + 0.0237$, ($R^2 = 0.9992$)in the ground.

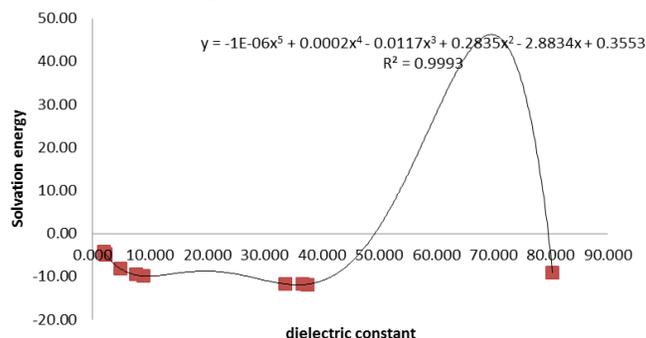
Figure4.Effect of dielectric contant on the electrophilicity of 1,10-phenanthroline in the GS



The Solvation energy of 1,10-phenanthroline in the ground state are in the following order; acetonitrile> dmf>methanol>dichloromethane>THF>water> chloroform>benzene >carbontetrachloride> cyclohexane

The plot of the solvation energy versus dielectric constant of solvents in ground state have been shown in the fig-5. The dependence of the solvation energy(y) on dielectric constant(x) follows $y = -1E-06x^5 + 0.0002x^4 - 0.0117x^3 + 0.2835x^2 - 2.8834x + 0.3553$, ($R^2 = 0.9993$)

Figure 5.Effect of dielectric contant on the solvation energy of 1,10-phenanthroline in the GS



Thus, it was found that 1,10-phenanthroline is most highly solvated in the ground state in acetonitrile than other studied solvents.

Figure6. Picture of HOMO-LUMO of 1,10-phenanthroline in the ground state in gaseous and ten various solvents

State	HOMO	LUMO
Gaseous state		
cyclohexane		
carbontetrchlorid e		
benzene		
chloroform		
THF		

State	HOMO	LUMO
dichloromethane		
methanol		
DMF		
acetonitrile		
water		

Table 2. Values of HOMO-LUMO energy, μ , η , ω of 1,10-phenanthroline calculated by DFT -B3LYP/6-31G- level

Solvents	HOMO	LUMO	Gap	$\mu = E_{\text{HOMO}} + E_{\text{LUMO}}/2$	$\eta = (E_{\text{LUMO}} - E_{\text{HOMO}})/2$	Electrophilicity $\omega = \mu^2/2\eta$
acetonitrile	-6.422	-1.600	-4.823	-4.011	2.411	0.026
benzene	-6.328	-1.487	-4.841	-3.907	2.421	0.025
carbontetrachloride	-6.325	-1.484	-4.841	-3.905	2.420	0.025
chloroform	-6.370	-1.528	-4.842	-3.949	2.421	0.025
cyclohexane	-6.318	-1.477	-4.841	-3.897	2.420	0.025
dichlormethane	-6.395	-1.554	-4.841	-3.975	2.420	0.026
dmf	-6.416	-1.593	-4.822	-4.005	2.411	0.026
methanol	-6.420	-1.598	-4.823	-4.009	2.411	0.026
THF	-6.388	-1.544	-4.843	-3.966	2.422	0.026
Water	-6.466	-1.660	-4.806	-4.063	2.403	0.027

(energy in eV)

Table 3. Values of energy components of 1,10-phenanthroline in gaseous state and various solvents in ground state calculated by DFT -B3LYP/6-31G- level

Energy components , in eV	Gas-phase	Acetonitrile	Benzene	Carbon tetrachloride	Chloroform	Cyclohexane	Dichloro methane	dmf	methanol	THF	Water
(A)Total zero electron terms	-	21386.60	21396.75	21388.79	21387.36	21388.26	21387.95	21387.31	21387.98	21388.19	21402.40
(B)Nuclear-nuclear	21390.87	21350.21	21381.96	21374.32	21362.70	21375.47	21357.62	21351.70	21351.86	21359.35	21360.45
(C)Nuclear-solvent		36.39	14.79	14.47	24.65	12.78	30.33	35.62	36.11	28.84	41.96
(E)Total one electron terms	-63.44591	-63425.75	-63460.52	-63437.23	-63431.14	-63436.68	-63430.44	-63427.66	-63428.57	-63431.49	-63451.77
(F)Electron-nuclear		-78791.35	-78855.77	-78827.22	-78809.84	-78828.51	-78802.90	-78794.14	-78794.57	-78805.55	-78812.48
(G)Electron-solvent		-37.80	-15.27	-14.95	-25.54	-13.20	-31.46	-37.02	-37.51	-29.92	-43.45
(H)Kinetic		15403.40	15404.87	15404.94	15404.24	15405.03	15403.91	15403.50	15403.52	15403.98	15404.16
(I)Total two electron terms	26500.63	26483.51	26493.45	26493.58	26488.57	26493.62	26487.08	26484.72	26484.97	26487.93	26493.69
(L)Electronic energy (E+I)	-36945.8	-36942.24	-36943.76	-36943.65	-36942.57	-36943.06	-36943.36	-36942.94	-36943.60	-36943.56	-36958.09
(N)Total quantum mechanical energy(A+L)	-15554.41	-15555.63	-15554.87	-15554.86	-15555.21	-15554.81	-15555.41	-15555.63	-15555.62	-15555.36	-15555.68
(O)Gas phase energy		-15554.41	-15554.41	-15554.41	-15554.41	-15554.41	-15554.41	-15554.41	-15554.41	-15554.41	-15554.41
(P)Solution phase energy(Q+R+S)		-15554.93	-15554.63	-15554.62	-15554.77	-15554.60	-15554.84	-15554.92	-15554.92	-15554.83	-15554.81
(Q)Total solute energy(N-C-G)		-15554.22	-15554.38	-15554.38	-15554.33	-15554.39	-15554.28	-15554.22	-15554.22	-15554.29	-15554.19
(R)Total solvent energyC/2+G/2)		-0.71	-0.24	-0.24	-0.44	-0.21	-0.56	-0.70	-0.70	-0.54	-0.75
(S)Solute cavity energy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
(U)Reorganization energy(Q-O)		0.19	0.03	0.03	0.09	0.02	0.13	0.19	0.19	0.12	0.22
(V)solvation energy(P-O) (kJ/mol)		-11.89	-4.92	-4.87	-8.20	-4.30	-9.95	-11.79	-11.78	-9.57	-9.14

CONCLUSION

The present study on solvent effect on the energy components of 1,10-phenanthroline in ground state by ten different solvents has lead us to conclude it is highly solvated in acetonitrile while lowest in cyclohexane. It has been found that 1,10-phenanthroline is most hard, in cyclohexane and least hard in water. The chemical potential of 1,10-phenanthroline is found to be highest in THF and lowest in water.

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REFERENCES

- [1] Foster Roy, Organic charge transfer complexes, Academic Press, New York (1969).
- [2] Lamis Shahada a, Adel Mostafa b, El-Metwally Nour a, Hassan S. Bazzi Journal of Molecular Structure Synthesis, spectroscopic, thermal and structural investigations of charge-transfer complexes of 4,40-trimethylenedipiperidinewith chloranil, TBCHD, 1,10-phenanthroline, TCNQ and iodine Journal of Molecular Structure 933 (2009) 1–7
- [3] T VINOD KUMAR, T VEERAAIAH and G VENKATESHWARLU, Molecular complexes of phenols with 1,10-phenanthroline Proc. Indian Acad. Sci. (Chem. Sci.), Vol. 112, No. 2, April 2000, pp. 119–125 Ó Indian Academy of Sciences
- [4] REFAT Moamen & El-METWALLY Nashwa M July 2011 Vol.56 No.19: 1993–2000doi: 10.1007/s11434-011-4525-9Refat M S, et al. Chinese Sci Bull July (2011) Vol.56 No.19 Investigation of charge transfer complexes formed between 3,3'-dimethylbenzidine (o-toluidine) donor and 1,10-phenanthroline, p-chloranil and TCNQ as π -acceptors
- [5] Liang-Yeu Chen,a,b Sie-Rong Li,a Po-Yuan Chen,a Ho-Chiang Chang,a Tzu-Pin Wang,aIan-Lih Tsai,b and Eng-Chi Wanga,* 2,3-Dichloro-5,6-dicyanobenzoquinone (1,10-phenanthroline) mediated oxidationdehydrogenationof 2-aroysl-3,4-dihydro-2H-benzopyrans : synthesisof 2-aroyslbenzopyran-4-ones ARKIVOC 2010 (xi) 64-76
- [6] Williams A F, Piguat C and Bernardinelli G 1991 Angew. Chem. Int. Edit. 30 1490
- [7] Hurley D J and Tor Y 2002 J. Am. Chem. Soc. 124,3749
- [8] Felder D, Nierengarten J F, Barigelletti F, Ventura B and Armaroli N 2001 J. Am. Chem. Soc. 123 6291
- [9] Baek N, Kim H, Hwang G and Kim B 2001 Mol. Cryst. Liq. Cryst. 370 387
- [10] Connors P J, Tzalis J D, Dunnick A L and Tor Y 1998 Inorg. Chem. 37 1121
- [11] Liu Q D, Jia W L and Wang S N 2005 Inorg. Chem.44 1332
- [12] Tannor, D. J.; Marten, B.; Murphy, R.; Friesner, R. A.; Sitkoff, D.; Nicholls, A.; Ringnalda, M.; Goddard, W. A., III; Honig, B. Accurate First Principles Calculation of Molecular Charge Distributions and Solvation Energies from Ab Initio Quantum Mechanics and Continuum Dielectric Theory. J. Am. Chem. Soc. 1994, 116, 11875
- [13] Marten, B.; Kim, K.; Cortis, C.; Friesner, R. A.; Murphy, R. B.; Ringnalda, M. N.; Sitkoff, D.; Honig, B. New Model for Calculation of Solvation Free Energies: Correction of Self-Consistent Reaction Field Continuum Dielectric Theory for Short-Range Hydrogen-Bonding Effects. J. Phys. Chem. 1996, 100, 11775.
- [14] Parr, R. G.; Pearson, R. G. J. Am. Chem. Soc., 1983, 105, 7512.
- [15] Pearson, RG 1991, Density functional theory-electronegativity and hardness chemtracts- Inorg.chem. 3:317-333
- [16] Parr, R.G.; Yang, W. Chemical potential derivatives. In Density-Functional Theory of Atoms and Molecules, 1st ed.; Oxford University Press: New York, NY, USA, 1989; pp. 87–95.
- [17] Johnson, E. R.; Keinan, S.; Mori-Sanchez, P.; Contreras-Garcia, J.; Cohen, A. J.; Wang, W. J. Am. Chem. Soc. 2010, 132, 6498..

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A study to assess the effectiveness of planned teaching programme on knowledge of staff nurses regarding prevention of urinary tract infection among patients with indwelling catheter

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Abstract- A One group pre-test post-test experimental study to assess the effectiveness of planned teaching program on knowledge of staff nurses regarding prevention of urinary tract infection among patients with indwelling catheter. The sample consisting of 90 staff nurses was selected by using simple random sampling. The tool comprised of structured self-administered questionnaire. The pretest was conducted and the planned teaching program was administered. The post test was conducted after one week. The data obtained were analyzed by using differential and inferential statistics. The mean score of post-test knowledge 21.53 (71.76%) was apparently higher than the mean score of pre-test knowledge 13.51 (45.03%), suggesting that the planned teaching programme was effective in increasing the knowledge of the staff nurses regarding prevention of urinary tract infection among patients with indwelling catheter. The mean difference 8.02 between pre-test and post-test knowledge score of the staff nurses was found to be significant.

Index Terms- Urinary tract infection, Indwelling catheter, One group pre – test post – test experimental study

I. INTRODUCTION

Urinary tract infection (UTI) usually refers to the presence of bacteria (> 10⁵ bacteria per ml of urine) in the urinary tract together with symptoms, and sometimes signs, of inflammation. It is characterized by frequency of micturation, dysuria, Pyuria, nicturia, fever, occasional suprapubic pain, and haematuria. UTI is one of the most commonly occurring bacterial Infections among men and women

Empirical antibiotic therapy is usually applied here and for this, knowledge of the common uro-pathogens and their susceptibility to commonly used antibiotics is needed. Treatment becomes even more challenging in the presence of risk factors such as higher age, co morbidity, and immunosuppressant. Many times, physicians resort to prescribing broad-spectrum antibiotics over specific antibiotics in the view of resistance of the causative organism to the antibiotic. Poor patient compliance and incomplete course of antibiotic therapy have resulted in the evolution of resistance to many of these antibiotics. Various studies done worldwide have shown changing patterns in the etiology of UTIs. However, studies on UTI and the pattern of

antibiotic resistance in India are few. The present trends of the uro-pathogens and their susceptibility to various antibiotics are essential to formulate guidelines for the empirical treatment of UTIs while awaiting the culture sensitivity.

A study was conducted on “Candiduria in catheterized intensive care unit patients: emerging microbiological trends” at Department of Microbiology, GB Pant Hospital, New Delhi, India. The study on Urinary tract infection (UTI) as a result of Candida spp. is becoming increasingly common in hospitalized setting. Clinicians face dilemma in differentiating colonization from true infection and whether to treat candiduria or not. The patients admitted in the ICUs and perform microbiological characterization of yeasts to guide treatment protocols. The result of the study Candiduria was more common at extremes of age. The mean duration of catheter days was 11.1 ± 6 days. Concomitant candidemia was seen in 4.3% of cases. Non-albicans Candida spp. (71.4%) emerged as the predominant pathogen causing nosocomial UTI8.

The urinary system is the most common site for all hospital-acquired infections, accounting for approximately 40% of all nosocomial infections. The knowledge of staff nurses regarding prevention of urinary tract infection in patients with indwelling catheter can help patients prevent urinary tract infection. Therefore the researchers were interested to take on the study.

II. RESEARCH ELABORATIONS

Statement of problem –

“A study to assess the effectiveness of planned teaching programme on knowledge of staff nurses regarding prevention of urinary tract infection among patients with indwelling catheter in selected hospital at Udaipur, Rajasthan, India”

III. OBJECTIVES

1. To assess the pre-test knowledge of staff nurses on prevention of urinary tract infection among patients with indwelling catheter
2. To administer the planned teaching programme on staff nurses to prevention of urinary tract infection among patients with indwelling catheter

3. To assess the post-test knowledge of staff nurses on prevention of urinary tract infection among patients with indwelling catheter
4. To compare pre-test and post-test knowledge score of staff nurses on prevention of urinary tract infection among patients with indwelling catheter

IV. HYPOTHESIS

H1 - There will be a significant difference between pre-test knowledge scores and post- test knowledge scores of staff nurses regarding prevention of urinary tract infection among patients with indwelling catheter.

V. MATERIALS AND METHODS

Population – Staff Nurses

Sample – Staff Nurses working in Geetanjali Hospital, Udaipur

Sample size – 90 staff nurses

Setting – Geetanjali Hospital, Udaipur, Rajasthan, India

Conceptual framework –the conceptual framework for this study was derived from General System Theory. According to General System theory, a system is a set of components or unit interacting with each other within a boundary that filters the kind and rate of flow of inputs and outputs to and from the system.

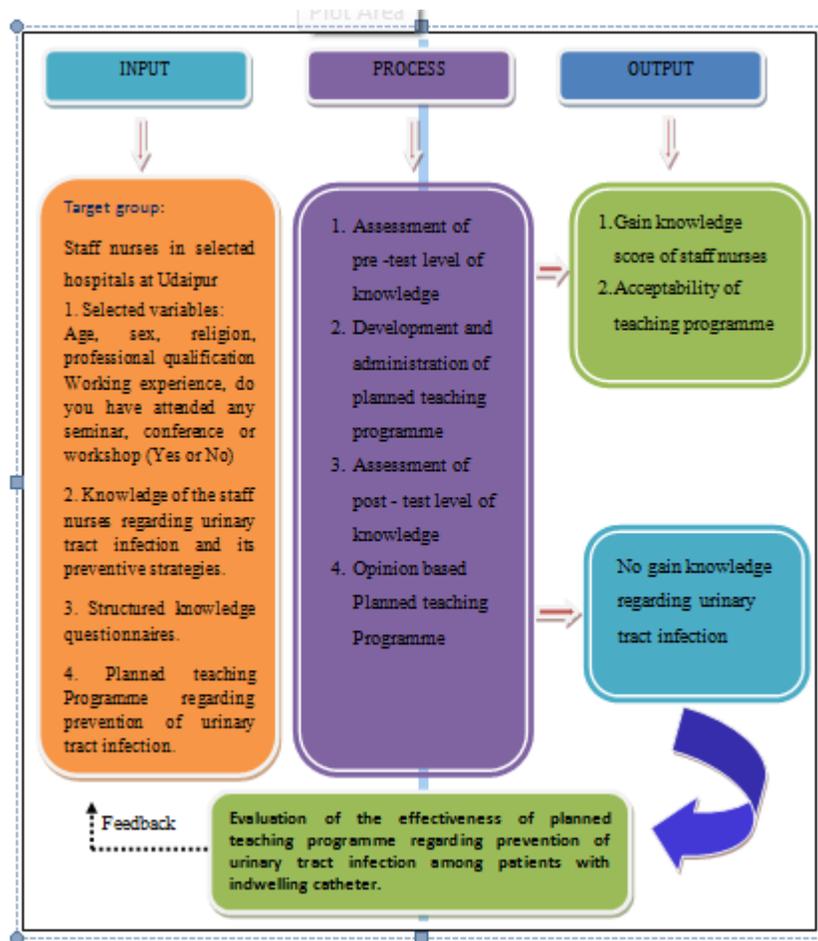


Figure 1 – Conceptual framework

VI. RESEARCH DESIGN

The research design selected for the present study was a one group pre-test post-test research design

GROUP	PRE-TEST (Dependent variable)	TREATMENT (Independent variable)	POST –TEST (Dependent variable)
RE	O1	X	O2
RE	Knowledge of Staff Nurses	Planned teaching programme regarding prevention of UTI Among patients with indwelling catheter	Knowledge of Staff Nurses

Table 1: One group pre and post-test research design

The interpretations of the symbol are as below:

- RE - Randomized experimental group
- O1 - Administration of pre-test knowledge questionnaire
- O2 - Administration of post-test knowledge questionnaire
- X - Intervention, treatment (independent variable) i.e. PTP.

Ethical Consideration

After obtaining permission from research committee of Geetanjali College of Nursing, prior permission was obtained from nursing superintendent Geetanjali medical college and Hospital at Udaipur. Consent was taken from each participant who had participated in the study.

Description of the Tool

The structured knowledge questionnaire consisted of two parts i.e. Part – I & II.

Part - I: consisted of 6 items on demographic data such as Age, Gender , Religion, Educational Qualification ,Working Experience, Attended any seminar or workshop related UTIs.

Part - II: consisted of 30 knowledge items. Each item was multiple choices in nature with 4 choices.

Scoring

The knowledge of Staff Nurses regarding the outcomes of Urinary Tract Infection was scored as follows, one mark for each correct answer and zero marks for incorrect answer. The maximum score was 30, to interpret level of knowledge the score was distributed as follows;

Interpretation of knowledge:

Level	Range
Inadequate knowledge	<50 %
Moderate knowledge	50-75 %
Adequate knowledge	>75 %

An answer key was prepared for scoring answer to the structured knowledge questionnaire.

Data Collection and Data Analysis

The data was presented under the following sections

Section-I: Description of demographic variables of the respondents.

Section-II: Distribution of Respondents according pre-test and post-test level of knowledge score.

Section-III: Effectiveness of planned teaching programme on knowledge of staff nurses on prevention of urinary tract infection among patients with indwelling catheter

VII. RESULTS

Table 2: Frequency and Percentage distribution of respondents to their level of knowledge score

N=90

Level of Knowledge	Score	Respondents			
		Pre-test		Post-test	
		Frequency	Percent (%)	Frequency	Percent (%)
Inadequate knowledge	<50%	53	58.88	0	0
Moderately knowledge	50-75%	11	12.22	60	66.66
Adequate knowledge	>75%	26	28.88	30	33.33
Total		90	100	90	100

Table 2: The result showed that, in pre-test out of 90 respondents 53 respondents (58.88 %) belongs to inadequate knowledge and 11 respondents (12.22%) belongs to moderate knowledge and 26 respondents (28.88%) belongs to adequate knowledge regarding prevention of urinary tract infection among patient with indwelling catheter.

In post-test 60 (66.66%) respondents belongs to moderate knowledge and 30(33.33 %) respondents belongs to adequate knowledge.

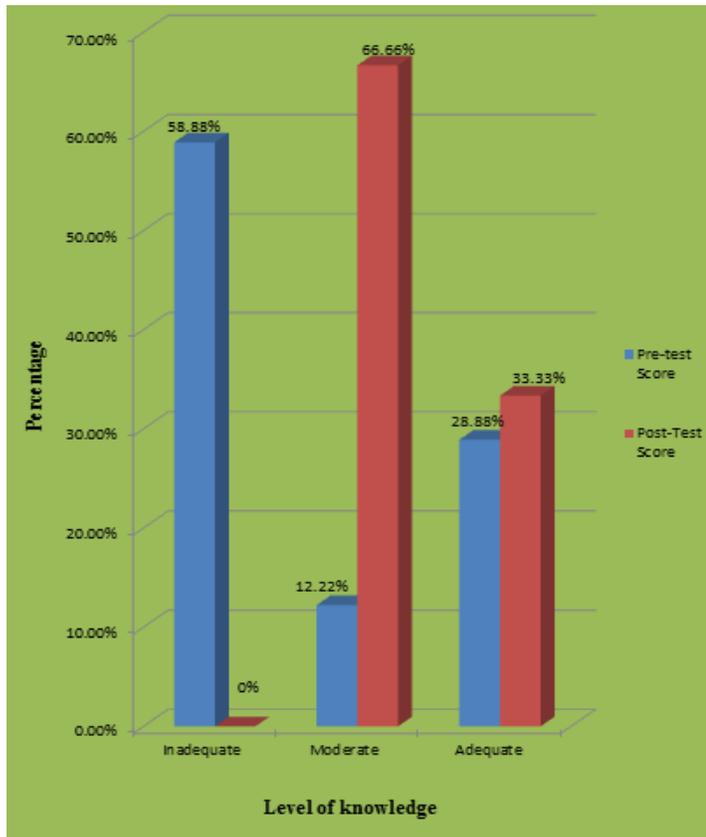


Figure 2: Frequency and Percentage distribution of respondents to their level of knowledge score

SECTION: III

EFFECTIVENESS OF PLANNED TEACHING PROGRAMME ON KNOWLEDGE OF STAFF NURSES ON

PREVENTION OF URINARY TRACT INFECTION AMONG PATIENTS WITH INDWELLING CATHETER.

The paired “t” value was computed to determine the effectiveness of planned teaching programme on knowledge of staff nurses on prevention of urinary tract infection among patients with indwelling catheter.

The following research hypothesis was stated

H1 - There is a significant difference between pre-test knowledge scores and post- test knowledge scores of staff nurses regarding prevention of urinary tract infection among patients with indwelling catheter.

Table 3: Effectiveness of planned teaching programme on knowledge of staff nurses on prevention of urinary tract infection among patients with indwelling catheter.

N=90

Knowledge Assessment	Mean	Mean Difference	SD	Df	Paired “t” test	P Value
Pre-test	13.51	8.02	3.70	89	17.06	<0.05
Post-test	21.53		2.74			

Table 3: The result showed that that the mean post-test knowledge score (21.53) was higher than the mean pre-test score (11.13). The mean difference pre-test score (8.02) of knowledge was significant at 0.05 % level at the “t” = 17.06 *P<0.05. Hence research hypothesis H1 was accepted. This indicates that the PTP was effective in increasing the knowledge of staff nurses on prevention of urinary tract infection among patients with indwelling catheter.

Table 4: Area wise comparison between pre-test and post-test

N= 90

Area of Knowledge	Max. Score	Pre-test				Post-test			
		Mean score	Mean %	Range	SD	Mean score	Mean %	Range	SD
Concept and definition of UTI	5	2.66	53.2	4	1.0	3.88	77.77	3	0.72
Causes & risk factor of UTI	5	2.05	41	5	0.92	3.42	68.44	3	0.76
Pathophysiology and Sign & symptoms of UTI	3	1.72	57.33	3	0.87	2.18	72.96	2	0.68
Diagnostic test of UTI	4	1.85	46.25	4	1.06	2.8	70	3	0.83
Management & treatment of UTI	4	1.58	39.5	4	0.99	2.63	65.83	3	0.79

Complications of UTI	1	0.22	22	1	0.41	0.63	63.33	1	0.48
Prevention of UTI	8	3.4	42.5	8	1.38	5.96	74.58	5	1.13

Table 4: The result showed that the mean, standard deviation and percentage of pre-test and post-test knowledge score on different areas of prevention of urinary tract infection.

In the area of Concept and definition of Urinary tract infection in the pre-test knowledge mean score 2.66 and SD 1.0 range 4 in pre-test experimental group and mean value 3.88 and SD 0.72 range 3 in post-test experimental group.

In the area of Causes & risk factor of UTI, the mean score 2.05 and SD 0.92 range 5 in pre-test experimental group and mean score 3.42 and SD 0.76 range 3 in post-test experimental group.

In the area of Pathophysiology and Sign & symptoms of UTI, mean score 1.72 and SD 0.87 range 3 in pre-test experimental group and mean score 2.18 and SD 0.68, range 2 in post-test experimental group.

In the area of Diagnostic test of UTI, mean score 1.85 and SD 1.06 range 4 in pre-test experimental group and mean score 2.8 and SD 0.83 range 3 in post-test experimental group

In the area of Management & treatment of UTI, mean score 1.58 and SD 0.99 range 4 in pre-test experimental group and mean score 2.63 and SD 0.79 range 3 in post-test experimental group.

In the area of Complications of UTI, mean score 0.22 and SD 0.41 range 1 in pre-test experimental group and mean score 0.63 and SD 0.48 range 1 in post-test experimental group.

In the area of Prevention of UTI, mean score 3.4 and SD 1.38 range 8 in pre-test experimental group and mean score 5.96 and SD 1.13 range 5 in post-test experimental group.

Therefore the results confirmed that the planned teaching program was highly effective in improving the knowledge of staff nurses regarding the prevention of urinary tract infection in patients with indwelling catheters.

VIII. CONCLUSION

The study aimed at testing the effectiveness of planned teaching program on knowledge of staff nurses regarding prevention of urinary tract infection among patient with indwelling catheters. The result showed that the planned teaching program was highly effective. The implications of this study emphasize on inclusion of teaching programs on prevention of urinary tract infection in clients with catheters in the hospital continuing education programs, so that the nosocomial infections can be prevented.

REFERENCES

[1] M Eshwarappa, et.al. "Clinico-microbiological profile of urinary tract infection": 2011.p.30-36
 [2] Parker D, et.al. "Nursing interventions to reduce the risk of catheter associated urinary tract" Jan-Feb 2009; 36(1); p. 23-34.
 [3] Edward s. Wong, M.D., "Urinary Tract Infections in Adults" 1999 Mar 1; 59(5). p. 1225-1234.

[4] Chedi, B.A.Z. et.al. "A seven months retrospective study on urinary tract infection" December 2(2).p. 95 – 98
 [5] Ann Pallett, et.al. "Complicated urinary tract infections" November 2010, 65(3).p. 25-33
 [6] PendseAK et.al. "The etiology of urolithiasis" 1986; 14(2).p.59-62.
 [7] GauravDalela, Sweta Gupta, et.al. "Antibiotic Resistance Pattern in Uropathogens" May (2012):6(4).p. 645 – 651
 [8] Jain M, Dogra V et.al. "Candiduria in catheterized intensive care unit patients: emerging microbiological trends" 2011 Jul-Sep;54(3).p.552-5
 [9] Burns N, Grove SK. Understanding Nursing Research. 2nd Edition. Philadelphia: Saunders; 2004.p.742-58.
 [10] Polit DF, Hungler B.P. Nursing Research: Principles and Methods. 6th Edition: Philadelphia: Lippincott; 2000.

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Germplasm evaluation in genus *Carex* of family Cyperaceae

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Abstract- To prepare a database of germplasm diversity in the Indian sedges, cytological studies were initiated on population basis from Punjab plains and adjoining areas. About 2000 taxonomical species have been recorded for major genus *Carex* but the cytological picture is quite dismal at the world level with chromosome records for only 579 species and 14 out of about 148 Indian species. The chromosome number varies from $2n=12$ to $2n=114$ on worldwide basis. Polyploids, intraspecific and aneuploid cytotypes are very common. Data suggest the existence of $x=6, 7, 8, 9, 10, 11, 13, 17$ and 19 . Chromosome numbers $2n=60$ is most frequent which support $x=6$ as the primary base numbers for *Carex*. The genus is dominated by polyploids with 98.96% of the taxa being polyploid ranging from $4x-12x$ ploid level. The chromosome size of the genus is small which support the breakage of diffuse centric chromosomes to account for existence of high %age of chromosome number variations which are perpetuated through vegetative multiplication prevalent in the family.

Index Terms- Aneuploidy, Diffuse centric chromosome, Germplasm, Polyploidy, Sedge, Vegetative propagation.

I. INTRODUCTION

Family Cyperaceae to which belong the sedges is one of the largest and widely distributed families of the monocots represented throughout the world by about 4000 species (Santapau and Henry 1973). In India around 400 species of the family are found as dominant constituent of the marshy flora. Due to prevalence of chromosomal diversity, polyploidy and aneuploidy coupled with vegetative means of propagation, the family forms a very good object to understand the various evolutionary processes involved in speciation. Some of the genera like *Carex*, *Cyperus*, *Scirpus*, etc. show high polyploid and aneuploid series.

The importance of cytology as one of the parameters to solve the problems related to interrelationships and evolution of plant groups, their reproductive behaviour and their systematic disputes has been realized long ago. Sedges have also attracted good attention particularly from Japan, Europe and North America. As far as Indian sedges are concerned cytological studies have been done by Sharma and Bal (1956), Sanyal and Sharma (1972), Rath and Patnaik (1974, 1978), Mehra and Sachdeva (1975a,b; 1976) from Eastern India; Nijalingappa (1972, 1973, 1975, 1977), Nijalingappa and Leela Bai (1990), Nijalingappa *et al.* (1978), Tejavathi and Nijalingappa (1990), Subramaniam (1988) from Southern India and Bir and Cheema (1994), Cheema (1991), Cheema *et al.* (1992a,b; 1993a,b), Bir *et*

al. (1982; 1986; 1988a, b; 1990a,b; 1991; 1992a,b; 1993a,b; 1996), Cheema and Bir (1994a,b; 1995; 1996; 1997), Wujek *et al.* (1997), Kaur and Gupta (2008-2009), Cheema and Gupta (2011, 2012) from Punjab state of NW India.

There has been a considerable confusion about phylogenetic and systematic position of the family as well as delimitation of some genera within family. Frequently different members belonging to one genus are transferred to another. Hooker (1897) divided the family into four sections **Cypereae** including tribes Eucypereae, Scirpeae and Rhynchosporae; **Hypolytreae**; **Sclerieae** and **Cariceae**. To assess the evolutionary patterns of sedges, in present communication an attempt has been made to elucidate the total chromosomal diversity in the *Carex* at India and world level based on chromosomal data available till date. Approximately 16% of described *Carex* species have been sampled (Roalson, 2008).

II. COLLECTION OF CHROMOSOMAL DATA

All the available information on chromosome numbers of *Carex* has been documented and analysed from Darlington and Wylie (1955); Fedrov (1969); Index to Plant Chromosome Numbers (1970–2003) compiled by Goldblatt (1973-2003); IOPB chromosome number reports published in Taxon from 1965 onwards and Biological Abstracts from 1971 onwards; Roalson (2008) and other recent papers published in different journals and internet sites.

III. CHROMOSOME NUMBERS

Carex Linn. with an estimated 2000 species is the largest genus of the family Cyperaceae. In India, it is represented by 148 species of which 22 occur in South India (Clarke 1894, Fischer 1931). On the basis of inflorescence morphology, Kükenthal (1909) divided this genus into four subgenera and reorganized 69 sections. In addition, *Carex* has remained a classic example of cytotoxic confusion (Heilborn 1939). A perusal of literature pertaining to the cytology of *Carex* revealed that a majority of the species investigated are from temperate zones and many tropical ones have remained either untouched or insufficiently examined. Considering the size of this genus, the cytological work done in India is very inadequate.

The variation of chromosome numbers within the genus and even within the species is quite common in Cyperaceae. At world level 249 species out of 579 and at India level 7 species out of 14 show either intraspecific or aneuploid cytotypes as reflected in Table 1. Further *Carex* is characterized by very high aneuploid chromosome numbers. These range from $2n=12$ in

Carex ciliato-marginata, *C. siderosticta* Hance to $2n=114$ in *C. cuspidata* Host, *C. hirta* Linn. and *C. pilosa* Scop. Thus like Poaceae, the *Carex* and in turn Cyperaceae represents a group of flowering plants with highly variable chromosome numbers.

From Fig.1, it is concluded that chromosome number in the genus ranges from $2n=12$ to $2n=114$ with $2n=60$ (75 taxa) being the most frequent followed by $2n=56$ (62 taxa), $2n=58$ (60 taxa) and $2n=68$ (58 taxa). The variation on the lower and higher side might have been due to phylogenetic decrease and increase in the chromosome numbers at diploid level.

IV. DIFFUSE CENTROMERE

Chromosomes in Cyperaceae are diffuse centric or holocentric or polycentric meaning that centromeric activity is distributed along the entire chromosome (Håkansson 1954). Heilborn (1928) noted that *Carex* chromosomes lack an obvious constriction, but it took more precise studies (Sharma and Bal 1956) to demonstrate that this was due to lack of a localized centromere. Holocentricity had previously been identified in the chromosomes of the Juncaceae (De Castro 1950; La Cour 1952), the sister family to the Cyperaceae. In holocentric chromosomes, fragments that arise by breakages are retained during meiosis and inherited in Mendelian fashion (Faulkner 1972; Luceño 1993). Consequently, breakages may result in viable gametes with aneuploid numbers that can become stabilized through backcrossing or selfing. Holocentric chromosomes occur throughout the Cyperaceae and Juncaceae as well as in four other Angiosperm genera *Cuscuta* L. subgenus *Cuscuta* (Pazy and Plitmann 1994; Guerra and García 2004), *Drosera* L. (Sheikh *et al.* 1995), *Chionographis* Maxim. (Tanaka and Tanaka 1977), and *Myristica fragrans* Houtt. (Flach 1966). It has been suggested that non-localized centromeres, i.e. holocentric chromosome structure appears to be uniform across the Cyperaceae.

V. POST-REDUCTIONAL MEIOSIS

Unlike most groups of organisms, the Cyperaceae undergo post-reductional meiosis. In pre-reductional meiosis, which is the more common type, homologous chromosomes segregate in the first round of meiosis, and sister chromatids segregate in the second. In post-reductional meiosis, this order is reversed (Battaglia and Boyes 1955). Post-reductional meiosis was first observed in *Carex* by Heilborn (1928) and demonstrated conclusively by Wahl (1940) whereas Tanaka (1941) had reported pre-reductional meiosis from the Cyperaceae. The order of meiosis has been confirmed, however, using molecular cytogenetic methods (Hoshino *et al.* 1999). Invariably associated with post-reductional meiosis in angiosperms is the absence of localized centromeres (Battaglia and Boyes 1955). Chromosomes in sedges and other organisms that undergo post-reductional meiosis are holocentric.

VI. BASE NUMBERS

A perusal of literature reveals that the basic number in Angiosperms vary from $x=2$ in *Haplopappus* of Compositae to

$x=44$ in *Uncinia* of Cyperaceae. Stebbins (1950) considered $x=10$ or lower numbers as the base numbers of the primary origin and all the other numbers as secondary base numbers. It may be stressed here that adequate data pertaining to chromosome numbers is a foremost necessity for deducing base number of a genus.

As far as family Cyperaceae is concerned, a lot of confusion exists about the base numbers. According to Wulff (1939), $x=5$ is supposed to be the original base number of the whole family and it is also supported by Mehra and Sachdeva (1975b) where as Subramaniam (1988) considered the existence of $x=8$ as the primary base number for the family. According to him $x=8$ should have given rise to other basic numbers $x=9$, 10, and 11 by means of aneuploidy. An analysis of various basic chromosome numbers on world-wide basis reveals that many genera show dibasic, tribasic or polybasic nature.

Various base numbers reported in the largest genus of the family, *Carex* are $x=6$, 7, 8, 9, 10, 11, 13, 17 and 19. The chromosome numbers recorded for this genus range between $2n=12$ to $2n=114$. The occurrence of this unusually wide range of chromosome numbers which are not in multiples of any common basic number led earlier workers to postulate different basic numbers. Heilborn (1924) inferred the base number of *Carex* to be 7 while Wahl (1940) suggested $x=5$, 6, 7 and 8. Supporting Heilborn, he believed that many of the species are derived by secondary polyploidy balancing at a number just below or just above the real euploid numbers from the species with a basic number 7 which is the most common. Löve *et al.* (1957) argues for a base number of $x=5$. Both Heilborn and Löve *et al.* however, believed that chromosome numbers were essentially invariant within species, and consequently they considered base numbers within the genus to be readily inferable from counts of individual species. A more recent study finds majority of the chromosome numbers as multiples of 6 (Roalson *et al.* 2007). Present analysis also support 6 as base number as reflected by chromosome maxima at $2n=60$ (Fig. 1). According to Hipp *et al.* (2009) the concept of base numbers may not be useful in *Carex* because of the uncertainty in chromosome numbers due to intraspecific variation prevalent in the genus.

Large variation in basic numbers clearly reflect the role of aneuploidy and neopolyploidy in the origin of these numbers.

VII. POLYPOIDY

Sedges exhibit a wide range of chromosome numbers which is clear indication of the prevalence of polyploidy. On world-wide basis the overall polyploidy in Cyperaceae has been estimated to be 77% (Goldblatt 1980) and 94.7% (Bir *et al.* 1988a). As far as Indian sedges are concerned 89% of them are noticed to be by Bir *et al.* (1988a), 85.5% by Cheema (1991), 72.3% by Cheema and Bir (1997) and 90% at world level and 87.64% by Cheema and Gupta (2012).

In *Carex*, 98.96% at world level and 100% Indian species are found to be polyploidy (Table 1). Various levels of ploidy in the tribe are $2x$, $4x$, $5x$, $6x$, $7x$, $8x$, $9x$, $10x$, $11x$ and $12x$ with $10x$ being the most frequent. So it can be concluded that higher grades of polyploidy are very common in the genus.

Autopolyploidy and allopolyploidy

Polyploidy has been demonstrated in a few species in the genus (Tanaka, 1949), though it plays a much more important role in chromosome evolution in the rest of the family (Luceño *et al.* 1998; Vanzela *et al.* 2000; Yano *et al.* 2004; Yano and Hoshino 2005). Yano *et al.* (2013) has reported polyploidy as significant player in the chromosomal variations in *Siderostictae* section of *Carex*. According to Löve *et al.* 1957 the only case of polyploid speciation with invariant chromosome numbers in *Carex* is in section *Chlorostachyae* Tuck. Ex Meinsh. (= *Capillares* (Asch. and Graebn.) Rouy). However, this study, which suggests speciation associated with autopolyploid changes in chromosome number, is based on mitotic counts, and it is difficult to interpret type of ploidy in *Carex* except in species with the lowest numbers (Hipp *et al.* 2009).

Autopolyploidy is well documented in just three carices (Tanaka 1949) e.g. *Carex siderosticta* Hance. (2n=12, 24), *C. dolichostachya* Hayata subsp. *dolichostachya* (= *C. multifolia* Ohwi) (2n=30, 60, 64, 65, 66). As hypothesized by Heilborn (1924) and supported by most subsequent workers, allopolyploidy is rare if present at all in *Carex*. Only two taxa, *C. jacksoniana* Boott subsp. *parciflora* (Boott) Kük. (= *C. parciflora* Boott) and *C. roraimensis* Steyerem. have been proposed to have allotetraploid origin.

Intraspecific Polyploidy

Intraspecific cytotypes have been observed in about 20 species (table 1) e.g. *C. filicina* Nees (2n=14, 42), *C. flacca* Schreb. (2n=38, 76), *C. humilis* Leyss. (2n=36, 72), *C. insniae* Koidz. (2n=50, 60) etc. Intraspecific agmatoploidy or aneuploidy is widespread in *Carex* (Tanaka 1940a,b, 1948, 1949; Wahl 1940; Faulkner 1972; Whitkus 1981, 1988, 1991; Cayouette and Morisset 1985, 1986a, b; Luceño and Castroviejo 1991; Hoshino *et al.* 1994; Hoshino and Waterway 1994; Rothrock and Reznicek 1996, 1998; Naczi 1999). Some species exhibit variation within populations (Luceño and Castroviejo 1991) or even individual plants (Schmid 1982; Luceño 1994). The different euploid chromosome races within species all show regular meiosis and are indistinguishable from one another morphologically (Schmid 1982; Cayouette and Morisset 1986b; Whitkus 1988; Rothrock and Reznicek 1996, 1998), though some chromosome races exhibit disrupted meiosis (Cayouette and Morisset 1986b).

A few studies demonstrate apparent correlations between geography and intraspecific chromosomal variation. While the incidence of polyploidy across angiosperms increases with latitude (Grant 1981) there is not a general correlation between latitude and chromosome number in *Carex* (Hipp *et al.* 2009).

Aneuploidy

Cyperaceae is characterized by extensive aneuploid series as stated by Stebbins (1971). High aneuploid series of chromosome numbers found in the family are probably modified form of polyploidy through increase or decrease in chromosome number (Stebbins 1950). Chromosomal records for *Carex* indicate widely varying chromosome numbers for the genus with 249 cytotypes at world level and 7 Indian cytotypes with more than one base number or aneuploidy. Håkansson (1954), Jones (1978) and Sachdeva (1972) have suggested centric fission and fusion as one

of the main factors responsible for aneuploidy in Cyperaceae with diffuse nature of centromere.

Chromosome number change in most angiosperms proceeds by duplication of chromosomes, but in *Carex* these are primarily by fission and fusion (Wahl 1940; Davies 1956; Hoshino 1981, Hipp *et al.* 2009). Malheiros-Gardé and Gardé (1950) coined the term agmatoploidy to describe chromosome number changes via fission in *Luzula* (Juncaceae). The term has subsequently been used to describe decreases due to fusion as well (Löve *et al.* 1957; Luceño 1994). Agmatoploidy contrasts with strict or quantitative aneuploidy, which refers to chromosome number changes due to duplication of single chromosomes. Heilborn (1924) held that although chromosome fission probably played a role in the origins of *Carex*, more recent chromosome number increases in the genus must be a consequence of chromosome duplications. Further, according to Rothrock and Reznicek (1998) the presence of only even-numbered haploid counts and tetravalents in most individuals counted suggests that chromosome number change in that species may be associated with chromosome duplication rather than or in addition to agmatoploid changes.

VIII. CONCLUSION

While there have been more than 4,000 chromosome counts in the family, these only represent approximately 16% of the species currently recognized in the Cyperaceae. Further, the maximum counts have been made in *Carex*, with few or no counts made in many genera. Assessment of the counts presented here is also complicated by questions of specimen identification accuracy and a lack of vouchers in some prominent studies of chromosome number variation in the family. Despite this, the patterns of chromosome number distributions within family suggests that while aneuploidy may dominate the overall pattern of chromosome number there is evidence for both aneuploid and polyploid chromosome number changes within the genera. From the above discussion it is clear that the chromosomal variations in number have played a major role in the speciation and genetic diversity in the *Carex*. Further to elucidate the relationships in this complex group, there is a need for integration of biosystematic, cytogenetic and genomic studies across the genus and to have more information from the modern tools of genetic markers at DNA level.

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REFERENCES

- [1] Battaglia E and Boyes JW 1955 Post-reductional meiosis its mechanism and causes. *Caryologia* 8 87-134.
- [2] Bir SS, Sidhu M and Kamra S 1982 Cytological studies on certain sedges from Punjab, India. *Cell and Chromosome Res.* 5 (1) 25-28.
- [3] Bir SS, Sidhu M and Kamra S 1986 Karyotypic studies in some members of Cyperaceae from Punjab, northwest India. *Cytologia* 51(1) 95-106.

- [4] Bir SS, Sidhu M, Kamra S and Cheema P 1988a Cytomorphological studies on some members of Cyperaceae from North India. *J. Cytol. and Genet.* 23 14-37.
- [5] Bir SS, Cheema P and Sidhu M 1988b In SOCGI Plant Chromosome Number Reports-VII. *J. Cytol. and Genet.* 23 220-221.
- [6] Bir SS, Cheema Paramjeet and Sidhu M 1990a Chromosomal variations in *Scirpus tuberosus* Desf. *The Nucleus* 33 (1,2) 22-24.
- [7] Bir SS, Cheema P and Sidhu M 1990b In SOCGI Plant Chromosome Number Reports-IX. *J. Cytol. and Genet.* 25 137-139.
- [8] Bir SS, Cheema, Paramjeet and Sidhu M 1991 Chromosomal variabilities in different populations of species of *Scirpus* Linn from north India. *Cytologia* 56 645-651.
- [9] Bir SS, Cheema Paramjeet and Sidhu M 1992a Chromosomal analysis of *Fimbristylis* Vahl in Punjab, North West India. *Ind. Nat. Sci. Acad. Biol. Sci. Part B* 58 63-70.
- [10] Bir SS, Cheema P and Sidhu M 1992b Chromosomal diversity in members of genus *Cyperus* Linn. from Punjab, NW India-I Section *Kyllinga* (Rottb.) Endl. *Jour. Pl. Sci.* 8 4-8
- [11] Bir SS, Cheema Paramjeet, Sidhu M and Kumari Santosh 1993a Karyomorphology of members of *Bulbostylis* and *Scirpus* Linn. from Punjab state NW India. *Ind. Nat. Sci. Acad. Biol. Sci.* 59 133-137
- [12] Bir SS, Cheema P, Kumari Santosh and Sidhu M 1993b Occurrence of B-chromosomes and karyotypic analysis in sedge genus *Eleocharis* R Br *Current Science* 66 322-324.
- [13] Bir SS, Cheema Paramjeet and Singh CP 1996 Chromosomal analysis of sedges of Sangrur District, Punjab, NW India. *Bangladesh Journal of Botany* 25(1) 51-58.
- [14] Cayouette J and Morisset P 1985 Chromosome studies on natural hybrids between maritime species of *Carex* (sections *Phacocystis* and *Cryptocarpae*) in northeastern North America, and their taxonomic implications. *Canadian J. Bot.* 63 1957-1982.
- [15] ——— 1986a Chromosome studies on the *Carex salina* complex (Cyperaceae, section *Cryptocarpae*) in northeastern North American. *Cytologia* 51 817-856
- [16] ——— 1986b Chromosome studies on *Carex paleacea* Wahl, *Carex nigra* (L) Reichard, and *Carex aquatilis* Wahl in northeastern North America. *Cytologia* 51 857-884 .
- [17] Cheema Paramjeet 1991 Cytological studies on members of family Cyperaceae from Punjab plain and adjoining regions, PhD thesis Punjabi University, Patiala.
- [18] Cheema Paramjeet, Kumari Santosh, Sidhu M and Bir SS 1992a Karyomorphology of members of *Fimbristylis* Linn. from Punjab state NW India. *Jour. Cyto. and Genet.* 27 163-173.
- [19] Cheema P, Bir SS and Sidhu M 1992b Chromosomal variations in *Cyperus rotundus* Linn. from Northwest India. *The Nucleus* 35 83-86.
- [20] Cheema Paramjeet , Bir SS and Sidhu M 1993a Chromosomal variabilities in *Cyperus* Linn. II Section *Pycreus* (Beauv.) Griseb. from NW India. *Cytologia* 58 345-349.
- [21] Cheema Paramjeet, Sidhu M and Bir SS 1993b Cytology of some members of *Cyperus* L III Section *Mariscus* (Gaert.) Endl. from NW India. *Cyperaceae Newsletter* 12 5-7.
- [22] Cheema Paramjeet and Bir SS 1994a Karyomorphological studies in Cyperaceae of NW India. *Proc. All India Conference on Cytol. and Genet.* 4 167-177.
- [23] Cheema Paramjeet and Bir S.S 1994b Aneuploidy in sedges Morphological distinctness of cytotypes from Punjab, NW India. In *Proc. of Current Researcher in Plant Sciences* Pp 263-269.
- [24] Cheema Paramjeet and Bir SS 1995 Karyotypic polymorphicity in the sedge flora of Punjab, NW India. *Perspectives in Cytology and Genetics* 8 223-236.
- [25] Cheema Paramjeet and Bir SS 1996 Cytological studies in *Cyperus* Linn. V Section *Cyperus* Linn from NW India. *Jour. Ind. Bot. Soc.* 75 57-60.
- [26] Cheema Paramjeet and Bir SS 1997 Cytological conspectus of Indian Cyperaceae In *The changing landscape of Plant Sciences, International Book Distributers, DehraDun* Pp 154-188.
- [27] Cheema Paramjeet and Gupta RC 2011 Germplasm Evaluation in family Cyperaceae - Tribe Scirpeae. *Jour. Punjab Acad. Sci.* 7-8 25-31.
- [28] Cheema Paramjeet and Gupta RC 2012 Chromosomal diversity in the family Cyperaceae, In *Biodiversity Evaluation - Botanical Perspective* M/S Bishen Singh Mahendra Pal Singh, Dehra Dun, India.
- [29] Clark CB 1894 Cyperaceae In Hooker JD, *The Flora of British India* 6 (L. Reeve and Company Ltd., London) pp 585-748.
- [30] Darlington CD and Wylie AP 1955 *Chromosome Atlas of Flowering plants.* George Allen and Unwin Ltd London.
- [31] Davies EW 1956 Cytology, evolution and origin of the aneuploid series in the genus *Carex*. *Hereditas* 42 349-365.
- [32] De Castro D 1950 Notes on two cytological problems of the genus *Luzula* DC. *Genét. Ibér.* 2 201-209.
- [33] Faulkner JS 1972 Chromosome studies on *Carex* section *Acutae* in north-west Europe. *Bot. J. Linn. Soc.* 65 271-301.
- [34] Fedrov An A (ed) 1969 *Chromosome number of Flowering plants, Academy of Sciences of the USSR*
- [35] Fischer CEC 1931 Cyperaceae In Gamble JS *Flora of the Presidency of Madras Pt9* (Adlard & Sons, London) pp 1620-1687.
- [36] Flach M 1966 Diffuse centromeres in a dicotyledonous plant. *Nature* 209 1369-1370
- [37] Goldblatt P 1975-2003 *Index to Plant Chromosome Numbers.* Missouri Botanical Garden.
- [38] Goldblatt P 1980 *Ployploidy in Angiosperms Monocotyledons,* In WH ed. *Ployploidy Biological Relevance* (Plenum Publishing Corp New York) Pp 219-239.
- [39] Grant V 1981 *Plant Speciation* (Columbia University Press, NewYork USA) pp 563.
- [40] Guerra M and García MA 2004 Heterochromatin and rDNA sites distribution in the holocentric chromosomes of *Cuscuta approximata* Bab (*Convolvulaceae*). *Genome* 47 134-140.
- [41] Håkansson A 1954 Meiosis and pollen mitosis in x-rayed and untreated spikelets of *Eleocharis palustris*. *Hereditas* 40 325-345.
- [42] Heilborn O 1924 Chromosome numbers, species formation, and phylogeny in *Carex*. *Hereditas* (Lund) 5 129-216.
- [43] ——— 1928 Chromosome studies in Cyperaceae. *Hereditas* 11 182-192.
- [44] ——— 1939 Chromosome studies in Cyperaceae. *Hereditas* 25 224-240.
- [45] Hipp AL, Rothrock PE and Roalson EH 2009 The Evolution of Chromosome Arrangements in *Carex* (Cyperaceae). *Bot. Rev.* 75 96-109.
- [46] Hooker JD 1897 *The Flora of British India* 6 (L. Reeve and Company Ltd., London).
- [47] Hoshino T 1981 Karyomorphological and cytogenetical studies on aneuploidy in *Carex*. *J. Sci. Hiroshima Univ., Ser. B, Div. 2, Bot.* 17 155-238.
- [48] Hoshino T, Furuta K and Hatooka H 1999 Pollen development and post-reductional meiosis in *Carex*. Abstract, XVI International Botanical Congress.
- [49] Hoshino T and Waterway M J 1994 Cytogeography and meiotic chromosome configurations of six intraspecific aneuploids of *Carex conica* Boott (Cyperaceae). *Japan Journal of Plant Research* 107 131-138.
- [50] Hoshino T, Hayashi S and Onimatsu A 1994 Meiotic chromosome configurations of intraspecific aneuploids of *Carex sikokiana* (Cyperaceae). *Japan J. Jap. Bot.* 69 142-146.
- [51] Jones K 1978 Aspects of chromosome evolution in higher plants, In HW Woodhouse ed. *Advances in Botanical Res.* 6 120-191.
- [52] Kaur Paramjeet and Gupta RC 2008 - 2009 Germplasm evaluation in tribe Eucypereae of family Cyperaceae. *Jour. Punjab Acad. Sci.* 5-6 76 – 81.
- [53] Kükenthal G 1936 Cyperaceae – Scirpoideae – Cypereae, In Engler A ed. *Pflanzenveich* 101, IV 20 1-671.
- [54] La Cour LF 1952 The *Luzula* system analyzed by X-ray. *Heredity* 6 77-81.
- [55] Löve A, Löve D and Raymond M 1957 Cytotaxonomy of *Carex* section *Capillares*. *Can. J. Bot.* 35 715-761
- [56] Luceño M 1993 Chromosome studies on *Carex* (L.) section *Mitrateae* Kükenth. (Cyperaceae) in the Iberian Peninsula. *Cytologia* 58 321-330.
- [57] ——— 1994 Cytotaxonomic studies in Iberian, Balearic, North African, and Macaronesian species of *Carex* (Cyperaceae) II. *Can. J. Bot.* 72 587-596.

- [58] Luceño M and Castroviejo S 1991 Agmatoploidy in *Carex laevigata* (Cyperaceae) Fusion and fission of chromosomes as the mechanism of cytogenetic evolution in Iberian populations. *Pl. Syst. Evol.* 177 149–160.
- [59] Luceño M, Vanzela ALL and Guerra M 1998 Cytotaxonomic studies in Brazilian *Rhynchospora* (Cyperaceae), a genus exhibiting holocentric chromosomes. *Can. J. Bot.* 76 440–449.
- [60] Malheiros-Gardé N and Gardé A 1950 Chromosome number in *Luzula multiflora* Lej. *Genét Ibér.* 4 91–94.
- [61] Mehra PN and Sachdeva SK 1975a IOPB chromosome number reports XLIX. *Taxon* 24 501-516.
- [62] Mehra PN and Sachdeva SK 1975b Cytology of some West Himalayan cyperaceae. *Cytologia* 40(3/4) 497-515.
- [63] Mehra PN and Sachdeva SK 1976 Cytology of some sedges from NW India. *Cytologia* 41(3/4) 585-590.
- [64] Naczi RFC 1999 Chromosome numbers of some eastern North American species of *Carex* and *Eleocharis* (Cyperaceae). *Contr. Univ. Michigan Herbarium* 22 105-119.
- [65] Nijalingappa BHM 1972 IOPB chromosome number reports XXXVIII. *Taxon* 21 679-684.
- [66] Nijalingappa BHM 1973 IOPB chromosome number reports . *Taxon* 22 459-464.
- [67] Nijalingappa BHM 1975 IOPB chromosome number reports XLVIII. *Taxon* 24 367-372.
- [68] Nijalingappa BHM 1977 Autotetraploidy in *Fimbristylis falcate* (Vahl) Kunth (Cyperaceae). *Proc. Ind. Acad. Sci.* 85B (1) 21-24.
- [69] Nijalingappa BHM, Nagraj N and Tejavathi DH 1978 IOPB chromosome number reports LXII. *Taxon* 27 529-535.
- [70] Nijalingappa BHM and Leela Bai D 1990 Cytological studies in some South Indian species of *Carex*. *Cytologia* 55 (3) 373-379.
- [71] Pazy B and Plitmann U 1994 Holocentric chromosome behaviour in *Cuscuta* (Cuscutaceae). *Pl. Syst. Evol.* 191 105-109.
- [72] Rath SP and Patnaik SN 1974 Cytological studies in Cyperaceae with special reference to its taxonomy I. *Cytologia* 39 (2) 341-352.
- [73] Rath SP and Patnaik SN 1978 Cytological studies in Cyperaceae with special reference to its taxonomy . *Cytologia* 43 (3/4) 643-653.
- [74] Roalson EH 2008 A synopsis of chromosome number variation in the Cyperaceae. *Botanical Review* 74 209-393.
- [75] Roalson EH, McCubbin AG and Whitkus R 2007 Chromosome evolution in the Cyperales Monocots *Comparative Biology and Evolution* (Poales). *Aliso* 23 62-71.
- [76] Rothrock PE and Reznicek AA 1996 Chromosome numbers in *Carex* section Ouales (Cyperaceae) from Eastern North America. *Sida* 17 251-258.
- [77] ————1998 Chromosome numbers in *Carex* section Ouales (Cyperaceae) Additions, variations, and corrections. *Sida* 18 587–592.
- [78] Sachdeva SK 1972 Cytomorphological studies on West Himalayan monocots with particular reference to species of economic importance, PhD thesis Punjab University, Chandigarh.
- [79] Santapau H and Henry AW 1973 A Dictionary of Flowering Plants of India. Publ. and Infor Directorate, CSIR, New Delhi.
- [80] Sanyal B and Sharma A 1972 Cytological studies in Indian Cyperaceae I tribe Scirpeae. *Cytologia* 37 13-32.
- [81] Schmid B 1982 Karyology and hybridization in the *Carex flava* complex in Switzerland. *Feddes Repert.* 93 23-59.
- [82] Sharma AK and Bal AK 1956 A cytological investigation of some members of family Cyperaceae. *Phyton* 6 7-22.
- [83] Sheikh SA, Kondo K and Hoshi Y 1995 Study of diffused centromeric nature of *Drosera* chromosomes. *Cytologia* 60 43-47.
- [84] Stebbins GL 1950 Variation and Evolution in Plants. Columbia University Press, New York.
- [85] Stebbins GL 1971 Chromosomal Evolution in Higher Plants. Edward Arnold Publ. London.
- [86] Subramanium D 1988 Cytotaxonomical studies in South Indian Cyperaceae I Species from plains. *Cytologia* 53 67-72.
- [87] Tanaka N 1940a Chromosome studies in Cyperaceae, VIII Meiosis in diploid and tetraploid forms of *Carex siderosticta* Hance. *Cytologia* 10 282-310.
- [88] ———— 1940b Chromosome studies in Cyperaceae, X Aneuploid plants of *Carex multifolia* Ohwi. *Botanic Magazine (Tokyo)* 54 438-446.
- [89] ———— 1941 Chromosome studies in Cyperaceae. XI. *Jap. J. Bot.* 11 213-219.
- [90] ———— 1948 The problem of aneuploidy (Chromosome studies in Cyperaceae, with special reference to the problem of aneuploidy). *Biological Contributions in Japan* 4 1-327.
- [91] ———— 1949 Chromosome studies in the genus *Carex* with special reference to aneuploidy and polyploidy. *Cytologia* 15 15-29.
- [92] Tanaka N and Tanaka N 1977 Chromosome studies in *Chionographis* (Liliaceae) I. On the holokinetic nature of chromosomes in *Chionographis japonica* Maxim. *Cytologia* 42 754–763.
- [93] Tejavathi DH and Nijalingappa BHM 1990 Cytological studies in some members of Cyperaceae. *Cytologia* 55 363-372.
- [94] Vanzela ALL, Luceño M and Guerra M 2000 Karyotype evolution and cytotaxonomy in Brazilian species of *Rhynchospora* Vahl (Cyperaceae). *Bot. J. Linn. Soc.* 134 557-566.
- [95] Wahl H A 1940 Chromosome numbers and meiosis in the genus *Carex*. *Am. J. Bot.* 27 458–470.
- [96] Whitkus R 1981 Chromosome numbers of some northern New Jersey carices. *Rhodora* 83 461-464.
- [97] ———— 1988 Experimental hybridization among chromosome races of *Carex pachystachya* and the related species *Carex macloviana* and *Carex preslii* (Cyperaceae). *Syst. Bot.* 13 146-153.
- [98] ———— 1991 Chromosome counts of *Carex* section Ouales. *Bot. Gaz.* 152 224-230.
- [99] Wujek Daniel E, Cheema Paramjeet, Bir SS and Menapace Francis J 1997 Achene micromorphology of some Indian Cyperaceae III Achene micromorphology as a systematic aid to the taxonomic recognition of cytotypes. *Rheedea* 7(2) 93-97.
- [100] Wulff HD 1939 Die ploentwicklung der Juncaceae nebst einer auswertung der embriologischen befunde hinsichtlich der verwandtschaft der Juncaceen und Cyperaceen. *Jahrb. Wiss. Botanik.* Pp 87.
- [101] Yano O and Hoshino T 2005 Molecular phylogeny and chromosomal evolution of Japanese *Schoenoplectus* (Cyperaceae), based on ITS and ETS 1f sequences. *Acta Phytotax. Geobot.* 56 183–195.
- [102] Yano O, Katsuyama T, Tsubota H and Hoshino T 2004 Molecular phylogeny of Japanese *Eleocharis* (Cyperaceae) based on ITS sequence data, and chromosomal evolution. *J. Plant Res.* 117 409–419.
- [103] Yano O, Ikeda H, Jin XF and Hoshino T 2013 Phylogeny and chromosomal variations in East Asian *Carex* Siderostictae group (Cyperaceae) based on DNA sequences and cytological data. *J. Plant Res.* Epub 1-9.

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Table 1 Data on total number of taxonomically and cytologically known species, level and frequency of polyploidy, frequency of different cytotypes and probable base number/ in genus *Carex* Linn. on World basis (+) and from India (++)

Genus	Total no of taxonomically known species	No. of cytologically worked out species			%age of poly-ploidy	Levels of ploidy	Total number of cytotypes	Known chromosome number (2n) Fig. in parenthesis represent the no. of cytotypes	No. of species with intraspecific cytotypes at the same base number which is in parenthesis	No. of species with more than one base number or aneuploid cytotypes	Probable base numbers*
		Total	Diploid	Polyploid							
+	1500-2000	579	6	573	98.96	2x, 4x, 5x, 6x, 7x, 8x, 9x, 10x, 11x, 12x	1144	12(2),14(2), 16(2), 18(6), 20(2), 24(3), 25(1), 26(10), 28(3), 30(12), 32(14), 33(3), 34(19), 35(4), 36(20), 38(26), 39(3), 40(27), 41(1), 42(15), 43(1), 44(24), 46(20), 48(33), 50(35), 52(53), 54(49), 55(2), 56(62), 58(60), 60(75), 61(2), 62(43), 63(2), 64(46), 65(1), 66(42), 67(5), 68(58), 69(6), 70(52), 71(2), 72(37), 73(4), 74(45), 75(3), 76(48), 77(6), 78(30), 79(4), 80(41), 82(1), 84(32), 85(3), 86(10), 88(7), 90(5), 92(3), 94(1), 98(2), 100(1), 104(2), 105(1), 106(2), 108(1), 110(1), 112(4), 114(3)	2(6), 3(7,9,19), 4(8), 10(10), 1(13,17)	249	6, 7, 8, 9 , 10 , 11 , 13 , 17 , 19
++	148	14	-	14	100.00	6x, 8x, 10x, 12x	19	42(2), 44(3), 46(3), 48(2), 52(1), 58(2), 60(2), 68(1), 74(1), 84(1), 104(1)	-	7	6, 7, 8, 9, 10, 13

*Base numbers in bold are more common

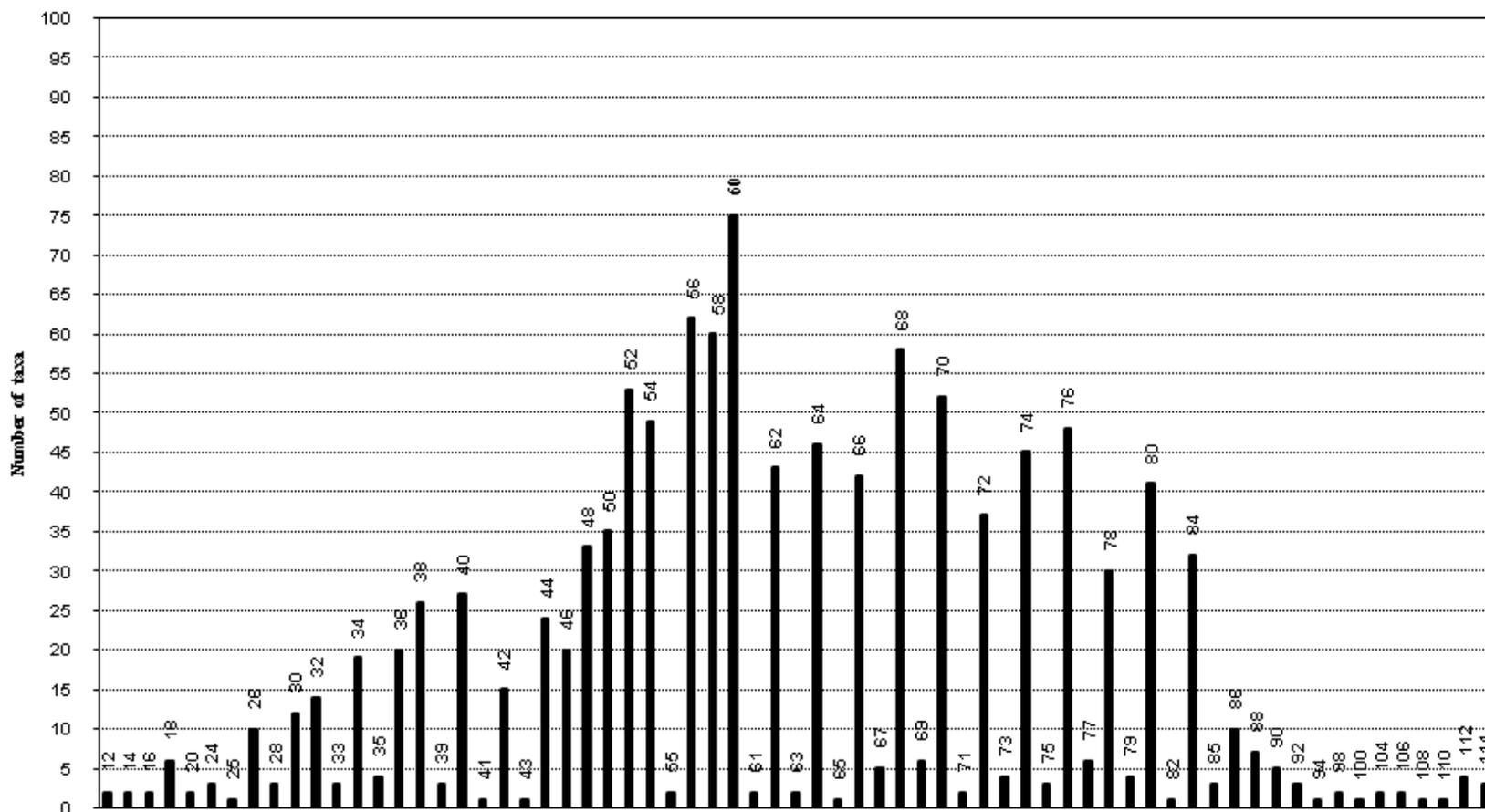


Fig.1 : Frequency of 2n chromosome numbers in *Carex*

Child Labour - Social and Economic Realities Which Effecting Child Development

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I. INTRODUCTION

Child Labour is a harsh reality and unavoidable in the present scenario of social and economic realities. Child Labour is not a new problem. It is a age old problem and it is perceived as a social evil in present situation. The Encyclopedia of social sciences (1959) defines child labour as “When the business of wage earning or of participation in work, conflicts directly or indirectly with the business of growth and education of children the result is child labour.

The child labour is essentially a development problem. It is prevalent in all the developing countries. The problem of child labour is an universal phenomenon. It is in existence in one form or another since historic times. However it is perverted as a social problem. The child labour problem is significantly acute in the developing countries than in the developed nation with the increasing rate of industrialization and modernization. The incidence of child labour in all the developing countries has been growing at an alarming rate.

The child labour concept leads to confusion as it is guided by various individual considerations. So a standard has to be accepted to determine an age range for defining a child labour is one of the oldest profession of the world and has remained as the most neglected part of population for the last few centuries (Misra, K.K; 1990). In mid 20th century social references Jurists began to bring reforms against such neglected and exploited class of human labour consideration their tender age.

Child labour is a ubiquitous and persistent problem of our country and has been a given subject of grave for administrators, policy makers, academicians and jurists for the last couple of years. The problem of child labour has been tackled to certain extent through legislation and countries of the world have enacted certain laws and regulations restricting the employment of children below certain age and specifying the conditions restricting the employment of children below certain age and specifying the conditions allowing minors to work in certain profession.

Child labour refers to the employment of children in a cartable occupations or national contribution to the income of the family. It is both an economic and social evil in that it leads to serious health hazards and denies them opportunity for physical and mental development. The term child labour is commonly interpreted in two different ways, first as an economic evil and secondly as a social evil. In the first context it signifies employment of children to earn the livelihood for them or for their family. In the second context it is said to restrict on children obstructing them to develop academically.

Definition of child labour in terms of age or which reference to occupation will not be adequate it will be necessary to

examine the social situation which makes the children work (Mohisin’ 1980: 27-2). The child labour could be defined as an activity of earning of supporting self or family which directly or indirectly comes into conflict with the opportunities for further physical and mental growth of the child. In India the term child labour refers to those engaged in earnable work. Child labour includes working in all forms of non industrial occupations which are injurious to their physical, mental, moral and social development.

“Any work by children that interfere with their full physical development, their opportunities for a desirable minimum of education or their needed recreation”. Home folks (1979), chairman US National Child Labour Committee.

The term child labour basically means the children below the age of fifteen who are employed for hire or reward in occupation that are injurious to their physical, mental, intellectual, moral and social development due to depression and exploitation internet in that employment (Patel, B.R; 1988:2) , hence the term child labour is not applicable to children working in all for an hour or two to earn their pocket money or assisting their parents in house work.

According to child labour prohibition and regulation act of 1986 employment of children up to the age of 14 years and in the case of hazardous employment up to 18 years is define as child labour and is banned.

Poverty relating to child labour: Poverty can be characterized as a state of deprivation, dependence and degradation below physically and socio culturally acceptable standards. It associated with a level of living below a set of norms held necessary for human beings. These norms are related to the basic physiological need like caloric intake, clothing, shelter, drinking water, medical aid and education etc it also includes some special needs like participation, human dignity, self esteem and status etc.

The issue of poor/poverty has different dimensions. The poorest of poor are beggars, pavement dwellers, sick people etc. The ducted and politically conscious poor vary from the socially isolated poor in villages. We may find various categories of poor such as bonded labourers, landless labours, and manual labourers with a little land. Scheduled castes, backward castes and upper castes, poor differ among themselves on different social and psychological dimensions.

The concept of poverty from a different angle. He was with the opinion that a family with more dependent children is poor. But when the children become independent and earners the income of the family increases and naturally the family comes out of poverty. The family even with substantial income becomes poor because of its poor financial management. Hence all these factors may have their influence in different contexts whether directly for the incidence of child labour.

Child Abuse: - Child labour is one form of child abuse. Children are abused by parents, employers, anti social elements etc. by subjecting them in unfavorable living and working conditions. Parents do not treat their children properly due to some economic, social and psychological constraints. Employers do not treat the child labour properly as they want extract more work with low wages.

Theories to study child abuse:-

- 1) **Psychiatric theory:** The theory gives the explanation of child abuse in term of deviant parental behavior. The school underlying parents emotional disturbance in abuse come to be known a psychiatric problems.
- 2) **Socio Cultural Theories:** - The sociological theory is based on the assumption that external forces with in the society are responsible for child abuse. Socio cultural theories may be divided in to three categories viz.,
- 3) **Socio situational theory:** - This theory says that normal parents may be socialised in to abusive child care practice through the interaction of cultural community and families influences. Factors such as low income, unemployment, isolation, conflict with spouse and other members of the family etc. lead to violence against children at home.
- 4) **Social habitability theory:** - According to this theory the nature of child maltreatment depends up on the environmental circumstances in which the individual and family developed.
- 5) **Exchange on social control theory:** - This theory says that parents use violence against their children because the children don't react and hit back. Certain types of children like handicapped, ill, ugly , demanding, and premature children are at great risk of being abused by there parents.
- 6) **Resource theory:** - According to this the use of force or threat by an individual depends up on the extent to which he can demand the resources – social, personal and economic.
- 7) **Social Learning Theory:** - This theory holds that people learned to be violent when they grown up in violent homes and violent environment. A history of abuse and violence in the family does increase in the risk that an individual will be violent as an adult.

II. MYTHS AND REALITIES OF CHILD LABOUR

Traditionally poverty is considered as the major cause of child labour contrary to this belief many studies established the fact that child labour also comes from improvised families. In some case exploited child labour perpetuates poverty.

Even though child labour is generally considered as a problem of the enveloping world. The reality is children of different ages routinely work in different forms in all industrialized countries.

Child Labour is considered as the result of the poor having more number of children. The reality is more than the number of children it is the parental discretions about the child is priorities and lack of faith in the formal education is causing the child labour. Many parents believe that working children will be

equipped with skills for the future but practically. The task allotted to child workers is simple and repetitive such as cleaning, serving helping and minor repairing. Skills are a misnomer when related to the toil and drudgery children engage in many things that children prefer to work. In many cases lack of interest in schooling is making the children to prefer for work, because of their inability to conceive of an alternative.

Many believe that there is nothing wrong in allowing children to work in non hazardous occupations. Even jobs which are not inherently hazardous become hazardous for children, when they are made to do the job for long periods defying their rights of recreation leisure and play.

There is a general believe that child labour is inevitable in certain fields. But the fact is that child workers may be replaced with adults which naturally enhance the cost of a product or service. This consequence is not acceptable to all concerned.

III. ABOUT THE PROBLEM

To any economy the child can be natural resources. The child can be compared with a bud. It is the responsibility of any society to provide a necessary atmosphere and opportunities to transform the bud into a blossom flower. However it is most unfortunate and heart burning to listen that millions of children in the age of 5 to 14 in many Asian, African and Laten American countries are attending to work. In fact the statistics relating to magnitude of incidence of child labour are not exact, in view of the fact that legislation is not controlling the unorganized sector in various countries. The estimates are only an indication of growing child labour issue.

The reasons for child labour are many. In some cases it is the social backwardness, but in many cases more than economic reasons, lack of interest in formal schooling and child development programmes pushing the children to work. For example certain communities in the society treat begging as their profession. In spite of having significant properties they continue begging, which may be called as culture poverty. On the same lines the problem of child labour is wide spread among low income groups who are also educationally backward. Many people from upper castes are in a better position in social and educational aspects in spite of their economic backwardness. High caste parents show significantly greater interest in the educational progress.

A long percentage of working children belong to Hindu religion and the percentage of backward classes and scheduled castes children among them is significant. The main reason for the low proportion of scheduled castes child workers more in agricultural sectors. It is generally observed that there is religious conversion from Hinduism to Christianity among the scheduled castes in rural areas.

IV. CONCLUSIONS

The child is a natural resource for an economy. It is the responsibility of the society to provide necessary atmosphere and opportunities to transform children into potential human resource. They are the future makers of the nation. Childhood is

understood to cover the period of the first 14 years in India. (Article 24 of Indian Constitution).

The most important cause of widespread child labour is the chronic poverty which forces the parents to send their children to seek employment parents are not only incapable of investing in their children's development due to poverty but also reluctant to support them and went them to starting earning as soon as possible. The tendency of the employers to attract children for economic reasons is also resulting in child labour problem. Limited success in providing compulsory education in all children below the age group of 14 as stipulated in the directive principals of state policy is another important factor.

Families migrated from rural areas to urban centers for livelihood could not bear the cost of living and all the family members have to work and this caused for the child labour illiteracy and ignorance of parents and large size of the family is forcing child to work. Lack of schooling facilities and high rate of school dropouts is also leading to child labour.

Various theories of poverty gave explanation to the incidence of the child labour in different sectors caused by cultural of poverty and economic necessities. Social and cultural deprivation in some communities is also forcing the children to go for work. Lack of family harmony and child abuse is making the to discontinue schooling and start working for livelihood.

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TOXICITY OF CYPERMETHRIN INFLUENCED BY P^H AND TEMPERATURE ON THE FRESHWATER FISH *OREOCHROMIS MOSSAMBICUS*

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Abstract- The influence of P^H and temperature on the toxicity of cypermethrin has been evaluated by using freshwater fishes. Both P^H and temperature were found to affect significantly the toxicity of pesticide by altering the physiological responses of fishes resulting in mortality. The adverse effects of the P^H and temperature were decreased oxygen consumption, acceleration of chemical reaction, impaired respiratory activities, insufficient energy liberation and so on. In general these environmental factors could lead to a higher level of bioaccumulation of the toxic chemicals, thus causing the chemical stress, which affecting the normal functioning of the body.

Index Terms: *Oreochromis mossambicus*, cypermethrin, P^H, temperature and mortality.

I. INTRODUCTION

Cypermethrin is one of the synthetic pyrethroid which are most extensively used for more than two decades as possible alternative to the organophosphate, organochloride and carbamate pesticides. The synthetic Pyrethroids are reported to more toxic than other pesticides and are widely used in crop protection, home pest control, forestry and in public health. But the pyrethroids are shown to produce toxic effects on biochemical, haematology of various aquatic animals [1],[2]. Among them cypermethrin is very toxic to the fish population and aquatic invertebrates [3]. The toxic effect of pyrethroids in mammals, birds, fishes, amphibians and invertebrates have been reviewed by [4].

In aquatic ecosystems P^H and temperature are important environmental variables which adversely affect the fish and fisheries [5], and [6] has recorded that the health of fishes is mostly influenced by the P^H, which would affect the reproduction and growth of fishes. Temperature is one of the most fundamental stressors altering the biological systems. This is because the water quality is greatly affected by temperature, P^H, hardness etc which influence the rate of bioaccumulation of the pollutants Literature are available in plenty with reference to P^H and hardness [7]. But limited reports are available on the toxicity of pollutants in relation to temperature, in aquatic organisms [8],[9]. The interaction of P^H and temperature related to pesticides are seldom let known and the role of these influencing factors on pesticide toxicity is not elaborated. Therefore the present investigation has been made to evaluate the influence of P^H and temperature with reference to cypermethrin toxicity in the freshwater teleost fish *Oreochromis mossambicus*.

II. MATERIALS AND METHODS

The experimental fishes collected from local reservoir were acclimatized to the laboratory conditions for 7 days in chlorinated tap water contained in glass aquaria. By using 0.5% acetone, the stock solution of 1% cypermethrin was prepared. The stock solution was used to prepare different concentrations like 1%, 2%, 3%, 4% and 5%. In each concentration a group of 10 fishes having the same weight and size were introduced. The mortality of fish was recorded in each concentration of the pesticide at an interval of 24 hours upto 96 hrs (Table-1). From this the LC₅₀ 96 hrs concentration was used to study the effect of P^H and temperature on the toxicity of pesticide.

A healthy fish of known weight and size was exposed to the pesticide contained in a rectangular jar. The time at which the fish died was recorded (survival time) at room temperature. Another test animal of the same size and weight was taken in the pesticide medium contained in a beaker which is kept in a water bath. The temperature of the pollutant medium was increased by 2°C above the room temperature by adding hot water to the water bath. Now the survival time of the animal was recorded. Another test

animal was treated in the pesticide medium in a similar manner and its temperature was decreased by 2°C below the room temperature by adding ice cold water. The survival time of the animal in the reduced temperature also recorded.

In another set of experiments, the test animal was exposed to the pesticide medium to known P^H and the survival time was recorded. Then the P^H of the pesticides was decreased by using P^H tablets and another test animal was introduced into it. Similarly the P^H of the pesticide was increased and the survival time of the test animal in that P^H was noted. The results were tabulated and discussed.

III. RESULTS AND DISCUSSION

Temperature is one of the important factor as it greatly affect the toxicity of xenobiotic chemicals(Table-2). The changing temperature may increase or decrease or cause an effect on the toxicity of the chemicals depending on the species and the chemical nature of the toxicant. The present study the pesticide exerted more toxic effect at high temperature. A high temperature of the pesticide medium could have decreased the oxygen content. So that the fishes died due to decrease in oxygen consumption at high temperatures also noticed by [10],[11] have found that the fishes were more susceptible to the metals at high temperature. [12] have observed that the heat death in animal is due to death of different tissues, sequentially at different temperature.

According to Processor and [13] the chemical reactions are acclerated as the temperature rises whereas the cardia and respiratory activities are slowed down resulting in hypoxia in fishes at lower temperature. In *Oreochromis mossambicus* the lowered temperature of the pesticide medium exhibited mortality because the rate of energy liberation could be insufficient for the maintainance of metabolism when the temperature of the body lowered. In the present study the temperature could affect the nervous system directly altering the input of impulses of fishes through skin thermoreceptors.

The P^H of the medium also highly alters the toxicity of chemicals through the effect on physiological responses of the organisms, as P^H causes a severe chemical stress (Table 3). Packer and [14] have reported that the elevation of P^H will lead the acidosis in fishes which could decrease the oxygen carrying capacity of blood. Drummond [15] have shown that the metal accumulation has been increased at higher P^H of the medium. On the other hand lowering of P^H has also been shown to increase accumulation of metal in fishes [16]. In lower P^H the present experimental fishes might have experienced enhanced bioaccumulation of the toxic substances by the uptake through gills. The same trend has also been noticed [17] in fishes exposed to toxicants. [18],[19] have reviewed the specific effect of P^H on bioaccumulation in fresh water invertebrates under acidic condition more energy is found to be required to maintain normal functioning of animals [20] oxygen uptake is found to be impaired in organisms [21]. Thus from the present investigation it is evident that the pesticide toxicity has been highly influenced by the interaction between the P^H and temperature in fishes under laboratory conditions. This laboratory experiments are highly useful to correlate and explain the dynamics of pollutants in normal environment under the influence of P^H and temperature.

TABLE 1: TOXICITY OF VARIOUS CONCENTRATION PESTICIDE CYPERMETHRIN ON *OREOCHROMI MOSSABICUS* DURING VARIOUS EXPOSURE PERIOD

CONCENTRATION OF THE PESTICIDE	MORTALITY %			
	EXPOSURE PERIOD (HOURS)			
	24 Hrs.	48 Hrs.	72 Hrs.	96 Hrs.
Control	0	0	0	0
1	0	10	20	30
2	0	20	30	40
3	0	20	40	50

4	10	40	60	90
5	10	50	80	100

TABLE 2: EFFECT OF TEMPERATURE OF THE TOXICITY OF PESTICIDE

S.NO.	TEMPERATURE	SUUVIVAL TIME (MINUTES)
1.	25°C	95
2.	30°C	55
3.	35°C	25

TABLE 3: EFFECT OF P^H ON THE TOXICITY OF PESTICIDE

S.NO.	P ^H VALUES	SURVIVAL TIME (MINUTES)
1.	6.0	70
2.	7.0	65
3.	7.7	35

REFERENCES

- [1]. Saxena, K.K and Seth, N. (2002) Toxic effects of cypermethrin on certain haematological aspects of fresh water fish *Channa punctatus*. Bull. Environ. Contam.Toxicol. 69:364-369
- [2]. Saxena, K.K and Gupta, P (2003) Effect of cypermethrin in the activities of acid and alkaline phosphomoneesterases in a fresh water fish Channa Punctatus. Proc. Nat. Symp. Biochem. Sci. Hith. Environ. ASP.477-479.
- [3]. Sarkar, B., Chatterjee A., Adhikari S., Ayyappan S. (2005) Carbofuran and Cypermethrin induced histo - pathological alterations in the liver of *Labeo - rohita* (Hamilton) and its recovery. Journal of Applied Ichthyology, 21, 131-135.
- [4]. Bradbury, S.P and Coats.J.R (1989) comparative toxicology of Pyrethroid insecticides. Rev., Environ. Contam.Toxicol., 108:133-177
- [5]. Brown, D.J.A (1982) The effect of pH and calcium on fish and fisheries water Air soil pollut.18:343-351.
- [6]. Boyd, C.E (1982) Water quality management for pond fish culture, Elsevier Scientific Publishing Company, 318 pp.
- [7]. S.Karthikeyan Dr.RM.Palaniappan and Selvi Sabhanayakam (2007) Influence of pH and water hardness upon nicked accumulation in edible fish *Arrhinus mrigala* J.Environ. Biol. 28 (2),489-492.
- [8]. John, P.R., V.Rena and D.J.Mcqueen (1996) Uptake rates of food chain and water borne mercury by fish Field measurements. a mechanistic model and an assessment of uncertainties Can.J.Fish. Aquat Sci., 53(2), 395-407.
- [9]. P.Kannadi., K.Kannan and S.Raveandran (2008) Effects of temperature on the behvioural and respiratory responses of cat fish *Mystus gulio* (Hamilton) Indian J.Environ and Ecoplan. 14(3) 750-754.
- [10]. Rafia Sultana and UmaDevi, (1995). Oxygen consumption in a cat fish *Hystus gulio* (Ham)exposed to heavy metals.J.environ.Biol., 16:207-210.
- [11]. Gupta, A.K. and V.K.Rajbanshi (1991) Toxicity of copper and cadmium to *Heteropneustes fossilis* (Bloch).Acta Hydrochim.Et. Hydroboil., 19(3), 331-340.
- [12]. Orr, T.R (1955) Heat death of whole animals and Tissues, Various animals Physiol. Zool. 28:290-302.
- [13]. C.Ladd Prosser and Frank A. Brown.JR (1965) Comparative Animal Physiology Second edition.
- [14]. Packer, R.K and Dinson. W.A. (1972) Anoxia and Sodium loss associated with the depth of brook trout low pH Comparative Biochem physiol. 41(A) 17-26.
- [15]. Drummond, R.A. olson, G.F and Batterman, A.R. (1974) Cough response and uptake of mercury by brook trout *Salvelinus fontinalis*, exposed to mercuric compounds at different hydrogen ion concentrations. Trans. Amer fish Soc. 2:244-249.
- [16]. Paulose.P.V (2004) Effect of water pH on toxicity and accumulation of inorganic and Methyl Mercury in a fish *Gambusia affinis* Indian J.Environ 4 Ecoplan. 8(1): 249-252.
- [17]. Paulose. P.V 1989 Histological changes in relation to accumulation and elimination of inorganic and organic mercury in gills of *Labeo rohita* Hamilton Ind.J.Expl.Biol. 27: 146-150
- [18]. Robert.L. Graney, D.Cherry and J.Cairns (1984) The influence of substrate pH diet and temperature upon cadmium accumulation in the Asiatic clan (*Corbicule fluminea*) in laboratory artificial streams. Water Res., 18, 833-842.
- [19]. Stephenson, M. and G.C.Mackie (1988) Multivariate analysis of correlation between environmental parameters and cadmium concentrations in *Hyalella azteca* (crustacea, amphipoda) from central ontario lakes. can.J.Fish Aquat.Sci., 45, 1705-1710.
- [20]. Rosseland, B.O. and M.Stournes (1994) Physiological mechanisms for toxic effects and resistance to acidic waters: An ecophysiological and eco toxicological approach. In: Acidification of fresh water ecosystem. Implication for the future (Eds:C.E.Steinberg and R.W.Ward wright) wiley, Newyork. P.P.227-246.
- [21]. Spry,D.J Wood, C.M. and Hodson, P.V (1981) The effects of environmental acid on fresh water fish with particular reference to the soft water lakes in ontaria and the modifying effects of heavy metals. A literature review. Canadian Technology Report of Fisheries and Aquatic Science No.999: 144p.

Factors that Affect the Entrepreneurs Growth in Bekasi Region, Indonesia

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Abstract- Entrepreneurs are important in the economy of a country. It could improve the overall economy of the country by opening more jobs opportunities which means more income to the country. That is why some scientist said that the minimum percentage of entrepreneurs in a country is 2%. In Indonesia, it still has low entrepreneur percentage which is only 1.56%. Compare to other South Asia countries like Singapore which has 5% of entrepreneurs, Indonesia is still being left behind. This paper explores the factors that affect the entrepreneur growth in Bekasi region, Indonesia. The research identified the education and motivation factors, entrepreneurial intention, readiness of potential entrepreneurs, government rules for the entrepreneurs, and hinders to capital access. The quantitative research method is used as well in this paper. The questionnaires are spread for 215 respondents. The result shows that the education and motivation factor has significant affect people to be an entrepreneur.

Index Terms- entrepreneur growth, entrepreneurship education, entrepreneurial intention, education and motivation factors.

I. INTRODUCTION

Indonesia is a country with 240 million people population. From that numbers, only 1.56% of the citizens are entrepreneurs (Lautama, 2013). The higher the rate of entrepreneur in a country could increase its economy growth and it may also reduce the number of unemployment and increase competition in Indonesia to trigger economic growth (Agrawal, n.d). Looking at the rate of entrepreneur in Indonesia which is lower than the ideal number of entrepreneur internationally which is 2% from the total of the population in the country. It is far behind compare to the countries in Southeast Asia for instance Singapore which has 5% rate of entrepreneurs in the country (Lautama, 2013). Therefore, the government should focus on this problem and try to improve the number of entrepreneur in Indonesia. Moreover, it is not only government who should concern about this problem. The citizens could help increase the entrepreneur rate by becoming entrepreneurs. There are several factors that could influence the citizens in a country to become entrepreneur. From the educational point of view, we may see that the education level in Indonesia is not suitable to improve the number of entrepreneur in Indonesia. It is because Indonesia's education standards still in low level in terms of encouraging young citizens to become entrepreneur. There are also several causes like most citizens in Indonesia do not really know about the policies in establishing business in Indonesia, lack of good facilities that could help them establishing the business, and the most interesting thing that may make people do not want to become entrepreneurship is corruption. Therefore, we

are going to have quantitative research to gather the exact data about why there Indonesia lack of entrepreneurs. This research can be the references for the government to develop the number of new entrepreneur in Indonesia and also it can become references for those who want to open business in Indonesia. The purpose of this research is to discover what are the factors that affect entrepreneurs growth in Bekasi Region is below from the standard. Moreover, this research has two specific research such as:

1. Does the level of education in Indonesia give impact to the motivation of citizens to become entrepreneur?
2. Does government's policies in Indonesia hinder the citizens to become entrepreneur?

This research has three parts. The first part reviews the relevant literature used to this research and the research problem. Then it is followed by the validity and reliability test of the data collected that suitable with the research question. Finally, the last part will presents about the outcome/result from this research that can be proposed to the government as the guidance to increase the number of entrepreneur in Indonesia.

II. RESEARCH COLABORATION

There are many researchers, scientists, or even the entrepreneurs themselves define who Entrepreneur is. For instance, Nelson (2012) an entrepreneur defines that entrepreneur is the one who organizes and manages the risk in enterprise. It is in accordance with the definition from Collins, Hanges & Locke (2004) who define entrepreneur as someone who own and actively manage a small business. To conclude those two definitions, Entrepreneur could be define as someone who own a business, organize it, and manage the risk to maintain the business. However, entrepreneur is not as simple as that. Entrepreneur is not only a person who owns a business, organizes it, and manages the risk. Entrepreneur is the one who introduces new ideas of business, turn the business idea into a reality, and changes the rate at which the business must be innovated. Entrepreneurs may also become the one who create new job opportunity in this era when many people are unemployed. It can be happened because they are creative people who have an unexpected business idea which still good and when they turn it into reality it is may become a convincing business and may be a way to absorb those unemployed people to have job. That is why Entrepreneur is important to the economic growth of a country especially for a developing country (van Praag & Cramer, 2001). Another example of the importance of entrepreneur in a country is they can improve the number of investment in the country. For instance the investment of land,

because a successful entrepreneur will expand their business in other regions of the country.

From definitions above, we may see the importance of entrepreneurs in a country. However, there are still many countries who have less entrepreneurs in their state economic activities. For example, as we explained before in Indonesia the rate of entrepreneurs is only 1.56% of its population which is lower than the ideal rate in a country which is 2% of the population. There are many factors that affect people in a country, especially in Indonesia not to become entrepreneur. For instance, low of education level, less of motivation, the government policy, and usually they do not have enough capital to start the business.

2.1 Education and Motivation Factor

Some researcher explained that if the students get enough education it will give positive impact to the performance of entrepreneurs in the country (Van der sluis, 2006). Junior Achievement Young Enterprise Annual Report (2006) found that education will give confidence and motivation, creativity, and interpersonal skills which will encourage people in becoming entrepreneurs. Looking for this we can feel that the improvement of entrepreneurship education in Indonesia to encourage young generation to become entrepreneurs by giving entrepreneurship subject from Senior High School (Education System in Indonesia, Law no.2 1989). Van der luis also stated that by having more education, one can gain more confidence and motivation to become entrepreneurs. To become entrepreneurs is a tough job because the competition is very high, that is why to increase the number of entrepreneur Solvesvick (2013) have a thought that there should be motivation from successful entrepreneur to give motivation for new generation to realize their business idea no matter how tough the competition will be. Interesting research has been done by Ernst & Young (2011) from entrepreneurs in Indonesia. They found that more than 90% of Indonesian entrepreneurs feel that dedicated education of entrepreneurs is the best way to cultivate entrepreneurship.

An interesting thought show up that said the economic background of the parents give impact also give impact for an individual to become entrepreneur. Research by Lene Vestergaard, Kare Moberg, and Casper Jorgensen (2011) showed parents' economic background only gave not big impact for an individual to become Entrepreneur because only 25% of the respondents have parents whom are entrepreneurs, while almost 50% of the respondents said they know other entrepreneurs.

H₁: The higher education people get give impact to the level of motivation for people become entrepreneurs. Motivation is important to trigger someone to become entrepreneur

2.2 Readiness to Become Entrepreneur and Entrepreneurial Intention

Ajzan and Shapero intention models showed that the best predictor of any planned behaviour, including entrepreneurship because due to Ajzan intention depends of how people perceive personal attractiveness, social norms, and feasibility. While Shapero explained that intentions depend on how people perceive desirability, feasibility, and propensity to act. Cachon and Cotton

(2008) found a great connection between entrepreneurial orientation and personal attitudes of potential entrepreneur which able to increase entrepreneurship and global competitiveness. (Lee and Peterson, 2000).

In his study, Ali (2011) found that the readiness of an individual to become entrepreneur was influenced by the education given to them. This founding is supported by Parker and Van Praag (2006), which stated that entrepreneurs' performance could be enhanced by education no matter directly or indirectly with a rate of return of 13.7% and 3-4.6% respectively.

H₂: The higher intentions of people to become entrepreneur influence themselves to become entrepreneur and readiness to make their own business in the future.

2.3 Government Policies and Environment

In her article "Factors Having an Impact on Starting and Operating business", N Nayab (2011) stated some conditions which government policies may support or suppress entrepreneurs in opening and running their business. For example, the government policies about infrastructure, facilitation, industrial parks, and etc may trigger people to become entrepreneur. However, the problem with taxation can suppress entrepreneurship. Maria Minniti (2008) observed that an entrepreneurial activity will be conducive depends on the environment of the country. Which could be the government policies in the area. Mostly, the government policies supposed to help its citizens to become entrepreneurs by providing good logistical things such as roads, power, communication facilities, and good bureaucratic system. However, sometimes the changes of the policies may give negative impact on the citizens. They may lost their interest to become entrepreneur because of of unclear rules and regulations and it may affect the economic growth of the country. That is why, Minniti explained that the policy environment of the government has the power to control entrepreneurs, however it doesn't really needed because it may trigger negative socioeconomic consequences. Mostly, it is hard for entrepreneur or those who want to become entrepreneur to be supported by government policies. This thought is supported by Waweru (2012) findings which show more than 70% of the respondents for her research in Kenya stated that it is hard to follow government policies to run their business where the others said it is not.

H₃: Government policies support and facilitate people to become entrepreneur because it is easier for people to realize their business by having government support in terms of logistic and bureaucratic system.

2.4 Hindrance to Capital Access

In the article which title is "How and Where Do I Get Money to Start or Expand my Business" explained about varieties of ways to gain capital to start the business. Usually, people do not want to become entrepreneurs because they are confused about how to get the money to open their business. In the article explained that we can get first funding by renting money, government help, and investor. The problem is, sometimes people do not know about all this. Ernst and Young (2011) found that 54% entrepreneurs in Indonesia said that it is easy to find overall funding for their business while the other

44% said the opposite. Lack of capital was told as the major factor why people did not want to become an entrepreneur in Zambia (Chigunta, 2005). This statement is supported by Ayodele (2006) in Nigeria who found that if the capital a person have is not enough, it hinders entrepreneurship.

H₄: The easier for people to access money to become their capital, the more interest people to become entrepreneur.

III. METHODOLOGY

Research Approach

The research was conducted by following the quantitative methodology. According to Struwig and Stead (2007) quantitative method is a form of conclusive research using large number of samples and reasonable structure data collection procedures. According to the research conducted in Serbia in 2010, it was stated that Small Medium Enterprise plays a big role in the economic growth of the country. Almost all enterprises in Serbia in were Small Medium Enterprise which means many entrepreneurs born in Serbia. By using random sampling for 100 samples for the research, they got 82 replies respondents that help them to conclude that the independent variables they used were correlated with the dependent variables. Following the research method used before, random sampling was used to get the samples. In order to assure its validity and reliability, Factor analysis and Reliability test Gronbach's Alpha were used. This study aimed to achieve a minimum sample of size 200 respondents. The sample size is in line with the requirements set for honours study (University of Pretoria, 2006). The respondents were taken in Bekasi region in Java Island. The types of respondents vary from the age and education since it is studying about the Effect of education to the number of entrepreneur growth in Bekasi region. The respondents could be entrepreneurs who already have business, those who have not started their business, those who have job already in the company, and those who still in terms of getting the education about entrepreneurs. The range of age for the respondents started from 16 years old (first grade senior high school students) until 50 years old. The model of the questionnaires that have been spread to the respondents were 7 scaled questions from strongly disagree, neutral, and strongly agree, with 20 questions minimal in it. Those questions contain two variables which were independent variable and dependent variable. The questionnaires are confidential which means the names of the respondent are not being asked in the questionnaire. The respondents who are

consider as potential respondents are those who involve in education institution like senior high school and University students as the one who may become entrepreneurs because the education they take may impact their decision in becoming entrepreneurs and they are as the young generation considered significantly for the growth of entrepreneurs in Bekasi. However, since the method used in this study is random sampling; the samples were taken not only from the education institution. The questionnaires were spread to the citizen's in Bekasi area. More than 200 respondents were taken in this research. In order to know whether the questionnaires are valid and reliable, Statistical software such as SPSS20 was used to measure the validity. The analyses used in SPSS20 were Factor analysis and Reliability test. The standard value to get pass for the Factor analysis and Reliability test have to be greater than 0.5 and 0.7, thus followed by multiple regression measurement in order to know which aspect or variable that has the significant effect for the result of research.

IV. FINDING

From our questionnaire result based on 215 respondents in Indonesia, the most respondents are people from age 15 years old up to 20 years Old, which is the young generation that has the most significant impact for the growth of Entrepreneurs in Indonesia. The second biggest respondents is people from 20 years old up to 30 years Old which have significant affect also for the growth of Entrepreneurs. The rest of our respondents are people from age 30 years old up to 40 years old and 40 years old up to 50 years old which have their own business and job already.

From 215 respondents we have gotten show that 54% of our respondents are female. The rest of our respondents are Male which is 46%. The most respondents are female which means that Female can be the most significant effect for the growth of entrepreneurs in Indonesia.

4.1 Validity

The research consists of 3 independent variables, 1 dependent variable. The total of respondents is 215. From 27 variables, there are 7 variables are not valid, and they should be deleted. Therefore, there are 20 variables that tested in this research. The result divided into three parts; validity, reliability, and multiple regression.

Table 1. KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.860
Approx. Chi-Square		2547.343
Bartlett's Test of Sphericity	Df	190
	Sig.	.000

The table above shows the KMO and Bartlett's Test. KMO shows the correlation between the statements. The result of KMO should bigger and not less than 0.5 (Jones, n.d). The best value is 0.9 and the minimum value is 0.5. The value of KMO is 0.860 and the value of Bartlett's Test of Sphericity is 0.000, it means that all the variables has good correlations between all potential factors (Education and Motivation Factor, Entrepreneurial Intention, Readiness of Potential Entrepreneurs, Government and Potential Factors, Hinderers to Capital Access) and all the factors are significant (Jones, n.d)

Table 3. Communalities

	Initial	Extraction
EDUCATION2	1.000	.588
EDUCATION4	1.000	.654
EDUCATION6	1.000	.694
EDUCATION7	1.000	.672
INTENTION8	1.000	.584
INTENTION9	1.000	.567
INTENTION10	1.000	.620
INTENTION11	1.000	.835
INTENTION12	1.000	.738
INTENTION13	1.000	.596
INTENTION17	1.000	.760
GRULE21	1.000	.798
GRULE22	1.000	.765
GRULE23	1.000	.659
GRULE24	1.000	.690
GRULE25	1.000	.642
CPTL27	1.000	.642
CPTL28	1.000	.676
CPTL29	1.000	.701
CPTL30	1.000	.749

Extraction Method: Principal Component Analysis.

The table above show the communalities result. The extraction value should be greater than 0.5 in each variable, because total of respondents is 215 respondents. All of value are

greater than 0.5 (0.567 at INTENTION8 is the smallest value) it means that all the variables (20 independent variables is valid), Field, A.P. (2005) chapter 15.

Table 4. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.937	34.687	34.687	6.937	34.687	34.687	4.650	23.249	23.249
2	2.838	14.189	48.876	2.838	14.189	48.876	3.409	17.047	40.296
3	2.107	10.537	59.413	2.107	10.537	59.413	3.040	15.200	55.496
4	1.747	8.733	68.145	1.747	8.733	68.145	2.530	12.649	68.145
5	.807	4.036	72.181						
6	.652	3.261	75.442						
7	.562	2.811	78.253						
8	.549	2.746	81.000						
9	.503	2.514	83.513						
10	.487	2.436	85.949						
11	.445	2.224	88.172						
12	.393	1.966	90.139						
13	.377	1.885	92.024						
14	.338	1.692	93.716						
15	.265	1.325	95.042						
16	.251	1.253	96.295						
17	.236	1.179	97.473						
18	.217	1.086	98.560						
19	.170	.852	99.412						
20	.118	.588	100.000						

Extraction Method: Principal Component Analysis.

The table above shows the total variables explained. In this research, the total variable that was used is 20 variables from 27 variables in the total. The value of Cumulative% is 68.145%

(greater than 60%). All the variance is valid data and all the variable can be determine without an error data (Institute for Digital Research and Education, 2013)

Table 5. Rotated Component Matrix^a

	Component			
	1	2	3	4
INTENTION11	.881			
INTENTION17	.842			
INTENTION12	.840			
INTENTION8	.736			
INTENTION10	.733			
INTENTION9	.712			
INTENTION13	.703			
GRULE21		.869		
GRULE22		.856		
GRULE25		.748		
GRULE24		.747		
GRULE23		.700		
CPTL30			.814	
CPTL28			.809	
CPTL29			.804	
CPTL27			.767	
EDUCATION6				.773
EDUCATION7				.770
EDUCATION4				.736
EDUCATION2				.697

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 5 iterations.

The table above shows the Rotated Component Matrix. The method that used for extraction value is Principal Component Analysis and the method for Rotation is Varimax with Kaiser Normalization. Each variable should be greater than 0.5 and the value each component has value that greater than 0.5 which is 0.697 at minimum point. Each independent variables are arrange in the same column (INTENTION12, INTENTION8, INTENTION10, INTENTION9, INTENTION13 are arrange in component 1), (GRULE21, GRULE22, GRULE25, GRULE24, GRULE23 are arrange in component 2), (CPTL30, CPTL28, CPTL29, CPTL27 are arrange in component 3), (EDUCATION6, EDUCATION7, EDUCATION4, EDUCATION2 are arrange in component 4). The entire variable is listed from big value to small value (by size). It means that factor analysis in each variable in the contents is valid Field, A.P. (2005) chapter 15.

4.2 Reliability Test

In order to make sure that the variables that we use for the questionnaires are reliable, Gronbach's alpha test is the most common use in international education. The theory is that, the questionnaires are reliable when the result of reliability test in SPSS is more than 0.7. The results from the reliability test to the independent variables such as Entrepreneurship Education, Intention to become entrepreneur, Government rule, and Capital access are passed the reliability test with Gronbach Alpha 0.876, 0.909, 0.880, and 0.855 respectively. The dependent variable which is the readiness to become entrepreneur also passed the reliability test with Gronbach Alpha 0.720. This results show that the dependent and independent variables used in this questionnaire is reliable. Based on the Research done by Maina Samuel Waweru and the results of this research, the independent

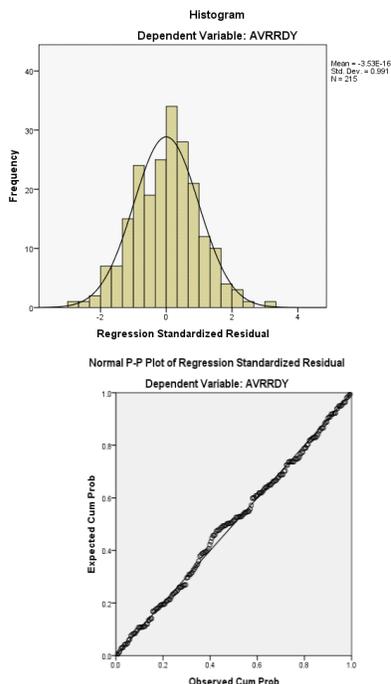
variables that used such as Government Rules and Hindrance to Capital are reliable both in Kenya and Bekasi region, Indonesia. Regarding the Education Variable also reliable in Korea (Sang M. Lee, 2000) and Bekasi region, and the last the Intention variable is reliable the same with Research by Akhtar Ali (2011) which all have Gronbach Alpha above 0.7.

4.3 Multiple Regression

There are three assumptions that need to be passed before we can use the multiple regressions. Those are:

- Normality

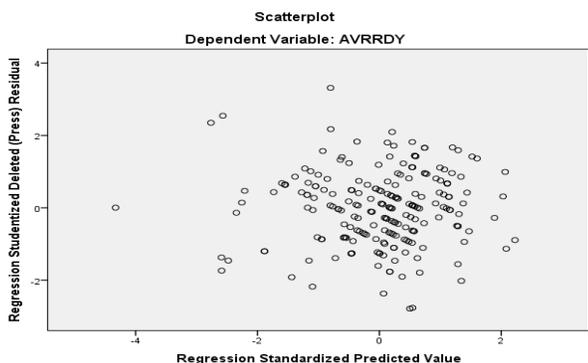
To check the normality of the statistic results, it can be seen from the pp plot and histogram in the regression test. The data are assumed to be normal if all the data are in the area of the histogram and in line along the plot.



From the two pictures above, it can be seen that the data are considered normal because most of them are in the histogram and in line with the pp plot line.

- Heterocedasticity

This second assumption can be checked from the scatter plot graph. It is to check whether the data are homogenous or not which means the distribution data is normal or not. If the result in scatter plot is not spread between the positive and negative side in the graph, it means that the data might be not homogenous or not normal distributed.



- Multicollinearity

Table 1

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	.214	.419		.511	.610
	AVRINT	.348	.072	.319	4.802	.000
	AVRRLE	.042	.068	.040	.620	.536

The last assumption is Multicollinearity which can be checked from Pearson Correlation and VIF from the results in regression process. Pearson Correlation is used to determine whether the correlation between X (independent variables) and Y (dependent Variable) is high, while VIF is used to check whether the data have multicollinearity problem or not. The standard for Pearson Correlation is from the collinearity statistic table. If the tolerance is around one it means that the X and Y are correlated each other. And if the VIF is less than five, it can be concluded that the data do not have multicollinearity problems.

Model	Collinearity Statistics	
	Tolerance	VIF
1	(Constant)	
	AVRINT	.677 1.478
	AVRRLE	.706 1.417
	AVRCPT	.769 1.301
	AVREDU	.698 1.433

a. Dependent Variable: AVRRDY

It can be seen that from the table above that the data have the VIF less than 5 (1.478, 1.417, 1.301, and 1.433) which means the data do not have the multicollinearity problem. From the tolerance, the conclusion also could be drawn that the Independent and Dependent variable are correlated because it is greater than 0.3.

In order to do the Multiple regression, after the three assumptions the procedure is continued to F-test and T-test checking. From the ANOVA table below, it shows that the F-test has a significance less than 0.05 which means that there are factors that give influence to the readiness of people to become entrepreneurs which can increase the growth of entrepreneurs.

Model	Sum of Squares	Df	Mean Square	F	Sig.
1 Regression	117.123	4	29.281	31.449	.000 ^b
1 Residual	195.521	210	.931		
Total	312.644	214			

a. Dependent Variable: AVRRDY
b. Predictors: (Constant), AVREDU, AVRCPT, AVRRLE, AVRINT

The last step is to make the multiple regression which we can take it from the T-test in coefficients table.

AVRCPT	-.004	.068	-.004	-.057	.955
AVREDU	.474	.085	.365	5.591	.000
a. Dependent Variable: AVRRDY					

In the multiple regressions, Y is the Readiness of people to become entrepreneur which related to the factor that influence the growth of entrepreneur. In this study, there are 4 independent variables which are Education, Intention to become entrepreneur, Government rule, and Capital access. It can be seen that Education is one of the Independent variable that has the highest influence to the readiness of people become entrepreneur. It can be said so because the coefficients of education is the highest from others which is 0.474 followed by the intention to become entrepreneur with coefficients 0.348. However, the significant of Government rule and Capital access is more than 0.5 which means that those 2 variables don't give much impact on the growth of entrepreneur.

The significant of Capital access and Government Rules are greater than 0.5 which mean that those two variables do not give influence to the growth of entrepreneur in Bekasi Region with significant 0.955 and 0.536 respectively. Research from Akhtar Ali also gives a good results regarding the entrepreneurial intention in influencing the growth of entrepreneur with significant .0001, while in Korea the significant of education also shows that it has good correlation and it influence to the growth of entrepreneur with significant 0,0001. To conclude the results above, from this research it can be seen that Education and Entrepreneurial intention really gives impact to the growth of entrepreneur in Bekasi.

V. CONCLUSION AND IMPLICATION

Based on the research results, the researcher found that in Bekasi Region, Indonesia, the growth of entrepreneur is significantly influence by the education and the intention of people to become entrepreneur. It means that the education or motivation given to encourage people to be ready to become entrepreneur is really effective. However, the Government rules in Bekasi as the results above show that the policy in Bekasi region do not give any impact to encourage people in there to become entrepreneur so does Capital access in Bekasi. It is the best for the government in Bekasi region to improve its Government rule and to add more ways for the people to be able to get more fund/capital to start their own business in order to increase the growth of entrepreneur in Bekasi region, Indonesia. According to the results of the H_1 The higher education people get give impact to the level of motivation for people become entrepreneurs. Motivation is important to trigger someone to become entrepreneur, it shows that the hypothesis can be accepted because the VIF is around 1 and the significant is below 0.5. The second hypothesis which is H_3 : "Government policies support and facilitate people to become entrepreneur because it is easier for people to realize their business by having government support in terms of logistic and bureaucratic system" cannot be accepted because the significant of T-test is above 0.5. The third hypothesis which is H_4 : "Capital Access, the easier someone get money, the more interest to become entrepreneur" also cannot be

accepted because the significant of T-test is above 0.5 which is 0.9

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REFERENCES

- [1] Ajzen, I. (1991). The theory of planned behaviour. *Organisational Behaviour and Human Decision Processes*, 50, 179-211.
- [2] Agreeawal, M, N. (n.d). Factors influencing growth of entrepreneurial technology ventures – Ali, A., Topping, K, J., & Tariq, H, R. (2011). *Entrepreneurial Attitudes Among Potential Entrepreneurs*.
- [3] Ayodele, J.B. (2006). Obstacles to Entrepreneurship development in Nigeria; in F.Omotosho, T.K.O. Aluko, O.I. Wale-Awe and G. Adaramola (Eds). *Introduction to entrepreneurship development in Nigeria*, UNAD Press Ado- Ekiti.
- [4] Cachon, J. and Cotton, B. (2008). The long-term effects of active entrepreneurial training on business school students' and graduates' attitudes towards entrepreneurship. *International Journal of Business and Globalization*, 2(1), 72 – 91.
- [5] Chigunta Francis (2001). *Understanding exclusion and creating value: A look at Youth livelihoods in informal settlements in Zambia: Study Report II*, Oxford University press, Oxford.
- [6] Collins, C. J., P. J. Hanges & E. A. Locke (2004) *The Relationship of Achievement Motivation to Entrepreneurial Behavior: A Meta-Analysis*, *Human Performance*, 17(1): 95-117.
- [7] Field, A.P. (2005). *Discovering statistics using SPSS (2nd edition)*. London: Sage. Retrieved from <http://www.statisticshell.com/docs/factor.pdf>
- [8] Institute for Digital Research and Education. (2013). *Annotated SPSS Output Principal Components Analysis*. Retrieved from <http://www.ats.ucla.edu/stat/spss/output/principalcomponents.htm>
- [9] Jones and Bartlett Publishers. (n.d). *Factor Analysis Path Analysis, and Structural Equation Modeling*. Retrieved from http://www.jblearning.com/samples/0763755486/55485_CH14_Walker.pdf
- [10] Junior Young Enterprise Annual Report (2006). *Entrepreneurs are made, not born*. Retrieved from :<http://old.ja-ye.org/Download/AR%202006.pdf>
- [11] Kotze, Theuns. (2007). *Guidelines in Writing a First Quantitative Academic Article*.
- [12] Lautama, William. (2013). *Indonesian Young Entrepreneurs*. Retrieved from :<http://williamlautama.wordpress.com/2013/03/31/indonesian-young-entrepreneurs/>
- [13] Lee, S.M. and Peterson, S.J.(2000). Culture, entrepreneurial orientation and global competitiveness. *Journal of World Business*. 35(4), 401-416.
- [14] Minniti, M., & Lévesque, M. 2008. Recent developments in the economics of entrepreneurship, *Journal of Business Venturing*, 23 ed.: 603-612.
- [15] Nayab, N. (2011, November 19), *Factors Having an Impact in Starting and Operating a Business*, Bright

- [16] Nelson, Brett (2012). The Real Definition Of Entrepreneur And Why It Matters. Retrieved from :<http://www.facebook.com/index.php?lh=74b8b7db5d955f5f90df15efa4f7ec0b>
- [17] Parker, S.C. and Van Praag, C.M.(2006). Schooling, capital constraints and entrepreneurial performance: The endogenous triangle. *Journal of Business and Economics Statistics*. 24(4), 416-431
- [18] Solesvik, M. (2013). Entrepreneurial motivations and intentions: Investigating the role of education major. *Education Training*, Vol. 55, No. 3, pp. 253-271.
- [19] Struwig, F.W. and Stead, G.B. 2007. Planning, designing and reporting research. Cape Town: Pearson.
- [20] Van der Sluis, J., Van Praag, M., Van Witteloostuijn, A., 2006. Why are the returns to education higher for entrepreneurs than for employee. University of Amsterdam, Amsterdam, the Netherlands Working paper.
- [21] vanPraag, C. M. & J. S. Cramer (2001)The Roots of Entrepreneurship and Labor Demand: Individual Ability and Low Risk Aversion, *Economic, New Series*, 68(269): 45
- [22] Vestegaard, L., Moberg, K., & Jorgensen, C. (2011). Impact of Entrepreneurship Education in Denmark.
- [23] Waweru, Samuel (2012). A research project report submitted in partial fulfillment for award of the degree of master project planning and management of the University of Nairobi.

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Survey on Requirements and Approaches of Business Process Repositories

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Abstract- Business processes manifest the business knowledge and related logics. As it becomes more common for organizations to describe their operations in terms of business processes, it is necessary to establish a Business Process Repository to manage thousands of process models while providing capabilities for effective sharing and reusing of valuable business and process related knowledge. Even though there are number of repositories exist to store process models, the heterogeneity of current process repositories makes it difficult to relate and share process knowledge across them. A survey of existing business process repositories has been reported here by reviewing number of available process repositories and the existing literature. Analyzing the principles on which development of these repositories are based, a comparison is made to identify the strengths and shortcomings. Founding on these principles, a number of essential properties that a successful process repository solution should possess are proposed as to support process repositories development efforts. Consequently, such a repository would become a common information asset to all business users and especially facilitate reuse over different business domains while enhancing assuring sharing and reuse business process knowledge.

Index Terms- Business Process Management, Process Model, Sharing & Reuse, Business Process Repository

I. INTRODUCTION

Business Process Management (BPM) refers to activities performed by organizations to manage and to improve their business processes. Basically, a business process is a series of activities occurring within an organization. Most often, it focuses on meeting the needs of the customer and delivering a good or service that will fulfill their needs. As business process models serves as blue prints for implementing business processes management solutions, the notion of a process model is foundational for BPM [3]. Identifying the activities and their relationships and representing them by business process models allows stakeholders to communicate about these processes in an efficient and effective manner [3]. By making business process models as common communication platform, business processes can be analyzed and then deciding on potentials improvement opportunities [3].

Traditionally, business processes are enacted manually. However, as the number of business processes and their enacted instances increase, it is difficult for business users to manage them all and to meet business process information requirements

effectively [8]. In that case, since the current interest in BPM is fueled by concepts and technologies from different areas of business administration and computer science, one solution is to collect and share process knowledge through a process model repository. The main benefits of such a repository are model reuse and knowledge exchange. This trend in modern BPM is discussed under emerging field known as Business Process Repository (BPR).

In general, a repository is a shared database of information about engineered artifacts produced and/or used by an enterprise [4]. Consequently, it should provide common database management services for data model creation and adaption, data retrieval, enabling data views, integrity management, access management and state management [7]. It should also provide services that are specific for managing objects as opposed to data in general; check-in/out, version management, configuration management, notification management, context management and workflow management [7]. The functionality for general repositories can be specialized and extended to accommodate repositories requirements specifically for storing and managing business processes [7].

Today, there exist a number of efforts to build BPRs, e.g. the MIT Process Handbook (MIT), Phios Process Repository for Supply Chain (SCOR), SAP Business Map (SAP), IBM Process Repository (IBM-PR), IBM-BPEL Repository (IBM-BPEL) and Semantic Business Process Repository (SBPR). Even though there are number of repositories exist to store business processes, the heterogeneity of current process repositories makes it difficult to relate and share process knowledge across them [5]. One of the promising approaches to overcome these limitations are through the identification of business process repository requirements and then establishment of development standard based on them for existing and future BPR solutions.

The main purpose of this survey is to establish a universal list of requirements for a BPR to facilitate process model reuse and knowledge exchange. Five process repositories; MIT, SCOR, IBM-PR, IBM-BPEL and SBPR are subjected to the said evaluation in this work. The survey is conducted through reviewing a set of available BPRs [9, 10] and the existing literature [1, 2, 4, 5, 6, 7, 8]. Having identified strengths and shortcomings of selected BPR solutions, a number of essential properties that a BPR should possess are proposed.

The remainder of the survey paper is organized as follow. Section 2 introduces five existing BPRs. In Section 3, the results

of the repository comparison are presented and a list of BPR requirements is proposed. Section 4 concludes the paper.

II. AN OVERVIEW OF EXISTING BUSINESS PROCESS REPOSITORIES

This section provides a brief overview of five existing BPRs which are chosen to perform the evaluation.

- 1) MIT: With respect to the presentation form, the repository describes business processes only in a textual form. The process mapping technique analyzes business processes using two dimensions; the vertical dimension distinguishes different parts of a process and the horizontal dimension distinguishes different types of a process [6]. In fact, the process categorization is based on the process compass. From any activity in the repository, user can go in four different directions; down to the different parts of the activity (its sub activities), up to the larger activities of which this one is a part (its uses), right to the different types of this activity (its specializations) and left to the different activities of which this one is a type (its generalizations) [6]. Besides from standard functionality for storing and retrieving information about process models, the repository supports browsing the process models along the two dimensions [7]. In addition to that it supports text-based search [7]. To support specialization, rather than just lump all different kinds of specializations into a single undifferentiated list, the repository separates them into categories called bundles. Bundles are based on the basic questions that can ask about any activity; how, what, who, when, where, and why [7]. In addition, the repository processes are grouped into ten root categories; procurement, supply chain management, marketing, sales, information systems, human resources, strategic planning, finance or accounting, manufacturing or logistics and engineering [2].
- 2) SCOR: This is a proprietary repository that stores business processes related to supply chain management only [2]. A process compass is used for classification, in the same way as MIT. Further classification is based on four verbs; create, destroy, modify, and preserve [2]. The processes in SCOR are organized around five management root processes; plan, source, make, deliver, and return [2].
- 3) IBM-PR: The IBM-PR is proprietary to IBM and gives a graphical representation of e-commerce related process models with the aim of providing an explicit control flow. Especially, it supports the storage of process objectives together with the process [2]. It classifies processes into five major groups; B2B direct, consumer direct, demand chain, hosting, and supply chain [2]. Each group has three sub groups: direct admin processes, direct starter stores, and direct solution [2].
- 4) IBM-BPEL: IBM has published another repository called BPEL (Business Process Execution Language) repository for storing business processes along with associated metadata. The IBM-BPEL is an Eclipse plug-in originally built for BPEL business processes and other related XML data [1].

The repository can easily be extended with additional XML schemas because of its flexible architecture [1]. It uses the BPEL XML format as its external format and stores the process models and their elements internally as objects in an EMF (Eclipse Modeling Framework) repository [7]. The processes are not presented in textual or graphical format instead they are treated as objects in IBM-BPEL [2]. The processes are stored without any classification scheme [2]. Besides the standard functionality for storing and retrieving process models, the repository can interact with query engines that are built on the EMF repository, EMF extensions and other external software [7].

- 5) SBPR: The SBPR is an ontology based repository for storing business process models [7]. It does not commit to a particular set of aspects of business process models that must be stored. Instead, it requires that the repository is configured with a process ontology, of which the concrete process models are be instances [7]. The processes in SBPR are neither presented in textual or graphical form nor classified into groups [2]. Besides from the standard database management functionalities, the SBPR supports semantic querying which can only be processed, when the ontological knowledge of the process models is taken into account. The SBPR is open for change by potential users. To avoid the production of inconsistent process models, it provides check-in and check-out capabilities; the process model in SBPR is locked when the modeling tool obtains it (check-out), so that no other users can modify the process model in the SBPR in the meantime [8]. After the modeling work has been done, the process model is updated in the SBPR and any locks that have been held for the process model are released (check-in) [8]. The repository also provides versioning functionality.

III. DISCUSSION

This section presents a comparison of repositories to identify the strengths and shortcomings of each and proposes a number of essential properties that a BPR should possess.

Based on the survey of repositories in the preceding section, a number of existing repository properties are chosen as criteria for evaluating repositories. The resulting criteria are as follows:

- 1) Provides graphical interfaces for user interaction (A)
- 2) Allows for maintenance by public (B)
- 3) Focuses on storing a domain specific business process models (C)
- 4) Classifies the processes in to categories (D)
- 5) Stores the processes described independently of the process modeling language used (E)
- 6) Presents business process in graphical form (F)
- 7) Describes the activities that are performed in the context of a process (G)
- 8) Describes the control flow relations between activities (H)
- 9) Describes the business objectives that will be satisfied through the use of a process (I)
- 10) Stores metadata about a process (J)
- 11) Supports the create, update and delete functions (K)

- 12) Supports process navigation (L)
- 13) Supports process search (M)
- 14) Supports process querying (N)
- 15) Enables version management function (O)
- 16) Enables check-in/out management (P)

Accordingly, the evaluation is performed to identify the extent to which each repository meets those criteria. Table I shows the results of the evaluation. The criteria are identified by alphabetic letters as given in the above list. The possible values of each criterion are: the repository meets the criterion (✓) or the repository does not meet the criterion (*).

Table I: Comparison of repositories

	MIT	SCOR	IBM-PR	IBM-BPEL	SBPR
A	✓	✓	✓	✓	*
B	*	*	*	✓	✓
C	*	✓	✓	*	*
D	✓	✓	✓	*	*
E	✓	✓	✓	*	*
F	*	*	✓	*	*
G	✓	✓	✓	*	*
H	*	*	✓	✓	✓
I	*	*	✓	*	*
J	✓	✓	*	✓	✓
K	✓	✓	✓	✓	✓
L	✓	✓	✓	*	*
M	✓	✓	*	*	*
N	*	*	*	✓	✓
O	*	*	*	*	✓
P	*	*	*	*	✓

The table shows that, all other repositories, except SBPR, provide graphical interfaces for user interaction. Instead, SBPR provides a Java API for interaction. Nearly, most repositories support for create, update and delete functions. Exceptions are MIT, SCOR and IBM-PR because although they do allow processes to be created, updated and deleted, do not provide public interface to do that. In addition, SCOR only stores process models related to supply chain management and IBM-PR only contains e-commerce related process models while MIT, IBM-BPEL and SBPR are unrestricted in scope. As classifications, 3 out of the total repositories classify processes in accordance with various classification schemes.

In contrast to IBM-BPEL and SBPR, all other repository contents are developed independently of any particular specification technology. IBM-BPEL focuses on storing the processes described in BPEL XML format. In SBPR, the business process models are based on process ontologies. Moreover, IBM-PR presents the process models in graphical format, whereas MIT, IBM-BPEL, and SCOR give a textual explanation of processes. Only MIT, SCOR and IBM-PR are able to store the textual phrasing of a process model that describes the activities of a process, the involved entities and their interaction. Also, except MIT and SCOR, other repositories have the ability to describe and store the control flow aspects of a process.

Aside from IBM-PR, no repository supports the storage of process objectives together with the process models and most repositories store process related information such as creation date, last modification, and number of versions, except IBM-PR. Furthermore, most repositories support one or more functions to search, query or navigate the repository. The table shows which type of functionality each process repository supports. With the exception of SBPR, no repository provides facilities for handling changes to process models by maintaining versions and for check-in/out management, to avoid the production of inconsistent process models.

Based on this comparison, the following repository requirements are proposed as the essential properties that a BPR should possess:

- 1) Should provide graphical interfaces for users to interact with the repository, so that users can easily interact with the functions provided by the repository
- 2) Should accessible for public creation, editing, and deletion, so users can be encouraged to reuse models
- 3) Should be able to store process models in general, hence the reusability of models between business domains can be increased
- 4) Should arrange its content according to a business classification scheme to allow quickly browsing the collection of processes
- 5) Should support to store the processes described independently of the process modeling language used, as a consequence the repository content can be developed independently of any specific technology
- 6) Should be able to present the process models in both graphical and textual formats, so such a repository will provide an easy and understandable access to its content
- 7) Should be able to cover description of: activities that are performed in the context of a process, control flow relations between activities, relationships between processes, physical resources that are required to execute a process, who is authorized to perform which part of a process, how the performance of a process should be monitored, the business objectives that will be satisfied through the use of a process and process related information such as creation date, last modification, and number of versions, hence users can clearly identify the related aspects of each process model
- 8) Should provide support for navigating, searching and querying facilities for users to locate content effectively
- 9) Should be able to maintain multiple versions of the same process model, produced during the customization, so that users can simply go back to old versions and develop process models from old versions further
- 10) Should be able to create private and public views on a process, which represents the process as it is performed inside an organization and which provides of what the behavior of the process to the out-side world will be like, so users will not be bothered with details that do not concern them
- 11) Should provide check-in/out functions to avoid the production of inconsistent process models as it opens for change

- 12) Should enable notifications to be generated in case an object in the repository is changed, so that users can get to know about most recent works

IV. CONCLUSION

In order to support the development of future BPRs which are capable for model reuse and effective knowledge exchange, the proposed set of repository requirements can be used as the basis. Such a BPR would become a common information asset to all business users and especially facilitate reuse over different business domains.

REFERENCES

- [1] J. Vanhatalo, J. Koehler, and F. Leymann. Repository for Business Processes and Arbitrary Associated Metadata. In Proceedings of BPM 2006, Vienna, Austria, pp. 25-31, 2006.
- [2] K. Shahzad, B. Andersson, M. Bergholtz, et al. Elicitation of Requirements for a Business Process Model Repository. In Proceedings of 4th BPD in conjunction with BPM'08, Milan, Italy, pp. 42-53, 2008.
- [3] M. Weske. (2007). Business Process Management: Concepts, Languages, Architectures (1st.). Heidelberg: Springer.
- [4] P.A. Bernstein, and U. Dayal. An Overview of Repository Technology. In Proceedings of VLDB 1994, Santiago de Chile, Chile, pp. 707-713, 1994.
- [5] P. Wohed, J. Zdravkovic, and P. Johannesson. A Universal Repository for Process Models, 2007.
- [6] T.W. Malone, K. Crowston, J. Lee, B. Pentland, et al. Tools for inventing organizations: Toward a handbook of organizational processes. Management Science 45(3), pp. 425-443, 1999.
- [7] Z. Yan, R.M. Dijkman, and P.W.P.J. Grefen. Business Process Model Repositories-Framework and Survey. Information and Software Technology, vol 54(4), pp. 380- 395, 2012.
- [8] Z. Ma, B. Wetzstein, D. Anicic, and S. Heymans. Semantic Business Process Repository. In Proceedings of SBPM 2007, Innsbruck, Austria, pp. 92-100, 2007.
- [9] MIT Process Handbook, <http://process.mit.edu/Directory.asp?ID=114&Expand=92>
Last accessed on 12th November 2013.
- [10] IBM Process Repository, http://publib.boulder.ibm.com/infocenter/wchelp/v5r6m1/index.jsp?topic=/com.ibm.commerce.business_process.doc/concepts/processPrice_order.htm
Last accessed on 12th November 2013.

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Vocational and Technical training for rural laborers in northern midland and mountainous area of Vietnam

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Abstract- For every country, human resource is a main power for country development. Vietnam is an agricultural developing country, rural labor force accounts for the majority of the whole country labor force. Rural human resource development is a compelling need to ensure Vietnam economy development speed, especially for northern midland and mountainous area, where there are special geographical characteristics and social. Economic condition is backward and lower compared to the average condition of whole country. Northern midland and mountainous area has special geographical characteristics with limited traffic structure, backward social, economic condition and low qualified rural human resource. These difficulties lead education programs implemented in this area be not effective as expected, especially for rural laborers in the countryside. Improving quality of rural labors can help them to increase their income, improve quality of life and also promote rural sustainable development. It is necessary to find some education models that can meet the requirements of this area condition by studying on the general education programs, vocational and technical training programs supported by the government. Finding out the causes of education programs' limitations and disadvantages to propose solutions for this area. A study on the experiences lesson absorbing from the failures of vocational and technical training programs supported by the government, and the success experiences of vocational and technical training programs implemented by local government and Non-Government organizations is also carried out to find out suitable education modals for rural human resource development in this area. The course organizing and curriculum building, teachers and instructors recruitment, financial and capital support solutions are proposed in this article.

Index Terms- human resource, vocational and technical training, non-formal education, rural laborer, northern of Vietnam.

I. INTRODUCTION

Northern midland and mountainous area of Vietnam is a special geographical area, traffic condition is not convenient, but this area contains a lot of nature valuable and rare mineral resources such as rare earth, iron, coal, copper, nickel, tin, lead, bauxite, gold and apatite resources, however the highland geographical condition makes it difficult to mine. The northern midland and mountainous area of Vietnam also has a large primeval forest, as well as highlands and large pastures.

Nearly 40 years after the country's reunification, the economics of this area is underdeveloped with limited human and social capital (including low educational and vocational skill levels, poor social networks, and the shortage of information and skills to adapt to changes in working and living environment), peasants still use the ancient methods of farming, rudimentary farming tools and technology that used thousands years ago, such as oxen-plough technology, or calculating seeding time based on the experience passed from generation to generation. The rural labor force in this area has not really qualified, most of laborers have low education levels and have not been trained. Education programs formally provided to people in this area do not meet the requirements of most people and expose shortcomings. However the number of laborers at working age in this area is abundant, most of labor force that supports urban areas and industrial zones come from this area.

In recent years government of Vietnam has carried out some formal vocational and technical training programs to improve quality of rural laborers. However these programs have not got enough efficiency as expected. The quality and quantity of trained laborers has not improved as expected. Current formal education or vocational and technical training programs implemented in this area are unable to serve with the requirement of the rural industrialization and modernization program. Investment in rural labor vocational training for the northern midland and mountainous area is not only to improve this area economic development but also improve the whole Vietnam economic development as well. It is necessary to find a long term and accordant vocational training program to deploy in this area.

II. OBJECTIVES

1. To find out limitations of general education, Vocational and technical education programs in northern midland and mountainous area of Vietnam.
2. To propose suitable vocational and technical education models for this area, with solutions for building programs, organizing course and setting up curriculum, recruiting teachers and instructors and solution for financial and capital support.

III. THE CURENT PROBLEMSOF THIS AREA

3.1 Low quality of rural laborers

Northern midland and mountainous area is the biggest area of Vietnam. As the census results in2009 of General Statistics Office (GSO) of Vietnam shows that the area accounts about 28.8% of the country area and 12.9% of country

population. Population in that area is mainly ethnic minority groups with 50 to 100 people per one square kilometer as population density (GSO. 2009). The Report on Labor force survey in 2012 of GSO reveals that 75.9 % of population in the northern midland and mountainous area resided in rural area, 14.7% of population aged 15 and over is illiterate, 22.7% does not finish primary level, and 25.6% just finishes primary level. Percentage of technical trained people is also low with 89.98% of people at workable age is not trained, 2.54% obtains elementary vocational level, 4.5% obtains intermediate vocational level, 1.65% has college diploma, and 1.33% has university or higher diploma (GSO. 2012). Low qualified of laborer and difficult transportation in this area does not attract industrial enterprises to establish in this area that leads to limit economics development and employment requirement as well.

3.2 Barriers affect achievements of education programs in this area.

The barriers of General education

The financial barrier : Vietnam implements six years compulsory education policy. Primary education is compulsory and it is free for all children, but in Vietnam the cost of education is not only school tuition fee but also other expenses such as; learning materials, uniforms or clothing, transport, additional living expenses, extra learning fee, school construction fee, and other unnamed expenses. A study showed that Vietnam is one of the countries in Asia that mobilizes the highest resource from society for education. The studies calculated in 2006, the education expenses accounted 41% of total social expenses. A survey result in this study showed that 57% of parents said that their children’s education expenses were “high”, 38% of parents said “relatively high”, and 18% of parents said “very high”(Tran Huu Quang, 2008). Socialized education policy of the government makes education expenses to be a burden of families whose children go to school. For this reason compulsory education is just a “formalism policy”, in fact, children especially children in rural areas do not get full preferences of this policy. High education expenses prevent rural children from continuing to attend higher education, prompting them to leave school early to participate in agricultural activities. The high dropout rate leads to increase the rate of low educated laborers.

The geographical, social and cultural barrier: In rural area one school serves a larger geographic area that because distribution of schools is based on population density. Far distances from home to school, difficult transportation condition, so most of pupils must reside in school, or school vicinity, particularly in some places pupils reside in temporary tents. The formal education programs are fixed schedule, and does not run in synch with the agricultural crops season, so many pupils leave school to participate in harvesting crops or planting new crops, while children start to work at early age, most of children in rural area after school they take part in harvesting crops, planting new crops or working to earn small income to support their families. For this reason, pupils find it is difficult for them to enroll in full time schooling as most of urban children do. In rural area people also get married at early age, as invested result show that 18.6% of people at the age of 12 to 19 get married (GSO. 2012). The fertility birth rate is high and close so the elder children often

leave school to work to support their brothers or sisters to continue school

The language barrier: In northern midland and mountainous area, majority of people are ethnic minorities groups so many pupils face language barrier when they are at school because the language used in these schools is Vietnamese, which is not the home language for some ethnic pupils. Not many teachers in ethnic areas can speak the ethnic language of the pupils and this makes it difficult for them in communicating with, as well as in teaching ethnic students.

The barriers of Vocational and Technical Education

Vocational and Technical training schools and centers are located in urban areas, far away from countryside, so most of learners must reside in schools, or schools vicinity. Training courses are developed by time – based approach so they are not flexible enough to meet agricultural crops season as well.

Expenses of formal Vocational and Technical programs are also burdens for most rural laborers to decide to enroll vocational training courses. As investigated 30 vocational training schools and centers in Thai Nguyen province in 2012. Each learner needed to pay average 664 USD for a semester (6 months). The largest expense was expenses for food and daily life, occupied for more than half of total expense. These expenses were increased because of the independent lives of expenses. If they lived with their families they would reduce travelling and communicating expenses, and in rural area most of daily food and necessities could be also reduced by self – sufficiency.

Table1: The average expenses of vocational training in northern midland and mountainous area of Vietnam

Expense	Average (USD)
School fees	105
Dormitory fees	41
Average food expenses	327
Materials and book	15
Extra - Learning fees	18
Membership fees (Young union, Student union...)	12
Physical test and insurance	10
Daily life expenses, travelling, communication, etc.	136
Total	664

The distribution of careers of vocational and technical training schools is unreasonable. As investigated more than 40 vocational training schools in 15 provinces of northern midland and mountainous area shows that 58% of career quota are engineering - welding and fabrication, electric technology, electronics technology, automotive mechanical technology, information technology and driver. Only 12.3% of career quota is agricultural careers. For the diplomat level, agricultural careers occupy 9.3% of the quota, and for secondary level agricultural careers account for a small number of quota, 10.8%. Diploma and secondary level requires trainees obtain at least secondary graduation certificate before enroll.

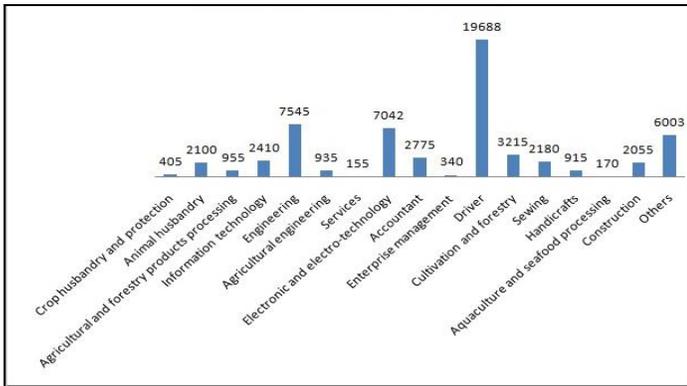


Figure1: Career quotas distribution

Rural labors can enroll to study elementary level; however the number of agricultural careers are only 15% of career quota, and agricultural careers are not deployed on a large scale, but only available in some agricultural schools located in some certain provinces.

Law on Vocational and Technical training issued in 2006, defined that vocational and technical training includes three levels: vocational elementary level, vocational secondary level, and vocational diploma. Vocational training includes full-time and regular training. The secondary, and vocational diploma levels limit to those who have graduated from secondary schools, so the law has hindered most of rural laborers to enroll formal vocational training programs, because 14.7% of rural laborers aged 15 and older in this area are illiterate, 22.7% un-graduated primary level, 25.6% finished primary level (GSO. 2012). It means 63% of rural laborers can only enroll in elementary training level and cannot enroll to higher level at formal vocational schools or centers because of their education certificates limitation as the law regulations.

The main problems of education programs in this area

- Curriculums are inflexible and in conflict with agricultural crop, duration of curriculums is long and trainers misspend on unnecessary subjects.
- Far distances from home to school, difficult transportation condition.
- Lacking of training, learning facilities and equipment, non financial support or little financial support from the government does not ensure learning and teaching condition for learners.
- Social - cultural gap, language barrier and high education expense.
- The investigation and survey activities are not exact and detail in identifying skills with unclear training target leads the training vocation does not meet the requirements of laborers.
- The input certification requirement prevents most of laborers to participate in higher training levels.
- The propaganda and consultant activities are limited and passive.
- The abilities of local officials are limited and the coordination of local departments for implementation of training program is weak.

IV. SOME SOLUTIONS FOR THESE PROBLEMS

4.1 Building non-formal Vocational and Technical training models for this area

General education will create “general human capital”, and Vocational and Technical Education will create “specific human capital” (Becker.1985). Vocational and Technical Education can meet changes in production technology; these changes go along with advanced technology development. The development of advanced technology will require skilled and qualified workers.

For major rural laborers in this area, general education seems not be suitable to improve their human capital. Because of the low qualified educational levels of rural laborers, general education makes rural laborers spend long time to achieve a degree while vocational and technical training will equip them what knowledge and skills that they require in short time. Vocational and technical training can reduce unemployment, and help rural laborers for self-employment. The trained laborers can open and operate their own, or their families workshop so they will create new employments. and Vocational and technical training will also promote “equity with a rural bias and serve the needs of relatively poor people”, create “skill culture”, as opposed to “academic culture” that is now prevailing in Vietnam, as the majority of pupils after high school graduation will participate an exam to enter colleges and universities with a dream to find a high income office job in city after graduation (Jandhyala B G Tilak. 2002).

Non-formal education is distinct from formal education, it is flexible, it can be customized to serve for specific learner groups with particular purpose. Non-formal vocational and technical training programs can be customized in a way that the course will be organized in their villages, or next to their homes, practicing can be applied in their daily work. Learners can choose what they learn in detail, and class time can be scheduled in spare time, so it will not affect or will have small effect on their harvesting. Let rural laborers take the initiative in education with flexible time and courses. They will not face difficulties in communicating or feel a complex about their over age. Finally learning expenses will not be their burden on themselves or their families.

4.2 Organizing course and setting up non-formal vocational and technical training curriculum

Non-formal vocational and technical training curriculum: Setting up sensible curriculums for rural laborers and attracting learners are very important for the success of programs. It is necessary to investigate and survey before setting up a curriculum. The investigation and survey activities are not exact and detail in identifying skills with unclear training purpose that leads the training programs do not meet the requirements of laborers. For northern midland and mountainous area with the particular social economic condition, curriculums should more focus on careers that can develop this area economics. The curriculum should put learners at the center of training activities, and let them take more roles on teaching and learning activities. After class learners can practice their knowledge immediately in daily life and teaching should be done in local language by local teachers (ILO.2002).

To set up a suitable curriculum, it is necessary to identify what knowledge and skills that rural laborers should be

equipped. The knowledge and skills that near by labor market needs is prior. The knowledge and skills about agricultural careers, agriculture production processing, marketing, management, information technology should also equip to rural laborers as they can improve their productivities or they can be self-employed or be agri- entrepreneurs. When rural laborers can self-employ they can also create employment for their families members or other people, and when they can process their agricultural products they may establish small agricultural products processing establishments and also create new employments. Self-employment, establishing agricultural products processing establishments and becoming agri-entrepreneurs will create new employments, new services in localities and improve local economics.

The curriculum must have the community at the centre of the decision making process – identifying a range of skills that they see appropriate and fit with the sources of growth and job opportunities within the locality. Curriculums should be built to support for rural laborers more than the elementary training level to equip rural laborers with enough knowledge and skills to self-employ or work in factories. Laborers can learn whole curriculum or a part of curriculum then enter labor market or start their own work, if they want to improve their skills they can attend the curriculum again. It should be a long – life curriculum. Preparing and organizing the curriculum: Curriculum organizing should fit the condition of rural laborers, all of the curriculum or a part of it should be taught in villages where learners reside. A vocational and technical training curriculum combines of two parts, theoretical part and practical part. Almost theoretical parts can be taught in localities but some practical modules require practice facilities or machines that are unable to be moved to localities, expensive moving cost, or unable to be installed in localities because of power supply limitation. For these cases the following methods can be used; Practicing associated with manufacturing in firms is an impeccable method for learners practice and make real production. Learners are practicing in real manufacturing environment that help them to have industrial manners. Learners can be paid amount of salaries to cover their expenses, and it also creates chance of employment for them after graduation. Course organizers can associate practice courses with surrounding vocational and technical training schools to help learners practice in these schools in free time such as weekend, summer vacation etc. Vocational and technical training schools are well equipped with facilities and machines, teachers and instructors are experienced and well professional. Maybe learners need to pay some extra expenses, however they can have better practicing environment. Curriculum should be organized in flexible schedule. Teaching may be scheduled for only part of a day, after working time, in evening, after harvest time, or for the weather day that people are unable to work outside in field

Attracting learners is one of the formal education failures so it could not attract learners to attend class. For northern midland and mountainous area, propaganda, investigation and survey activities should be improved. These activities can be carried out by local social political organizations available in rural area such as: Ho Chi Minh Communist Youth Union, Vietnam Youth Federation, Vietnam Women's Union, Vietnam farmer's Union, Study Encouragement Society, Agricultural Extension ... etc. Almost rural laborers participate in

at least one of these organizations so these organizations can understand condition of rural laborers, and rural laborers can be directly fed propaganda. These organizations can create vocational learning movements for rural laborers like other political movements popularized in rural area. These organizations can investigate or do surveys about local rural laborers to prepare for training courses. These organizations can also carry out propaganda activities and enrolment activities as well.

In rural area people keep their family relationships and clan connections closely, in each clan the role of matriarch or patriarch is very important, and some clans have their own rules. Big families or clans can be considered as organizations. We can mobilize them to participate in propaganda activities, enrollment activities to their members. Taking advance of the local organizations and local governments we can attract rural laborers to attend class more effective and more economic saving.

The training programs should be associated with local organizations' activities to prove good effect, and reduce expenses. The programs should also exploit local tradition culture and family relationship to attract learners. Using public facilities to reduce expenses and mobilizing finance from social organizations to supply scholarship to learners will ensure them to attend class.

4.3 Teachers and instructors

In the northern midland and mountainous area, the geographical and social economic condition is difficult; traffic is limited, especially for some remote localities, so it is not attractive for teachers to come for sustainable employment. For professional and experienced teachers, it is more difficult to recruit.

To recruit teachers, wage and bonus will not be the condition to attract teachers. The policy of vocational training for rural area can be treated as social policy; teachers can be volunteered for short-term. Graduated students will be a source of voluntary teachers. Graduated students can accept to work in rural area few years before move to good condition area. Surrounding vocational and technical training schools' teachers can also be a suitable voluntary source. They can take apart in rural courses in their free time, like weekend or vacation. Another source of voluntary teachers is retired teachers, the teachers are experienced and professional, they also are ensured by retirement pension, so wage will not be pressure for their work, and they have full time for their work. High skilled technicians of local agricultural expansion encouragement society or craftsman from trade villages, skilled workers can also recruited as instructors. Local teachers and instructors will be the first choice because they are familiar with local conditions, they also can communicate with learners in local languages, and the expenses (such as traveling expense, accommodation expense ... etc) for them will be less than expenses for teachers from other places.

4.3 Financial and capital support

Finance for non-formal vocational and technical training programs includes teacher wage and pension, organizing cost (includes preparing expenses such as investigations, propaganda activities. etc), teaching and learning facilities, equipments, materials, machines, workshops, building, power, scholarship. Government should be the main sponsor provides financial

resource to these programs, and vocational training for rural labors should be put as a nation policy, especially for the northern midland and mountainous area, vocational training for rural labors policy can narrow economic gap with other areas as the policy that government of Vietnam are performing.

Local governments should provide financial support to these programs, because the success of these programs will improve local economics and social environment condition. Though local governments' financial resources are plentiful, they can support to vocational training programs by other resources like electric power, practice materials or learning facilities...etc. Enterprises when invest in rural area they should also invest in human resource. If they want to have high skilled laborers they should invest in human resource development by themselves or recruit high skilled laborers. In rural area high skilled laborers are not available for recruitment, for this reason, it is better for enterprises to invest in vocational training for rural labors in localities where they locate in. If enterprises using raw materials from local agricultural products for their production, investing in vocational training for rural laborers who produce and support agricultural products as raw material resources to enterprises will also improve the quality and productivity of raw material resources. This policy will bring benefit to both enterprises and labors, rural labors will reap more quantity and better quality agricultural product, and enterprises will be supplied with stable and good quality material resources.

Financial contributions can be donated from interior and international sponsors such as social organizations, international organizations, and non-governmental organizations. The credit loans from international organizations will be another financial resource supported for these programs. The donation finance in Vietnam from NGOs is difficult because of the politic of Vietnam, these organizations are limited in implementation their activities, so they find difficult to take a part in development of Vietnam economics. If government of Vietnam loosens religions control, it can mobilize big resources from these organizations support for economic development.

Self - created finance is finance created by learning associated with manufacturing, such as the expanding handicraft and trade villages programs, learners could make commercial products while they were learning. The finance will support learners daily lives to maintain the courses and for next higher courses.

Finance expenses can be reduced by using public facilities available in localities, such as commune post-culture houses, culture houses, libraries, village halls in teaching and learning activities. In the northern midland and mountainous area as an investigation result of General Statistics Office (GSO), there are 1904 post-culture houses about 83.84% communes, 716 culture houses, about 31.53% communes, 139 public libraries about 6.12% communes. And others village halls and community houses of clans, these places can be used as classrooms with little equipped.

Teacher wage and pension can also be reduced by recruiting retired teachers, short- term teachers and voluntary teachers. Investigations, propaganda, enrolment activities carried out by local organizations can reduce significant amount of organizing expenses.

V. CONCLUSION

The solutions will be more effective if rural laborers are ensured by law to improve their skills and knowledge, so it is necessary to build a law on non-formal vocational and technical training to give non-formal vocational and technical training organizations permission to train higher training levels and award higher training levels certificates. The present vocational and technical training law provisions that the higher training levels (secondary training level and diplomat training level) that required for at least secondary school graduation. The only secondary vocational schools, vocational colleges, professional secondary schools, colleges and universities who have registered to provide vocational training at the secondary level are allowed to provide higher training level. It is necessary to develop a vocational qualification evaluating system with the regulations to admit the certificates of non-formal vocational training programs to be equivalent with other vocational training certificates, and to allow laborers to participate in the highest vocational training level as they can.

As well as supporting vocational and technical training for rural labors, laborers recruitment and employment policies should be deployed simultaneously to ensure laborers after graduated can find a wage employment or self-employ. Developing small enterprises or family establishments is a suitable way to employ laborers and develop local economics. Small enterprises and family establishments easily to adapt to economic changes, market requirements, producing technology change. They can be established in rural area use local labors and materials. The government can make policy provide financial support or preferential tax policy to develop small enterprises in rural area. Linking vocational training with enterprises is a way to solve trained laborers. In Vietnam most of labors must find employment by themselves or 'implore for a job', sometime they must pay amount of money for employers to get a job. If vocational training centers can be linked with enterprises to establish a 'channels laborer distribution' with clear information of human resource, laborers will have more employment chances and response requirement of labor market better.

It is important to change misconception of vocational and technical training and learning. A lot of Vietnamese people regard academic education and disregard vocational education, and "qualification above ability" conception is popular in Vietnam. To change misconception, the propaganda activities should be direct to rural labors; vocational training should be brought directly to rural labors. When people realize that vocational training can increase their labor productivities, increase income and improve their lives they will change their misconception.

REFERENCES

- [1] Wim Hoppers. (2006). *Non-formal education and basic education reform: a conceptual review*. Paris. Retrieved February 20, 2013 from <http://www.unesco.org/iiep>
- [2] UNESCO. (1997, November). *International standard classification of education ISCED 1997*. Paris. Retrieved February 20, 2013 from http://www.unesco.org/education/information/nfsunesco/doc/isced_1997.htm

- [3] Government of Vietnam. (1998). *The Education Law of Vietnam*. Retrieved February 20, 2013 from <http://thuvienphapluat.vn/archive/Luat/Law-No-11-1998-QH10-of-December-02-1998-Education-Law-vb75411t10.aspx>.
- [4] Government of Vietnam. (2006). *Law on Vocational Training*. Retrieved June, 7, 2013 from <http://thuvienphapluat.vn/archive/Luat/Law-No-76-2006-QH11-on-vocational-training-vb116841t10.aspx>.
- [5] GSO. (2009). *The 2009 Vietnam population and housing census: Completed results*. Retrieved June, 7, 2013 from <http://www.gso.gov.vn/default.aspx?tabid=512&idmid=5&ItemID=10798>.
- [6] GSO. (2012). *Report on Labour force survey - First 9 months 2012*. Retrieved June, 7, 2013 from http://www.gso.gov.vn/default_en.aspx?tabid=476&idmid=4&ItemID=13475.
- [7] Tran Huu Quang. (2008). *Ket qua cuoc khao sat ve cac van de kinh te trong giao duc pho thong cuoi nam 2007*. [Result of economic issues investigation in general education at the end of 2007 year]. Vietnamese Review of Studies and Discussion. Vol 13.
- [8] GSO. (2012). *Results of the 2011 rural, agricultural and fishery census*. Retrieved June, 7, 2013 from http://www.gso.gov.vn/default_en.aspx?tabid=462&idmid=2&ItemID=13407.
- [9] Government of Vietnam. (2009). *Decision approves the Scheme on vocational training for rural laborers up to 2020*. Retrieved June, 7, 2013 from <http://thuvienphapluat.vn/archive/Quyet-dinh/Decision-No-1956-QD-TTg-of-November-27-2009-approving-the-scheme-on-vocational-training-for-rural-laborers-up-to-2020-vb100624t17.aspx>.
- [10] MOLISA. (2010). *Nhung ket qua buoc dau trien khai de an dao tao nghe cho lao dong nong thon*. [The first results of implementation schemes on vocational training for rural workers]. Ministry of Labour Invalids and social Affairs. Retrieved August, 1, 2013 from <http://www.molisa.gov.vn/news/detail/tabid/75/newsid/51879/seo/Nhung-ket-qua-buoc-dau-trien-khai-de-an-dao-tao-nghe-cho-lao-dong-nong-thon/language/vi-VN/Default.aspx>.
- [11] ILO. (2002). *Non-formal education and rural skills training: Tools to combat the worst forms of child labour, including traffic*. ILO Mekong subregional project to combat trafficking in children and women. ILO, International Programme on the Elimination of Child Labour. Bangkok: International Labour Office. Retrieved June, 7, 2013 from <http://www.ilo.org/asia/child/trafficking>
- [12] MOLISA. (2013). *Hoi thao thuc day dao tao nghe, tao co hoi viec lam va thu nhap ben vung cho nguoi ngeo*. [The seminar on impulse to vocational training, creating employment and sustainable income for poor people]. Ministry of Labour Invalids and social Affairs.
- [13] Becker, G.S. (1964). *Human Capital*. National Bureau of Economic Research.
- [14] Jandhyala B G Tilak. (2002). *Vocational education and training in Asia*. Kluwer Academic Publishers.
- [15] Chaudhri, D. P. (1979). *Education, Innovations and Agricultural Development: A Study of Northern India*. London: CroomHelm Ltd. for the International Labour Organisation
- [16] Chu Lam. (2007). *Country Profile of Vietnam on Non-Formal Education. Country Profile commissioned for the EFA Global Monitoring Report 2008, Education for All by 2015. United Nation Educational, Scientific and Cultural Organization*. Retrieved July, 10, 2013 from <http://unesdoc.unesco.org/images/0015/001555/155517e.pdf>
- [17] Foster, Andrew D. and Mark R. Rosenzweig. (1996). *Technical change and human capital returns and investments: evidence from the green revolution*. American Economic Review, 86, 931-53.
- [18] Hussain, S. and D. Byerlee. (1995). *Education and farm productivity in post-'green revolution' agriculture in Asia*, in G. H. Peters and Douglas D. Hedley, eds., *Agricultural Competitiveness: Market Forces and Policy Choice*. Proceedings of the 22nd International Conference of Agricultural Economists held in Harare, Zimbabwe (Aldershot: Dartmouth Publishing Company Limited), 554-69.
- [19] Jamison, Dean T. and Peter R. Moock. (1984). *Farmer education and farm efficiency in Nepal: the role of schooling, extension services and cognitive skills*. World Development, 12, 67-86.
- [20] Moock, Peter R. (1981). *Education and technical efficiency in small farm production*. Economic Development and Cultural Change, 29, 723-739.
- [21] Shultz, Theodore W. (1964). *Transforming Traditional Agriculture*. New Haven: Yale University Press.
- [22] Claudio Zaki Dib. (1987). *Formal, non-formal and informal education: concepts/applicability*. Inter-American Conference on Physics Education. Oaxtepec, Mexico.
- [23] Roger Iredale. (1978). *Non-Formal Education in India: Dilemmas and Initiatives*. Comparative Education, Vol. 14, No. 3, Special Number (2): Policies and Politics in Education. pp. 267-275.
- [24] UNESCO. (1999). *Project on training of non-formal, education personnel. National, workshop's in China, Lao PDR and Vietnam cum study visits undertaken by teams of Bhutan, Nepal and India*. UNESCO principle, regional office for Asia and the Pacific. Bangkok.
- [25] OECD. (2010). *Recognising Non-Formal and Informal Learning: outcomes, policies and practices*. The Organisation for Economic Co-operation and Development. Retrieved OECD database
- [26] Chana Kasipar, Mac Van Tien, Se-Yung LIM, Pham Le Phuong, Phung Quang Huy, Alexander Schnarr, Wu Quanquan, Xu Ying, Frank Bünning. (2010). *Linking Vocational Training with the Enterprises - Asian Perspectives*. Retrieved from http://www.unevoc.unesco.org/up/Link_Voc_End.pdf
- [27]

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Directory of Open Access Journals, Music: A Bibliometric Study

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Abstract- Nowadays, vast collection of electronic research journals is available on the internet. This fundamental growth of e-journals has led to the origin of DOAJ. The Directory of Open Access Journals is very comprehensive and covers a huge number of scholarly journals related to interdisciplinary subjects. The present paper is an attempt to study 44 journals of music. These journals were accessed through DOAJ. Readers can be benefitted due to the availability of summarized information of all free access music e-journals. All music journals are analyzed on the basis of their originating country, language and year of emergence.

Index Terms- E-Journals, DOAJ, Open Access, Music

I. INTRODUCTION

Open access publishing leads to wider dissemination of information and increased efficiency by providing free access to findings for the widest audience. "Shifting from ink on paper to digital text suddenly allows us to make perfect copies of our work. Shifting from isolated computers to a globe – spanning network of connected computers suddenly allows us to share perfect copies of our work with a worldwide audience at essentially no cost. About thirty years ago this kind of free global sharing became something new under the sun. Before that, it would have sounded like a quixotic dream. Digital technologies have created more than one revolution. Let's call this one the access revolution."1 Suber, Peter is of opinion that "Open-access (OA) literature is digital, online, free of charge, and free of most copyright and licensing restrictions. What makes it possible is the internet and the consent of the author or copyright-holder."2

Why it is said open? Simply because it is open to read, open to use and open to reuse. Access means this literature is easily accessible by the public and always accessible for processing. That's why open access is becoming the first choice of authors, researchers, librarians, institutions, funders, research assessment workers as well as knowledge transfer workers. Through open access the gap of digital divide can be easily bridged. In the present era of information and communication, every researcher and scholar must be able to access the rich collection of scientific literature. There are two primary vehicles for delivering OA to research articles: OA journals and OA archives or repositories. Open access journals are e-journals that are freely available. They mirror the quality assurance practices of conventional journals, such as editorial oversight, peer review and copy editing. "Open Access journals provide free access to

all articles and utilize a form of licensing that puts minimal restrictions on the use of articles."3

II. DIRECTORY OF OPEN ACCESS JOURNALS (DOAJ) : AN OVERVIEW

Directory of Open Access Journals (DOAJ) provides an extensive listing of open access journals that does not charge readers or their institutions for access. "The aim of the DOAJ is to increase the visibility and ease of use of open access scientific and scholarly journals, thereby promoting their increased usage and impact. The DOAJ aims to be comprehensive and cover all open access scientific and scholarly journals that use a quality control system to guarantee the content. In short, the DOAJ aims to be THE one stop shop for users of open access journals."4 "The Directory of Open Access Journal (DOAJ) is the world's most authoritative list of scholarly, peer reviewed, fully open access journals, and a "must" for libraries of all types. DOAJ is growing rapidly, at a rate of more than one title per calendar day. DOAJ's highly functional and aesthetically pleasing interface features a number of search options, including a new search option for authors looking for open access or hybrid journals to publish in." 5 DOAJ is not limited to particular languages or subject areas. According to DOAJ website, presently it includes 124 countries, 9988 journals, 5691 journals searchable at article level and total 1544323 articles for the readers. Undoubtedly these figures are bigger one.

III. OBJECTIVES OF THE PAPER

- To find out free e-journals offered by DOAJ in the subject of music.
- To find out the year of their origin and to provide the specific URLs of these journals.
- To know country wise distribution of e-journals
- To find out the language of each journal and to select the most favorite one.
- To list out the number of journals published in more than one languages.

IV. RESEARCH METHODOLOGY

The website of directory Open access Journals (<http://www.doaj.org>) is browsed for the present paper. Journals related to music were searched out. Total 44 journals of music were found under the main subject "Arts and Architecture". These 44 journals were analyzed on the basis of their country, the year of

their origin , the languages in which they are available and their subject headings.

V. ANALYSIS AND INTERPRETATIONS

Analysis of 44 music e-journals is presented in tabular form for easy understanding. All journals were analysed on the basis of different aspects like their country, languages , subject headings etc.

Identify the constructs of a Journal – Essentially a jo

Table 1 : List of free Journals of Music

Sr. No.	Title of the Journal	ISSN/E-ISSN No.	Publisher
1.	Act : Zeitschrift für Musik & Performance	2191253X	Universität Bayreuth
2.	Action, Criticism and Theory for Music Education	15454517	Southern Illinois University Edwardsville
3.	Anuario Musical	02113538 19884125	Consejo Superior de Investigaciones Científicas
4.	Approaches : Music Therapy & Special Music Education	17919622	Greek Asso.of Primary Music Education Teachers
5.	Critical Studies in Improvisation	17120624	University of Guelph
6.	Current Research in Jazz	19444877	Current Research in Jazz
7.	Dancecult : Journal of Electronic Dance Music Culture	19475403	Griffith University
8.	Empirical Musicology Review	15595749	Ohio State University Library
9.	Ethnomusicology Review	21644578	University of California (UCLA)
10.	Frankfurter Zeitschrift für Musikwissenschaft	1438857X	Universität Bern, Institut für Musikwissenschaft
11.	Hellenic Journal of Music, Education, and Culture	17922518	Greek Asso.of Primary Music Education Teachers
12.	Journal of Interdisciplinary Music Studies (JIMS)	13070401 13069055	Journal of Interdisciplinary Music Studies
13.	Journal of Jazz studies	21581401	State University of New Jersey
14.	Journal of Music and Meaning	16037170	University of Southern Denmark
15.	Journal of Music History Pedagogy	2155109X	Pedagogy Study Group of the American Musicological society
16.	Journal of Sonic Studies	22126252	Leiden University Press (LUP)
17.	Journal of the Society for Musicology in Ireland	16497341	Society for Musicology in Ireland
18.	Min-Ad : Israel Studies in Musicology Online	03342026	Min-Ad
19.	Music & Politics	19387687	University of California, Santa Barbara
20.	Music and Arts in Action	17547105	University of Exeter
21.	Music Performance Research	17559219	Royal Northern College of Music
22.	Music Theory Online	10673040	Society for Music Theory
23.	Musica Docta : Rivista Digitale di Pedagogia e Didattica della Musica	20399715	University of Bologna
24.	Musica e Tecnologia	19740042 19740050	Firenze University Press
25.	Musical Offerings	23308206 21673799	Cedarville University
26.	Muzikologija	14509814	Serbian Academy of Sciences and Arts
27.	Nota Bene : Canadian Undergraduate Journal of Musicology	19208979 19208987	University of Western Ontario
28.	Pacific Review of Ethnomusicology	10961291 21517045	University of California (UCLA)
29.	Per Musi	15177599	Escola de Música da UFMG
30.	Philomusica	18269001	Pavia University Press
31.	Popular Musicology Online	13570951	CyberStudia academic community
32.	Revista de la Lista Electrónica Europea de Música en la Educación	15759563	Universidad de La Rioja and Jesús Tejada
33.	Revista Electrónica Complutense de Investigación en Educación Musical	16987454	Universidad Complutense de Madrid
34.	Revista Musical Chilena	07162790 07176252	Universidad de Chile
35.	Samples : Notizen, Projekte und Kurzbeiträge zur Populärmusikforschung	16128001	Arbeitskreis Studium Populärer Musik
36.	Sonograma Magazine	19891938	Webdemusica.org
37.	SoundEffects	1904500X	Aarhus University
38.	South Central Music Bulletin	15452271	College Music Society - South Central Chapter
39.	STM-Online	14035715	Swedish Musicological Society
40.	Studii si Cercetari de Istoria Artei : Teatru, Muzică, Cinematografie	00393991 20675119	Romanian Academy
41.	Sul Ponticello	16976886	Conservatorio virtual

42. TRANS : Transcultural Music Review	16970101	Society of Ethnomusicology of Spain, (SIBE)
43. Voices: A World Forum for Music Therapy	15041611	University of Bergen. Antioch University
44. Zeitschrift für Kritische Musikpädagogik	16198301	Zeitschrift für Kritische Musikpädagogik

Table 1 provides information about all free open access online journals of music. The ISBN/ISSN and names of publishers are also given.

Table 2 : Yearwise distribution of E- Journals of Music

Sr. No.	Title of the Journal	Starting Year.	URL
1.	Act : Zeitschrift für Musik & Performance	2010	http://www.act.uni-bayreuth.de/index.html
2.	Action, Criticism and Theory for Music Education	2002	http:// act.maydaygroup.org
3.	Anuario Musical	2001	http://anuariomusical.revistas.csic.es
4.	Approaches : Music Therapy & Special Music Education	2009	http://approaches.primarymusic.gr
5.	Critical Studies in Improvisation	2004	http://www.criticalimprov.com
6.	Current Research in Jazz	2009	http://www.crj-online.org
7.	Dancecult : Journal of Electronic Dance Music Culture	2009	http://dj.dancecult.net/index.php/journal
8.	Empirical Musicology Review	2006	http://emusicology.org
9.	Ethnomusicology Review	2011	http://ethnomusicologyreview.ucla.edu/
10.	Frankfurter Zeitschrift für Musikwissenschaft	1998	http://www.fzwmw.de/
11.	Hellenic Journal of Music, Education, and Culture	2010	http://www.hejmec.eu
12.	Journal of Interdisciplinary Music Studies (JIMS)	2007	http://www.musicstudies.org
13.	Journal of Jazz studies	2011	http://jis.libraries.rutgers.edu
14.	Journal of Music and Meaning	2003	http://www.musicandmeaning.net/index.php
15.	Journal of Music History Pedagogy	2010	http://www.ams-net.org/ojs/index.php/jmhpf/
16.	Journal of Sonic Studies	2011	http://journal.sonicstudies.org/
17.	Journal of the Society for Musicology in Ireland	2005	http://www.music.ucc.ie/jsmi/index.php/jsmi
18.	Min-Ad : Israel Studies in Musicology Online	2002	http://www.biu.ac.il/hu/mu/min-ad/
19.	Music & Politics	2007	http://quod.lib.umich.edu/m/mp/
20.	Music and Arts in Action	2008	http://www.musicandartsinaction.net/
21.	Music Performance Research	2007	http://mpr-online.net
22.	Music Theory Online	1993	http://mto.societymusictheory.org/index.html
23.	Musica Docta : Rivista Digitale di Pedagogia	2011	http://musicadocta.cib.unibo.it/ e Didattica della Musica
24.	Musica e Tecnologia	2007	http://ejour-fup.unifi.it/index.php/mt/index
25.	Musical Offerings	2010	http://digitalcommons.cedarville.edu/musicalofferings
26.	Muzikologija	2002	http://www.doiserbia.nb.rs/journal.aspx
27.	Nota Bene : Canadian Undergraduate Journal of Musicology	2008	http://ir.lib.uwo.ca/notabene/
28.	Pacific Review of Ethnomusicology	1984	http://ethnomusicologyreview.ucla.edu/
29.	Per Musi	2010	http://www.scielo.br/scielo.php?
30.	Philomusica	2001	http://philomusica.unipv.it/
31.	Popular Musicology Online	2000	http://www.popular-musicology-online.com/
32.	Revista de la Lista Electrónica Europea de Música en la Educación	1998	http://musica.rediris.es/leeme/index.html
33.	Revista Electrónica Complutense de Investigación	2004	http://revistas.ucm.es/index.php/RECI en Educación Musical
34.	Revista Musical Chilena	1996	http://www.scielo.cl/scielo.php
35.	Samples : Notizen, Projekte und Kurzbeiträge zur Populärmusikforschung	2002	http://www.aspm-samples.de/
36.	Sonograma Magazine	2008	http://www.sonograma.org
37.	SoundEffects	2011	http://www.soundeffects.dk/
38.	South Central Music Bulletin	2002	http://www.scmb.us/
39.	STM-Online	1998	http://musikforskning.se/stmonline/index-en.php
40.	Studii si Cercetari de Istoria Artei : Teatru, Muzică, Cinematografie	2007	http://scia.istoria-artei.ro/
41.	Sul Ponticello	2004	http://www.sulponticello.com/
42.	TRANS : Transcultural Music Review	1995	http://www.sibetrans.com/trans/index.htm
43.	Voices: A World Forum for Music Therapy	2001	http://www.voices.no
44.	Zeitschrift für Kritische Musikpädagogik	2002	http://www.zfkm.org/

Table 2 shows the year of origin of the journals and their URLs. Users can use these URLs to easily access these journals. Earliest journal of this list came in the year 1984 and latest belongs to 2011. Maximum 6 journals were started in 2002 followed by 5 journals in 2007, 2010 and 2011.

Table 3 : Countrywise & Languagewise Distribution of E- Journals of Music

Sr. No.	Title of the Journal	Country.	Language
1.	Act : Zeitschrift für Musik & Performance	Germany	German , English
2.	Action, Criticism and Theory for Music Education	United States	English
3.	Anuario Musical	Spain	Spanish, English, French, German, Italian, Portuguese, Catalan
4.	Approaches : Music Therapy & Special Music Education	Greece	Greek, English
5.	Critical Studies in Improvisation	Canada	English, French
6.	Current Research in Jazz	United States	English
7.	Dancecult : Journal of Electronic Dance Music Culture	United States	English
8.	Empirical Musicology Review	United States	English
9.	Ethnomusicology Review	United States	English
10.	Frankfurter Zeitschrift für Musikwissenschaft	Switzerland	German, English
11.	Hellenic Journal of Music, Education, and Culture	Greece	English, Greek
12.	Journal of Interdisciplinary Music Studies (JIMS)	Turkey	English
13.	Journal of Jazz studies	United States	English
14.	Journal of Music and Meaning	Denmark	English
15.	Journal of Music History Pedagogy	United States	English
16.	Journal of Sonic Studies	Netherlands	English
17.	Journal of the Society for Musicology in Ireland	Ireland	English
18.	Min-Ad : Israel Studies in Musicology Online	Israel	English, Hebrew
19.	Music & Politics	United States	English
20.	Music and Arts in Action	United Kingdom	English
21.	Music Performance Research	United Kingdom	English
22.	Music Theory Online	United States	English
23.	Musica Docta : Rivista Digitale di Pedagogia e Didattica della Musica	Italy	Italian
24.	Musica e Tecnologia	Italy	Italian, English
25.	Musical Offerings	United States	English
26.	Muzikologija	Serbia	Serbian, German, English
27.	Nota Bene : Canadian Undergraduate Journal of Musicology	Canada	English
28.	Pacific Review of Ethnomusicology	United States	English
29.	Per Musi	Brazil	Portuguese, French, English, Spanish
30.	Philomusica	Italy	Italian, English, French German
31.	Popular Musicology Online	United Kingdom	English
32.	Revista de la Lista Electrónica Europea de Música en la Educación	Spain	Spanish, English, Portuguese, Italian
33.	Revista Electrónica Complutense de Investigación en Educación Musical	Spain	Spanish, English
34.	Revista Musical Chilena	Chile	Spanish
35.	Samples : Notizen, Projekte und Kurzbeiträge zur Populärmusikforschung	Germany	English, German
36.	Sonograma Magazine	Spain	Catalan, Spanish, English
37.	SoundEffects	Denmark	English
38.	South Central Music Bulletin	United States	English
39.	STM-Online	Sweden	English, Swedish, German
40.	Studii si Cercetari de Istoria Artei : Teatru, Muzică, Cinematografie	Romania	Romanian, French, English
41.	Sul Ponticello	Spain	Spanish
42.	TRANS : Transcultural Music Review	Spain	English, Italian, Spanish, Portuguese, French
43.	Voices: A World Forum for Music Therapy	Norway	English
44.	Zeitschrift für Kritische Musikpädagogik	Germany	German, English

Table 3 presents a picture of countrywise and languagewise distribution of e-journals . Some journals are published in more than one languages. Three tables are further created to analyse above table 3 further.

Table 3.1 : Analysis of Countrywise Distribution of E-Journals of Music

Sr. No.	Country	No. of E-Journals	Rank
1.	Germany	3	3
2.	United States	12	1
3.	Spain	6	2
4.	Greece	2	4
5.	Canada	2	4
6.	Switzerland	1	5
7.	Turkey	1	5
8.	Ireland	1	5
9.	Denmark	2	4
10.	Netherlands	1	5
11.	Israel	1	5
12.	United Kingdom	3	3
13.	Italy	3	3
14.	Serbia	1	5
15.	Brazil	1	5
16.	Chile	1	5
17.	Sweden	1	5
18.	Norway	1	5
19.	Romania	1	5

Table 3.2 : Analysis of language wise distribution of e-journals

Sr.No.	Language	No. of E-Journals	Rank
1	English	41	1
2	German	8	2
3	Spanish	8	2
4	French	6	3
5	Italian	6	3
6	Portuguese	4	4
7	Catalan	2	5
8	Greek	2	5
9	Hebrew	1	6
10	Serbian	1	6
11	Swedish	1	6
12	Romanian	1	6

Table 3.3 : Analysis of journals published in more than one languages

Sr. No	Language	No. of Journals
1	Single Language	25
2	Two Languages	10
3	Three Languages	4
4	More Than three Languages	5

Table 3.1 analyses the countrywise distribution of e-journals. As it is clear that by publishing 12 journals, United States occupies first rank and Spain stands on second position by publishing 6 journals. Table 3.2 clearly states that maximum journals are published in English language i.e. 41 out of 44 e-journals and 8 journals are published in German and Spanish each so their rank in the list is second. Table 3.3 is one step further analysis to check the number of journals published in more than one languages. The majority of journals i.e. 25 are published in single language .

Major findings of the study :

- It is observed that maximum 6 journals were started in the year 2002
- United States secures first rank in publishing with 12 journals.

- It is observed that maximum journals of music are published in English language.
- A majority of music e-journals are published in one language. Moreover, it is worth noting that five journals are published in more than three languages.

VI. CONCLUSION

DOAJ provides a gateway to scholars, researchers and professionals for wider communication of their research work. Free access leads to increased usage of scholarly work that is otherwise very difficult to refer. DOAJ lists a vast number of open access journals of almost all subjects for the benefit of users of e-community.

REFERENCES

- [1] http://archive.org/stream/9780262517638OpenAccess/9780262517638_Open_Access#page/n13/mode/2up accessed on 5.12.2013
- [2] <http://legacy.earlham.edu/~peters/fos/brief.htm> accessed on 5.12.2013
- [3] <http://digital-scholarship.org/cwb/OALibraries2.pdf> Open Access and Libraries By Charles W. Bailey, Jr. accessed on 3.12.2013
- [4] <http://www.doaj.org/doi?func=loadTemplate&template=about&uiLanguage=en> accessed on 3.12.2013
- [5] <https://circle.ubc.ca/handle/2429/871?show=full> accessed on 5.12.13
- [6] <http://www.act.uni-bayreuth.de/index.html>
- [7] <http://act.maydaygroup.org>
- [8] <http://anuariomusical.revistas.csic.es>
- [9] <http://approaches.primarymusic.gr>
- [10] <http://www.criticalimprov.com>
- [11] <http://www.crj-online.org>
- [12] <http://dj.dancecult.net/index.php/journal>
- [13] <http://emusicology.org>
- [14] <http://ethnomusicologyreview.ucla.edu/>
- [15] <http://www.fzmw.de/>
- [16] <http://www.hejmec.eu>
- [17] <http://www.musicstudies.org>
- [18] <http://jis.libraries.rutgers.edu>
- [19] <http://www.musicandmeaning.net/index.php>
- [20] <http://www.ams-net.org/ojs/index.php/jmh>
- [21] <http://journal.sonicstudies.org/>
- [22] <http://www.music.ucc.ie/jsmi/index.php/jsmi>
- [23] <http://www.biu.ac.il/hu/mu/min-ad/>
- [24] <http://quod.lib.umich.edu/m/mp/>
- [25] <http://www.musicandartsinaction.net/>
- [26] <http://mpr-online.net>
- [27] <http://mto.societymusictheory.org/index.html>
- [28] <http://digitalcommons.cedarville.edu/musicalofferings>

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Design of Triband Miniature Microstrip Antenna with Modified Resonating Structure using CADFEKO

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Abstract- In this paper, a Tri band linearly-polarized microstrip patch antenna is designed and simulated with Modified Resonating Structures using CADFEKO antenna simulation software from a dual band antenna. Antenna parameters are examined in this which includes resonating frequency, VSWR, impedances and bandwidth of the designed and proposed resonating structure with microstrip feed. The antenna is proposed for GPS/GSM, UMTS and Wi-Fi/WLAN wireless communication applications provided with greater bandwidth. This paper focuses on the designing of miniature microstrip antenna with microstrip feed and analyzes the results like return loss S_{11} , VSWR, impedance and Bandwidth.

Index Terms- Resonating Structure, Tri band, Microstrip Antenna, CADFEKO, Modified Structure Resonator.

I. INTRODUCTION

In the last few years, the development of GPS/GSM and Wi-Fi/WLAN represented one of the principal techniques in the information and wireless communication. As per the present situation in communication systems has been to develop low cost, low profile antennas, minimum weight commonly used dielectric materials that are capable of maintaining high performance over a wide spectrum of frequencies [1]. With a simple geometry, patch antennas offer many advantages not commonly exhibited in other antenna geometry. Advantages are low profile, inexpensive, lightweight and simple to manufacture using modern day printed circuit board technique, compatible with microwave and millimeter-wave integrated circuits (MMIC), and have the ability to conform to resonating structures[1]. In addition, once the shape or geometry and operating mode of the patch are confirmed, designs become very selective in terms of resonating frequency, return losses, polarization, radiation pattern, voltage standing wave ratio and impedance. That is possible with Microstrip antenna probably exceeds that of any other type of antenna element [1]. Using the Multi Band Resonator concept in this paper on Tri band modified Resonating Structure Microstrip antenna is designed and simulated. There are few software available which allow the optimization of the antenna. CADFEKO is one of the imperial electromagnetic software which allows to designing and solving for radio and microwave application. It works based on methods of moments (MOM). The CADFEKO simulator tool computes most of the useful parameters of interest such as radiation pattern, input impedance, return loss, VSWR, gain, directivity etc.

However, the difficulty in designing antenna challenges engineers when the size of the antenna reduces and the number of operating frequency bands increases. So far, for size reduction, bandwidth enhancement, and resonance-mode increment, numerous antennas have been proposed by employing various feed structures such as the probe, the microstrip, and the coplanar waveguide (CPW). In these monopole antennas, a large solid ground plane having the shape of a rectangle, square, circle, or ellipse is usually adopted [3,4]. Different from this, a notable ground structure named defected ground structure (DGS) has recently been investigated and found to be a simple and effective method to reduce the antenna size as well as excite additional resonance modes[1]. Designing of antenna in this paper is done by FEKO antenna software simulation, with the standard parameters and consideration like permittivity of $\epsilon_r=4.4$, microstrip feed, tangent loss of 0.01 and infinite ground plane.

II. DUALBAND RESONATING STRUCTURE MICROSTRIP ANTENNA

In order to realize multiband operation, there is a wide variety of antenna types, which uses different multiband techniques, is used. The most popular technique for obtaining multiband antenna system is the usage of multiple resonant structures. The multiple resonant structure technique is also frequently used in mobile communication systems to achieve multiband mobile antennas. The proposed antenna is miniature in size the overall dimension of the 16 mm X 3.2 mm in length and width with the thickness of 0.1 mm provides the one of the objective of this paper of compact size [2]. The resonating structure is at distance of 0.1 mm from the feed line which has modified structure of rectangular curl. Further in this paper, these curls are increased to one to two in number to achieve triband operations.

The design of a dual band single resonating structure microstrip antenna using microstrip feeding technique satisfying the given specifications:

Frequency(fr)	1.65 GHz and 3.64 GHz
Dielectric constant(ϵ_r)	4.4
Substrate Height(h)	1.5 mm
Line Impedance	50 Ω
Ground Plane	Infinite
Tangent Loss	0.01

As for the substrate selection, the major consideration will be the dielectric constant. A high dielectric constant will result in a smaller patch size but this will generally reduce bandwidth

efficiency and might have difficulty in fabricating a very small patch size antenna [1,4].

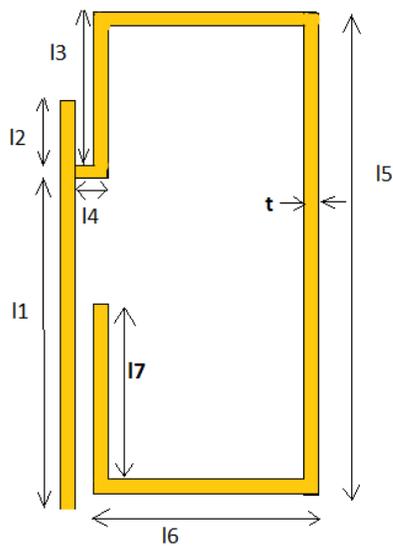


Figure 1 The configuration resonating structure

As shown in Figure.1, the proposed dimension of dual band resonating structure.

• **Patch Dimensions:**

- Length (L1) = 4.2 mm Length (L2) = 1.1 mm
- Length (L3) = 2.2 mm Length (L4) = 0.3 mm
- Length (L5) = 6 mm Length (L6) = 2.6 mm
- Length (L7) = 2.8 mm Thickness (t) = 0.1 mm
- $\epsilon_r = 4.4$ Tangent Loss = 0.01

• **Feed Line Dimensions:**

- Length = 11.575 mm
- Width = 0.45 mm
- Ground Plane: Infinite
- Feed: Microstrip port

With the above parameters, a microstrip patch antenna is designed and simulated for the range of 1 GHz to 5 GHz, which is commonly used for wireless communication systems [2].

III. TRIBAND RESONATING STRUCTURE MICROSTRIP ANTENNA

The configuration of proposed tri band antenna is the outer geometry specification kept same as for dual band but inner geometry is designed by keeping distance between outer and inner geometry as shown in Figure 2.

Frequency(fr)	1.57, 2.95 and 4.05 GHz
Dielectric constant(ϵ_r)	4.4
Substrate Height(h)	1.5 mm
Line Impedance	50 Ω
Ground Plane	Infinite
Tangent Loss	0.01

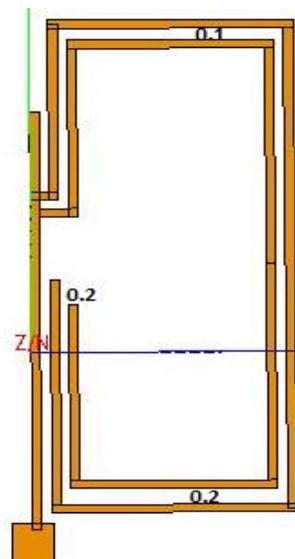


Figure 2 The configuration Tri band resonating structure

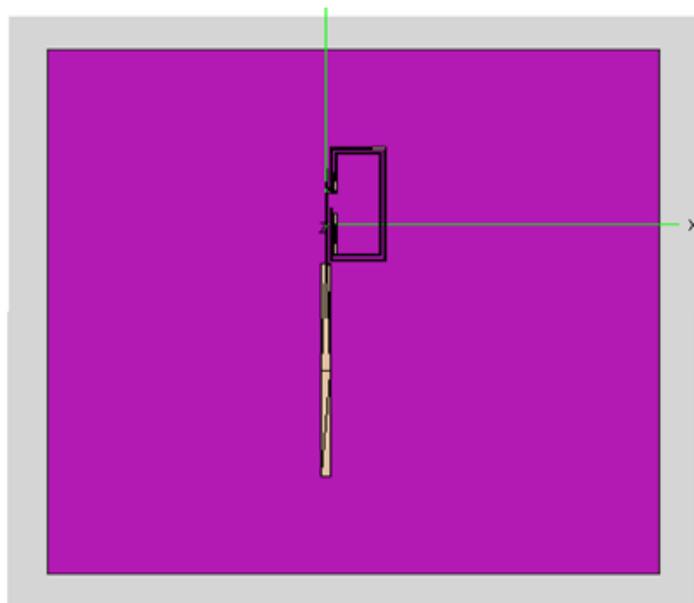


Figure 3 Triband resonating structure on CADFEKO Simulation Software

IV. SIMULATED RESULT AND DISCUSSION

The microstrip feed used is designed to have an inset depth of 11.575mm, feed-line width of 0.45 mm. A frequency range of 0.1-6.0 GHz is selected. CADFEKO simulated for approx 26 frequency points over this range to obtain approximate results. The center frequency is one at which the return loss is minimum. The bandwidth can be calculated from the return loss plot as shown in figures. The bandwidth of the antenna can be said to be those range of frequencies over which the return loss is greater than -10 dB (-9.5 dB corresponds to a VSWR of 2 which is an acceptable figure) [1,5]]. The designed antenna resonates at 1.65 GHz and 3.64 GHz. The return loss at 1.65 GHz frequency is -37 dB and at 3.64 GHz is -31 dB as shown in Figure 4.

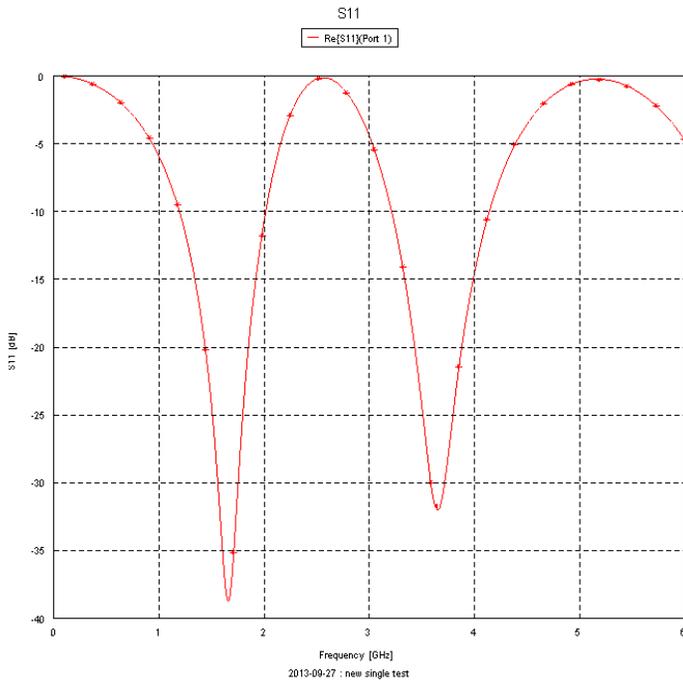


Figure 4 Return Loss of dual band antenna (S_{11} in dB).

The VSWR plot for single geometry antenna is shown in Figure 5. Ideally, VSWR must lie in the range of 1-2 which has been achieved for the frequencies 1.65 and 3.64 GHz. The value for VSWR is 1.6 and 1.1.

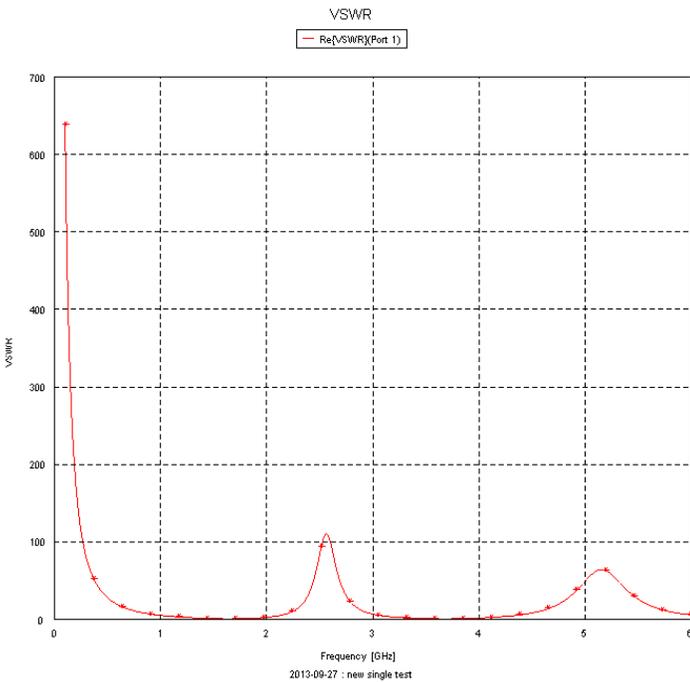


Figure 5. VSWR Versus Frequency Plot of dual band antenna

Figure 6 shows the S_{11} parameters (return loss) for the proposed triband antenna.

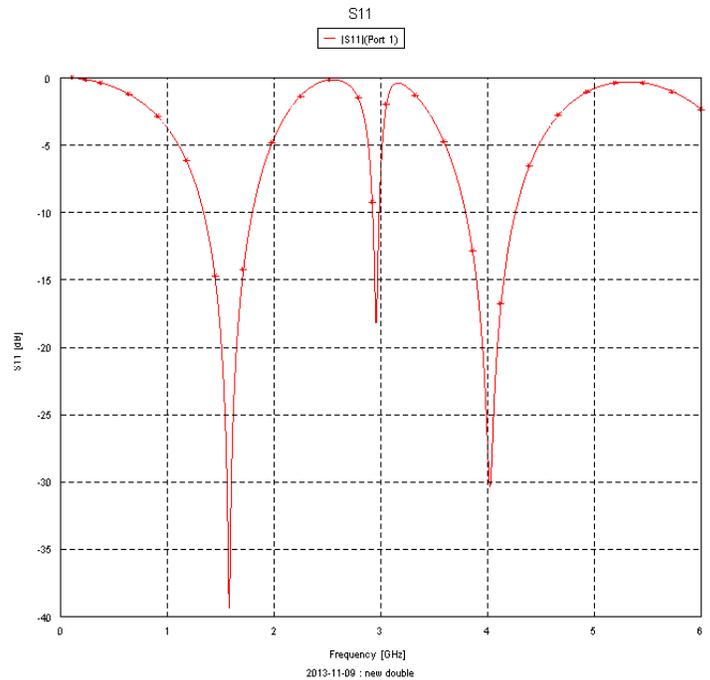


Figure 6 Return Loss of triband antenna (S_{11} in dB)

The designed antenna resonates at 1.57, 2.95 and 4.05 GHz. The return loss at 1.57 GHz frequency is -39 dB, at 2.95 GHz is -18 dB and at 4.05 GHz frequency is -30 dB. Ideally, VSWR must lie in the range of 1-2 which has been achieved for the frequencies 1.57, 2.95 and 4.05 GHz. The value for VSWR obtained is 1.6, 1.65 and 1.17. The impedance for double geometry antenna is obtained as 59, 57 and 52 Ohm for 1.57, 2.95 and 4.05 GHz.

The VSWR plot for double geometry antenna is shown in Figure 7. Ideally, VSWR must lie in the range of 1-2 which has been achieved for the frequencies 1.57, 2.95 and 4.05 GHz. The value for VSWR is 1.6, 1.65 and 1.17.

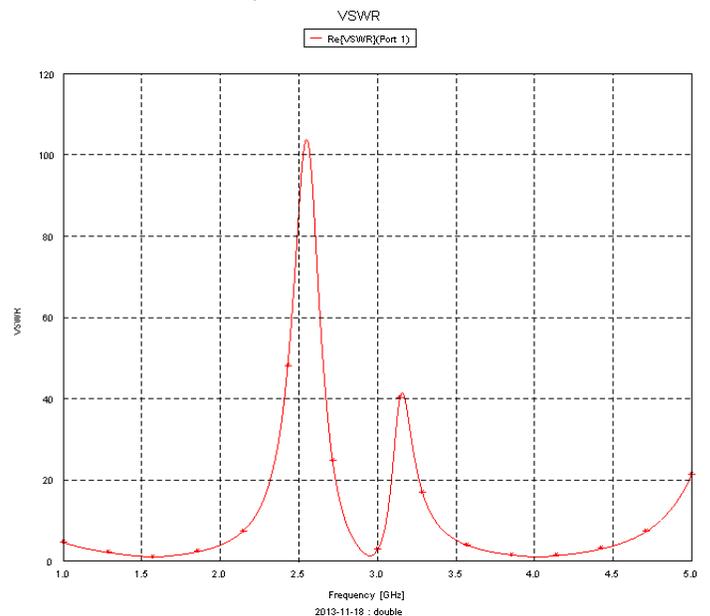


Figure 7 VSWR Versus Frequency Plot of Tri band antenna

Resonating Frequency (GHz)	Return Loss S_{11} (dB)	VSWR	Impedance (Ω)	Bandwidth (MHz)
1.57	-39	1.6	59	460
2.95	-18	1.65	57	80
4.05	-30	1.17	52	460

Table 1 Return Loss, VSWR and Impedance at Resonating frequencies for Triband Structure.

Table 1 shows the simulated results of return loss, VSWR and impedance. This miniature Tri band antenna has wide application in GSM, UMTS, Wi-Max and Wi-Fi/WLAN of wireless communication and clearly reflects that increase in number of resonating structures definitely increases the multiband but the center bands are having less bandwidth as compared to outer bands for the designed model. Outer bands are having bandwidth of 460 MHz whereas center band is having bandwidth of 80 MHz.

V. CONCLUSION

The purpose of this work is successfully completed as studied and designed the antenna using a modified resonating structure microstrip antenna. The simulated result of the return loss of the microstrip-fed Microstrip patch antenna yields Tri band. The radiation pattern is unidirectional pattern for all of operation bandwidth. The simulation gave results good enough to satisfy our requirements to fabricate it on hardware which can be used proposed wireless applications. The proposed work has been limited mostly to theoretical studies and simulations due to lack of fabrication facilities. Detailed experimental studies can be taken up at a later stage to design the multiband resonating structures antenna. Thus, antenna is proposed for GPS/GSM, UMTS and Wi-Fi/WLAN wireless communication applications provided with greater bandwidth.

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REFERENCES

- [1] C.A. Balanis, Antenna Theory, 2nd Ed., John Wiley & sons, pp 16-20., New York.1982.
- [2] Gaurav Morghare, Poonam Sinha, "Dual band optimized microstrip antenna with modified resonating structure using CADFEKO", International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE), Vol. 2, Issue 10, October 2013.
- [3] G. Du, X. Tang and F. Xiao, "Tri-Band Metamaterial –Inspired Monopole Antenna with modified S-Shaped Resonator", Progress In Electromagnetics Research Letters, Vol. 23, pp 39-48, 2011.
- [4] Jaemin An, Yuseon Kim, Hyunseong Pyo, Hyesun Lee, Yeongseog Lim, "Determining Resonant Frequencies of Single Dual-Mode Resonator and its Application", Proc. IEEE Antennas and Propagation, Vol. 10, pp 41-44, 2010.

- [5] Bin Yang, Yong-Chang Jiao, Wei Zhang, Huan-Huan Xie, Fu-Shun Zhang, "Dual-band ring-shaped antenna for WiMAX/WLAN applications", IEEE trans., Vol. 11, pp 42-44, 2011.
- [6] Wen-Chung Liu, Chao-Ming Wu, and Yang Dai, "Design of Triple-Frequency Microstrip-Fed Monopole Antenna Using Defected Ground Structure", vol.59, pp 7-12, July 2011.
- [7] Muhammad R. Khan, Mohamed M. Morsy, Muhammad Z.Khan and Frances J. Harackiewicz, "Miniaturized Multiband Planar Antenna for GSM, UMTS, WLAN, and WiMAX bands", IEEE tans.,Vol. 18, pp 63-68, 2011.
- [8] G. Jegan , A.Vimala juliet, G. Ashok kumar " Multi B and Microstrip Patch Antenna for Satellite Communication", IEEE tans., Vol 7, pp21- 26, 2011.
- [9] Aiza Mahyuni Mozi, Dayang Suhaida, Awang Damit and Zafirah Faiza, "Rectangular Spiral Microstrip Antenna for WLAN Application", IEEE Control and System Graduate Research Colloquium (ICSGRC 2012), Vol. 16, pp 35-39, 2012.

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The Challenge of Policy Formulation and Service Delivery in the 21st Century: “Improving customer service delivery” By E-governance

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Abstract- Governments of the countries around the world have started utilizing the potential of technology to deliver online information and services to their citizens. Using ICT in the form of e-governance could yield great benefits in the reform and modernization of the public sector. The experience of e-governance in a number of developed and developing countries has shown that ICT can be a tool for greater service delivery with the goal of improving service quality. E-governance can also promote ‘good govern-ance’, that is, greater civic engagement can increase opportunities for direct representation and voice, and support for increased democracy. This paper discusses and presents the survey findings that seek to test the role of e-governance in improving service delivery by altering the principal-agent relationship. It further seeks to elucidate the quality aspects of public service. Strong leadership is required to implement e-governance to capture and internalize the benefits of quality services and satisfied customers.

Questionnaires distributed to different groups of respondents using stratified random sampling. The results indicate that e-governance has the potential to improve service delivery and customer satisfaction. It is also confirmed through the findings in this research that the expectations of citizens from public services are quite high, but experience has often been negative i.e. there is a huge variance in the perception and expectation of normal citizens in the country regarding service delivery, quality of services. This has negatively affected customer satisfaction over the number of years. E-governance should be seen as a means of improving service quality in the future.

Index Terms- ICT, E-Governance, Public Service Delivery, Customer Satisfaction, Customer Service, Service Quality.

I. INTRODUCTION

The development of public administration not only contributes to the modernization of the public service but has also educated the public. Public expects the civil service to fulfill their needs in the best tune. Therefore, the quality of the services given by the public service, in all aspects, need to recognize the customers’ expectation. Realizing the important of improving the public service, our aimed to investigate the customer’s satisfaction towards service quality in the counter of the local authority. Even though the operation of each local authority followed the same operating procedures, but still the satisfaction rendered to the customers differ. With the intention of

understanding and assisting the state government to improve their services, we decided to focus our study in the district of Ahmadabad .The main objective of this study is to measure the quality of services provided at the counter. The dimensions concerning employees’ performance at the counter, layout plan and counter service quality were selected to be the predictor of the dependent variable which influences customer’s level of satisfaction. E-Governance provides access to information to empower citizens so they can make better life for themselves and for the next upcoming generation.

II. BACKGROUND

Despite a plethora of delivery mechanisms, most governments are increasingly perceived as unresponsive, with no covert accountability systems and mere lip service to transparency. It is by now an accepted fact that traditional government structures and systems are no longer adequate to meet the demands of rising citizen aspirations and challenges of complex global economies. The role of the government established and accepted earlier as the ‘Sole Provider’ is being questioned in every forum. The availability of constantly improving technological solutions coupled with innovative managerial tools have given rise to scope and options for improved administrative structures, efficient and effective public service delivery systems and the highest quality of governance. Governments and governance the world over are undergoing a ‘paradigm shift’ in their traditional roles and structures of inflexible control and procedure orientation, towards result orientation, flexibility, facilitation and a citizen-centric approach. Administrative reforms are not new to this country. Historically, from the days of Chandragupta Maurya and Chanakya, to Akbar, Jahangir and the British Raj, strong to feeble attempts have been made to reform the government. But most often these reforms were aimed at improving the government’s ability to control the inflow and outflow of revenue. The welfare orientation and the focus on development of backward areas and people are post-independence phenomena. Since the 1950s, the Government of India has been slowly but steadily climbing the ladder towards a citizen-centric focus on administrative reforms. Since the 1990s, it has been accepted at the national as well as state levels that there are three ‘non-negotiable ingredients’ for a government to be considered capable of delivering good governance. These ingredients are – responsiveness, transparency and accountability. However, when we look back at the reform initiatives in the Indian administration, it can be clearly seen that

these non-negotiable principles have only evolved of late through a process of experience gathering at all levels. It appears preposterous today that the R.A. Gopalswami Report of 1952 entitled 'Machinery of Government – Improvement of Efficiency' was treated as a confidential document! The year 1964 is important in the history of administrative reforms in India as the Department of Administrative Reforms under the Ministry of Home Affairs was setup in March that year. The 1970s were more or less uneventful in terms of earth-shaking reforms. The 1980s saw capacity-building as the focus for administrative reforms. The first time that a shift in the emphasis from regulation to development was placed on paper, was in the report of the L.K.Jha Economic Administrative Reforms. The announcement of the new economic policy in January 1990 led to stress on privatization, down-sizing and concentrating on cost-benefit outcomes of governmental functioning. The 1997 conference of chief ministers is a landmark development for commencing the shift towards attaining good governance across the centre and the states. The overall theme of the conference revolved around 'rebuilding the credibility of the government' by coming out with strategies for a responsive and effective administration. The sub-themes of the conference included – an accountable and citizen-friendly government, a transparent administration, and a performance-oriented public service with high levels of integrity. 'Responsiveness' to the needs of the poor and 'transparency' in the form of low cost access and two-way flow of information became the major concerns.

Citizen's Perception of the Government that there are no institutionalized standards for the delivery of public services. Therefore, there always appears to be an unending struggle between the governmental systems, its capability to deliver and the actual needs of the citizens. Going by the typical definition of democracy, i.e. 'a government of the people, for the people and by the people', democratic India certainly seems to have fulfilled the tenets of 'a government by the people'. Though having recognized the need to govern 'for the people', and place the common requirements and aspirations 'of the people' on the highest priority for service delivery, progressive governments have found that the governing process itself comes in the way of their attempts to establish a positive relationship with its citizens. For the citizens, any encounter with the government is a harrowing experience. Be it a visit to the police station for registering an FIR, or to the respective authorities for obtaining a permission/license/certificate, or a visit to the government hospitals or government educational institutions – the procedures are so lengthy and the number of officials and their attitudes so complicated that the citizen remains a dissatisfied and frustrated customer. The earlier governments performed well in the past but now with the dawning of the information age and the emerging knowledge regime, the citizen is no longer satisfied with services which can be delivered only by frequent visits to government offices, or standing for hours in long queues, or after time-consuming lengthy processes or with the evil but necessary associations with touts and middle men. The citizens want fast and efficient systems available at a single window which do not require them to know the faces and names of the bureaucratic structures, and which give them a 'nice feeling' about interacting with the government. From Government to e-Government to e-Governance/Government is the sum total of the systems by

which a state or community is governed . Therefore, e-government would necessarily mean the electronic systems adopted by any government for enabling transactions which aid in governing a state or a community. Not only are these two definitions dispassionate to the needs of the citizens on first appearance, but would indeed be practically incomplete if they were not associated with the major outcome of every such system i.e. governance. Government is the instrument we use'. On the basis of these concepts, it is simple now to realise that e-governance is not just the mere application of information and communication technology to government functioning. In fact, it goes much beyond stand-alone back office automation of government departments for generating management information systems. As per a typical definition, e-governance is 'the electronic delivery of services by the government to the citizens'. This really is a definition which is quite restrictive in scope, as it does not take into account aspects such as creation of data banks, tracking and monitoring systems, inter-linking of ministries and departments and related organizations etc. The government of India's definition of e-governance as 'using IT to bring about SMART (simple moral accountable responsive transparent) governance' appears more rounded and wider in scope but tends to dilute the boundaries between good governance and e-governance. In my view, all definitions of e-governance should be approached cautiously so as to ensure that it remains one of the most important items on the broader agenda of good governance practices and not an alternative term of usage for good governance. Further, it must be remembered that unlike in the nineties, more than administrative reforms leading to adoption of e-governance initiatives, today e-governance is driving the process of administrative reforms.

The Indian governments, at the national and state level, are keenly encouraging the development of IT as a strategy for responsive and transparent administration in all major domains. While initially, most e-governance efforts concentrated on data collection, data exhibition on web sites and facility for data downloading, there was almost negligible, if any, element of organisational transformation and change. Fortunately, it was quickly realized, that these efforts would come to zero, unless accompanied by transformation of mind sets, culture and processes in government organizations. Therefore, of late, most e-governance efforts inherently include business process re-engineering, aimed at generating citizen-centric and citizen interactive systems. Further, and once again very fortunately, the central and state governments also realized that unlike many development-oriented schemes which are replicated mutatis mutandis, across the board, the treatment for e-governance has to be different. The micro culture, the micro geography, the micro needs and the micro systems have to be taken into account. Each model of e-governance provides a learning ground for bringing about better and improved electronic solutions for delivery of services, provided it is replicated or adapted with care. Care has to be taken to understand at what stage we should introduce e-governance for ensuring effective service delivery.

III. COMMON SERVICES CENTERS (CSC)

CSCs, which are broadband-enabled computer facilities, offer a range of government-to-citizen and business-to-customer

services, besides promoting basic access to the Internet. Information management systems are designed to ensure that relevant information is available anywhere, anytime, and in any way for government-to-government (G2G), government-to-citizen (G2C), and government-to-business (G2B) interactions. The scheme creates a conducive environment for the private sector and NGOs to play an active role in implementation of the CSCs and to become partners of the government in the development of rural India. The public/private partnership model of the CSC scheme envisages a three-tier structure consisting of the CSC operator (called Village Level Entrepreneur or VLE); the Service Centre Agency (SCA), which is responsible for a division of 500-1000 CSCs; and a State Designated Agency (SDA), identified by the state government responsible for managing the implementation over the entire state. The CSCs are aimed at providing high-quality and cost-effective video, voice, and data content and services in the areas of e-governance, education, health, telemedicine, entertainment, and other private services. CSCs also offer web-enabled e-governance services in rural areas, including application forms, certificates, and utility payments such as electricity, telephone, and water bills. Like India, ICT driven e-governance applications making the citizens happier with timely and cost savings in availing services and improvement in the reliability of services. Special emphasis is needed in working out revenue models, ensuring the full implementations through appropriate tenure appointments of project champions, ensuring effective monitoring and maintenance of systems. It is important to understand the 'whys', 'which' and the 'how's' of public service delivery. It is very difficult to define this term. We do not have any comprehensive definition or understanding of what really is public service delivery. Briefly put, it is the inter-relationship between the government functionaries and the citizens to whom the services of the government are addressed to, and the manner in which the services reach those for whom they were intended. Any effective public service delivery mechanism must ultimately lead to good governance. The governments generally utilise one or the other of a variety of mechanisms for delivering services to the citizens. There is no limit to the scale of such composite applications. Once the structure is in place, governments can more easily get down to the business of public services.

Urban local bodies in India are the primary delivery mechanism for providing services to urban citizens in the areas of public health, education, tax collection, services & utilities like power, water, telecommunications, sanitation, solid waste disposal, land development, transportation, housing development and many other essential services. The typical urban local body consists of a council of elected members assisted by government bureaucrats. While the elected officials provide the political interface to the citizens, the bureaucrats handle the delivery mechanisms of the policies articulated by the elected civic bodies. Most urban local bodies in India have a poor understanding of and access to the enormous potential that information and communication technologies hold in improving the functioning of these organizations.

Many cities such as Bangalore have evolved unique public-Private Partnership models in which the urban local bodies, the citizens and enlightened corporate entities are working together to look at governance issues more holistically. The Bangalore

Agenda Task Force (BATF), which started off as a unique experiment in private public partnership in urban governance, has been successful in bringing together the various stakeholders consisting of municipal service providers, the city government, domain experts, nongovernment organizations and the citizens on a common platform to discuss urban development issues and evolve common governance guidelines. (BATF, 2005). In a non-ICT enabled urban local body the key processes adopted while serving the community are (i) making & administering policy, (ii) implementing policy for the welfare of citizens and society, (iii) controlling the activities, (iv) organizing for achieving the above.

Political Context

The political context of a nation influences the scope and type of interactions between government and other sections of society (civil society, media, business and citizens). Where citizens participate in the selection of political leadership and are able to influence government policies, the Citizen Report Card can offer a powerful mechanism for people to speak about their experience as the users of public services. When the means for citizens to voice their opinion (through elections, public meetings, and other ways) are less, or absent, political institutions and processes are rarely designed to use feedback from citizens.

- The CRC would be an unfamiliar mechanism. Governments would have to recognize the importance of citizen feedback. Citizens would have to become comfortable with openly providing feedback on government services. If the state is likely to block the CRC effort, involve government in the process. The CRC can be used as an internal diagnostic tool to evaluate service delivery. Although the advocacy or "public voice" component will be minimal, this application of the CRC can still create a new mechanism by which government listens to and incorporates the perspective of the people. The political system of a nation moulds the institutions and policies that govern society. It determines the degree of freedom enjoyed by average citizens. Improving Local Governance and Pro-Poor Service Delivery.

Decentralization

Many central/national governments have decentralized the responsibility of providing services. Although the aim of decentralization is to give more independence - both spending and policymaking — to local governments, the results have been mixed. In some places, decentralization has led to improved government services. In other places, decentralization has increased the misuse of funds and has failed to produce better quality services. Within the context of the CRC, understanding the impact of decentralization is important. Who is now responsible for service provision? Efforts to improve services should aim at these institutions.

Customer Service Delivery by e-Governance

It is important to understand the 'whys', 'which' and the 'how's' of customer service delivery. It is very difficult to define this term. I have not come across any comprehensive definition or understanding of what really is public service delivery. Briefly put, it is the inter-relationship between the government

functionaries and the citizens to whom the services of the government are addressed to, and the manner in which the services reach those for whom they were intended. Any effective public service delivery mechanism must ultimately lead to good governance. The governments generally utilise one or the other of a variety of mechanisms for delivering service the citizens such as Central Government Schemes, implementation of state-specific schemes, local self-government interventions, small-scale interventions of NGOs, special purpose vehicles such as DRDAs (District Rural Development Agency) and JNURM (Jawaharlal Nehru Urban Renewal Mission), contracting out or outsourcing to the private sector, fostering other partnerships etc. Despite this assortment of mechanisms, there is no substantive change in the perception of the government in the eyes of the beneficiaries towards whom these services are aimed at. Quality, selection, responsiveness and speed seem to have been overtaken by the concept that competition can be decided on the basis of 'best price' alone. We need to begin somewhere. To go about this process, we need to ask ourselves certain basic questions about public service delivery such as it exists today:

- what do we want to deliver
- how do we want to deliver it
- why do we want to deliver it in the manner in which we are doing right now
- is there an alternative mode of delivery

1. Identify all the services.
2. Identify the modes of service delivery
3. Identify the category of beneficiaries such as individual citizens, miscellaneous as well as uniform groups, gender groups, age-related categorisation, organisations, institutions etc.
4. Prioritise the services which are most in demand and also prioritise the categories of beneficiaries. This has to be done with the complete involvement of all the stakeholders including the intended beneficiary. This process should also include identifying the areas of harassment to the beneficiaries.
5. Look at, and analyse the 'as is' status and process. Check each level, analyse the kind, mode and speed of delivery, identify points of delay, of corruption etc.
6. Identify all resources that are available and also all the resources which are being utilised to maintain 'as is' status i.e. man (power), money (funds), machine (equipment and logistics), motivation (of employees) etc.
7. Identify the wasteful aspects and/or the gaps in operationalising delivery of services, transporting or communicating within the organization and outside to complete the processes, levels and kinds of inspection and monitoring, and areas/points of delay.
8. Innovate and adapt This is where we need to think out of the box, take care of the gaps and focus on citizens needs. By adopting the GPR or CPI process, we need to actively improve and/or re-engineer processes to reduce delays, keep time commitments, provide accessibility at several locations, fix and standardise responsibility of the service providers and service users, focus on accuracy, provide for grievance redressal, take care of augmenting the skill and training level of government functionaries, etc.

This is the stage where e-governance should make its entry. If there is any attempt to introduce IT for delivery of services before this stage, then it can be an initio termed a failure. Every department has its own system (which are perpetrated by an inherent resistance to change) of dealing with the citizens. But de facto, a citizen does not live his life within the different water-tight compartments of different departments. He is neither aware nor interested in the functional segregations of departments, which in any case are meant for the government's convenience. He expects the government to look at his own convenience in a manner that enables all his life's events to be taken care off at a single window. If a citizen was asked to design his very own government there would be no queues, no multiple visits, no under the table deals, no loss of time and income for him! The future of e-governance lies in integrating and designing the delivery of all services required during the life time of a citizen, in such a manner that the G2C interface becomes seamless, cutting across all boundaries. The government functionaries would become faceless and nameless in such a system, and the movement would not be of 'files', but a flow of information in a smooth and user-friendly manner. This of course demands commitment, standardisation, change in mind sets and capacity-building of the human resources, organisational transformation, quick uptake of new and better technological and managerial tools, and participation of the community.

IV. SOME STATE-LEVEL INITIATIVES FOR PUBLIC SERVICE DELIVERY: THE CASE OF GUJARAT

It is not a very well-publicised fact that the state of Gujarat perhaps has one the largest OFC networks in the Asia Pacific region. The Gujarat StateWide Area Network is a state-of-the-art system which caters to the internal and external communication services of the administration, and is fully equipped with voice, video and data technology services. All these services are IT-based with its leased line gateway at the state capital which also hosts the server farm. Some important e-governance initiatives of Gujarat which have impacted in a positive manner on the efficacy of the public service delivery are mentioned below.

1. SWAGAT (State-Wide Attention on Public Grievances by Application of Technology)

On a single day each month, applicants from across the state submit their long-standing grievances online from the district headquarters to the Chief Minister's Office. The Chief Minister on the same day directly interacts with the applicants and the district administration through video conference and attempts to resolve the grievances on the spot. Since the inception of the initiative in October–November 2003 up to December 2004, out of a total of 8621 long-pending complaints, 7660 were resolved. From January 2005 to December 2006, the initiative received 10,911 complaints/applications of which 10,109 were disposed on the spot. This is an initiative which is entirely based on GPR.

2. E-GRAM

This project envisages taking IT to all the 18,000 villages of Gujarat, for the delivery of public services. The eight services to be delivered under this initiative are standardised and include a single-window delivery of birth certificates, death certificates, income certificate, caste certificate, tax collection, agriculturist certificate, payment of electricity dues, entry in record of rights

and issue of land ownership records. This programme is running successfully in over 13,000 gram panchayats today and it is intended to complete the implementation in all the 18,500 villages by the end of this year. Governance at the doorstep is a major development through BPR and CPI. Following is the progress chart.

3. The Jan Sewa Kendras

These are citizen facilitation centres spread over all the 25 district headquarters of the state as well as all the 225 taluka headquarters. They are run by the revenue administration headed by the collector and district magistrate in each district. The 75 services provided by the Jan Sewa Kendras are also standardised and the focus here is on the citizen's charters. The services in the citizen's charters are categorised into two categories depending on the time for disposal. These are: the 'one-day governance services' (which are services delivered within one hour on the same day as the application) and 'time limit disposal' of services in which the services are delivered as per the commitment of time made under the citizen's charters. Processes have been re-engineered to ensure that time limits are maintained. There is complete transparency in the provision of services as the citizens are kept informed of the whole system of processing of applications. The one-day governance services are functional in all the Jan Sewa Kendras. The entire 75 services or the citizen's charter online is also successfully running in all the 25 districts, based on the successful pilot model of Ahmedabad District. This model has been replicated in all the districts with standardised processes, logo, signage, etc for all the Jan Sewa Kendras. The Ahmedabad district alone processed over 90,000 applications in the year of initiation(2004) of its Jan Sewa Kendra!. In 2005–2006, 5.1 lakh applications were processed in the various JSKs of the state.

4 . Mahiti Shakti

This project was taken up as a pilot in 80 villages in Godhra District and its success has motivated the government to replicate it. This initiative provides easy availability of information relating to the government and also makes available standardised application forms of various departments of the governments at information kiosks spread over the rural areas. The innovative aspect of the scheme includes the fact that these kiosks have been setup at varied locations including dairy co-operatives, district co-operative banks and STD/PCO booths in partnership. The forms can also be sent online to the concerned departments therefore saving time, cost and energy of the rural citizens. IWDMS (Integrated Work Flow and Document Management Systems) This is an initiative taken by the state secretariat for enabling decisionmaking, policy formulation, correspondence and data management, tracking of documents and inter-operability, and standardisation of procedures across various departments of the state government. A private agency has already been selected for customising the software and this initiative has been made functional in all the 25 departments of the Sachivalaya. The above is just an illustrative list of e-initiatives taken by the Government of Gujarat. There are several others such as the sales tax department online, talim rojgar, tele fariyad or the Chief Minister's call center, e-Dhara (land records online), form book online and GR (government resolutions)

online, treasury network, etc. The e-dhara initiative has made available approximately 98 lakh land holdings online, across the length and breadth of the state, covering a population of 1 crore and 16 lakhs. The videoconferencing facilities provided in jails for online trials have helped the state government save almost Rs.80 lakhs per jail, per year! Now about 2000 of the citizen's facilitation centres have GSWAN connectivity (of which 1000 are in the rural areas, 225 in the taluka/block headquarters and 350 in police stations). The State Disaster Resource Network is constantly updated and is an important tool in the hands of the district administration for managing disasters. The system of internet-based disease surveillance by the Health Department is necessarily updated on a daily basis to enable quick response. The list of initiatives is very long but the focus of all e-governance efforts in Gujarat is to provide for active user interface and committed standards for delivery of services and also to enable citizens to have easy access to information about public services. The Final Analysis There is already enough that has been said or written about e-initiatives and lot of work is being done to sensitise the governments to the need for transparency, accountability and responsiveness through e governance . Though it has become an accepted mechanism for delivery of public services, each time governments undertake the daunting task of rising to the expectations of the citizens ,the questions of 'how', 'where', 'when', 'for whom', etc will arise. There is no doubt in our minds that there is a need to speedup the reforms process, and that this can only be done by focusing on the main pillar of globalisation i.e. information. Over the last 10 to 15 years we, as customers, are demanding better and better products and services. We expect products to be customised to our unique needs and there is no doubt now that customers have choice. The only thing that comes in the way of exercising this choice is the lack of accessibility and availability of information. The first bastion, i.e. the monopoly of the government over information and knowledge has already fallen with the enactment of the Right to Information Act in 2005. Information about laws, policies, decisions, modes of public service delivery, etc will soon be commonplace. If the Act is rightfully implemented in accordance with its spirit, the days of harrowing tracking of grievances by the citizens should soon be of historical importance only. It would be the government's turn to keep track of information needs and to take action to make it more and more citizen-centric. To develop information as a resource capable of bringing the citizen closer to the government in a typical G2C interface, it becomes important to evolve all e-governance initiatives around the citizen's needs. The key building blocks for such a focused e-governance programme for public service delivery, in my view, must have some of the following components.

- Leadership should be provided from higher levels of government for initiating and implementing pilots. But once a pilot has been found successful, the replication should become the responsibility of the state government.

- There must be empowered e-government coordinators at various levels. They should be available, at district level, state level and at the centre, persons with experience and vision who have the power to take decisions on the kind, quality, standards, strategy, replica-ability, etc of e-governance projects within a given overall framework.

- A strong framework for e-governance and for its overall management at the central level, which goes down till the last mile with inbuilt scope for flexible adaptation at the local level.
- A criteria for defining 'success' of a project, so that it can be taken up for replication, and a system for sharing best practices at the state level, nationally and globally.
- A legal framework at the central and the state level
- Inter-operability framework
- Information security policy and practice
- Outsourcing policy
- Commitment to innovation

V. ADDRESSING THE CHALLENGES

There are three key challenges in stepping up e-governance in India: investments in and access to ICTs, capacity building to utilize e-governance services, and promoting people's participation in edemocracy. It is hoped that improved access to information and services will provide economic and social development opportunities, facilitate participation and communication in policy and decisionmaking processes, and promote the empowerment of the marginalized groups.

The United Nations Conference on Trade and Development (UNCTAD) has credited India with a projected economic growth of 8.1% – the fastest rate of expansion in the world after China. Nevertheless, it is also a country of stark contrasts. India is home to the largest rural-urban disparities in the world. It is a painful reality that almost 260 million people (around 25% of the total population) live below the poverty line. The 2010 United Nations Human Development Report ranked India's development index at 119 out of 169 countries.

India is beleaguered by a host of crises: the failure to improve productivity in agriculture; over a quarter million suicides among farmers from 1995 to 2010; high maternal and infant mortality rates; low status of women; gross violation of the rights of children, with the largest number of child laborers (around 100 million) in the world; spiraling corruption and scams of every hue and kind; an era of jobless economic growth; the shadow of hunger that increasingly stalks people across the country, resulting in substantial poverty and starvation deaths; and the neglect of the disadvantaged and marginalized masses. There are fundamental questions of utilizing development funds on a priority basis for education and basic needs which have a direct effect on people's lives, rather than incurring huge spending on ICTs for e-governance that will trickle benefits down to them.

In an article in Economic Times entitled 'Development lessons of the 90s', the author, Shri D. Subbarao states that 'a variety of approaches to growth are possible, and what approach a country needs to take has to be routed in the specific country context. What has worked for one country may not work for another, and following the best practice is not always the right choice. There is no unique set of rules for growth. The focus has to be on accumulation of human and physical capital, efficient allocation of resources, adoption of technology and sharing of the benefits of the growths'. Taking off from here, the challenges before governance in terms of policy, organisational structures, laws and rules and the work culture itself can only be resolved by recognising information also as a resource (in addition to human,

financial, and physical resources) which is essential for growth and for attaining the goal of good governance. Capturing data at one common source is perhaps a long way off in our country, but that is where we need to head lock, stock and barrel! As an example of multiple efforts, we have the case of the postal directory which is prepared with painstaking details by the Postal Department. At the same time, while trying to enlist voters, the same efforts are duplicated to locate addresses and voters attached to those addresses by the election machinery. The census survey is not far behind. Then we have BPL surveys, Polio surveys, cable TV surveys... imagine it and voila... we have yet another survey! There are innumerable such examples. What stops us from linking the census survey every 10 years with the survey for the multi-purpose National Identity Card and get it updated every decade? Why cannot birth and death registers be automatically linked to the voters list? Why cannot, say, a rural woman simply walk into an information kiosk and decide for herself which scheme of which department for which she is eligible, she would like to apply for? Why cannot this choice be known to all the departments at the same time, so that duplication of benefits from similar schemes of different departments to the same beneficiary is prevented and at the same time the citizens get empowered to make their own choices? Why cannot we issue caste certificates along with the birth certificates? I can see only one way forward for this. There has to be one single nodal agency for implementing e-governance in the country which is empowered to formulate the overall framework for all the state governments and the central government departments – somewhat on the lines of the various poverty alleviation schemes of the Ministry of Rural Development (MORD). The implementation process of these rural development (RD) schemes in the States such as the SJSY, NREGS, etc follow central government guidelines but are permitted the flexibility of local innovations leading to smooth adaptation in a given common framework. We have tried it out and it is acknowledged the world-over that it has worked. Therefore, I cannot help drawing further smiles from the RD schemes here. These schemes invariably have an IEC (information, education, and communication) component inbuilt as a percentage of the budgetary allocations. The harbingers of these schemes must have been true ICT and e-governance visionaries, though unacknowledged as such, so far. The problem is that this component is mostly interpreted as a provision for distributing pamphlets or calling for immensely large and sometimes unmanageable gatherings of rural folk and addressing them (unilaterally of course, with no scope for two-way discussions) on the benefits of various government schemes. In my view, the guidelines on the utilisation of this component must strictly indicate a certain degree of progress in e-governance (such as digitising data, process re-engineering, increasing accessibility of information to the citizens, etc) completely based on local innovation/adaptation and local technology availability, before the next amount is released. I would go further and suggest that in fact, all project funding, whether from central or state governments must be tied up to a compulsory component of IT and e-governance on similar lines. While concluding, I would once again like to reiterate that, the profound realisation of the rapidly changing role of the state from an interventionist, regulator and control freak to a facilitator, promoter, partner and

arbiter has led to increasing concerns about profitability, performance and ethics. The main players i.e. the service providers and policy makers will have to focus on the citizens, particularly the poorest of the poor. They will also have to involve the stakeholders, build capacities of the employees, encourage attitudinal shifts, be data driven in decision-making and cautiously adapt best practices. In the final analysis, if the end result of all the administrative reforms for efficient service delivery, whether through e-governance or any other good governance practice, is the empowerment of citizens, then the battle is won. We are not waiting to achieve a 'government on demand', but a government 'designed' by you and me.

VI. IMPROVING CUSTOMER SERVICE DELIVERY BY TECHNOLOGIES

There's no denying the fact that customer service is important to a small or mid-sized business. The quality of that service will either enhance or degrade customer loyalty to your brand and your business. With the economy in recession, customers have more alternatives than ever. The business that proves to be responsive to customer questions, complaints, or other needs can gain a clear competitive advantage. That's why it's so important to understand how new technologies can help you anticipate customer needs, tailor business processes to best serve customers, and ultimately improve the efficiency of your business – the latter of which can keep costs down.

Customer Service Technology

There are a few major areas in which technology now is able to help provide key advantages to businesses in engendering customer loyalty by improving customer service:

- Websites. Providing areas on your website where customers can answer their own questions or seek answers from others.
- E-mail. Using e-mail as a way to improve customer service and more quickly respond to certain needs or help requests.
- Communications. Unifying communications so that you know that the customer who left a voice mail also sent an e-mail with the same request a few days ago.
- Software. Better managing customer relationships with more sophisticated data-gathering tools, such as customer relationship management software.

Giving Customers What They Want, When They Want It

The goal of your business in terms of its customer interactions is the generate loyalty. There's no better way to do that than to offer quality products and services and to be responsive to your customers. But as new technologies have come to market to make it easier for businesses to provide customer service, they may also be increasing the number of channels through which you interact with customers and the complexity of those interactions. Accenture, the technology consulting firm, suggests that businesses that want to use technology to raise the quality of their customer service focus on the following:

- Data management and analytics. Using data collected from customer to analyze their preferences.
- Insight-driven marketing. Gaining insights into your business from customer data so you can more effectively target marketing.
- Marketing automation. Streamlining and automating business processes to improve efficiency and keep costs low.
- Self-service optimization. Finding ways for customers to interact with your business when they want.
- Workforce effectiveness. Encouraging your staff to embrace new ways improving customer treatment by providing tools and training to deliver better service.

REFERENCES

- [1] <http://www.indiaurbanportal.in/reforms/local/e-governance.pdf>
- [2] <http://egov.eletsonline.com/2008/08/e-governance-in-urban-local-bodies/>
- [3] J. Service Science & Management, 2009, 3: 190-203 doi:10.4236/jssm.2009.23023 Published Online September 2009 (www.SciRP.org/journal/jssm)
- [4] <http://www1.worldbank.org/publicsector/Apresentacao.pdf>
- [5] http://www.ecdevjournal.com/index.php?option=com_content&task=view&id=255&Itemid=51
- [6] <http://www.egovernments.org/files/casestudies/municipal-egovernance%20systems%20for%20local%20bodies.pdf>
- [7] <http://books.google.co.in/books?id=yoBKVBJCavoC&printsec=frontcover&dq=books+for+improving+customer+service+delivery+by+e-governance&hl=en&sa=X&ei=z2QOUv33H4qKrgeXsIHACg&ved=0CE0Q6AEwBA#v=onepage&q&f=false> (Book - improving public service delivery: by peter c. Humphreys-CPMR Discussion paper-1998 addition)
- [8] <http://books.google.co.in/books?id=5tzi-PxSF4cC&printsec=frontcover&dq=books+for+improving+customer+service+delivery+by+e-governance&hl=en&sa=X&ei=z2QOUv33H4qKrgeXsIHACg&ved=0CFcQ6AEwBg#v=onepage&q&f=false> (book-E governance and the decentralization of service delivery by Virpi Timonen,Orla O'Donnell – CPMR Discussion paper, 25 – 2003 addition)
- [9] The Economic Times (News Papers)

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Effects of Demography, politics, competition & environment on business

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Abstract- Business has to fight for every dollar when times get tight and the economy slows to a halt. On top of all of this, they also have to make sure all their figures are right, comply with all the laws, and follow guidelines to properly maintain a legal business. Doing all of these tasks can be difficult but are manageable if a small business takes the right paths, makes the right decisions, and works hard enough. Small businesses have many barriers but with many hurdles overcome these business can succeed. Although business competition is exceedingly harmful to businesses themselves, we should all be glad that we as consumers can reap the benefits. Monitoring, understanding and adapting to the political environment is absolutely essential for any business, because it significantly affects every business.

Index Terms- Business, Economy, Environment

I. INTRODUCTION

Future being uncertain, all business activities involve many types of impact or risk. Environment also affects a business. There may be loss of assets due to fire, flood, storm, earthquake, cyclone, etc. There are personal risk due to accident, death, loss of goodwill or earning power, deterioration of health, etc. Environment plays a different role in business. There are different types of environmental factor which effects business.

RESEARCH ELABORATIONS

II. DEMOGRAPHICAL EFFECTS ON BUSINESS

- POPULATION
- LITERACY
- URBANISATION
- AGE STRUCTURE
- CULTURE
- GEOGRAPHIC REGION
- INCOME

The Statistical data relating to the populations and groups within it, used especially in the identification of consumer markets. It can be a very general science that can be applied to any kind of dynamic living population, i.e., one that changes over time or space.

Demography studies how populations changes overtime, in terms of size and structure.

III. GOVT. & ECONOMIC INFLUENCES ON BUSINESS

The health of the local and national economy, as well as the state of the international financial system, influences businesses of all sizes. **But the economy is not the only external influence on business, as governments can enact legislation that may dramatically impact a company's profit margins and the way in which it manages its employees.** Therefore, the business world must take into consideration economic realities, as well as possible interventionist policies on the part of the government.

IV. POLITICAL EFFECTS ON BUSINESS

- CHANGES IN REGULATION
- MITIGATION OF RISK
- INTERNATIONAL AGREEMENT
- FISCAL POLICY
- GOVERNMENT AND ECONOMIC INFLUENCES
- CRISIS TAXATION
- LABOUR LEGISLATION

The political environment in a country affects business organizations and could introduce a risk factor that could cause them to suffer a loss. The political environment could change as a result of the actions and policies of governments at all levels, from the local level to the federal level. **Businesses need to be prepared to deal with the fallouts of government politics.**

Politics and business are interrelated, as one of the most important success factors for a government is its economic policy. **Economic growth and the development of a stable, competitive environment for businesses is a top priority for local and national administrations.** However, political decisions, such as **trade bans or state monopoly on certain fields of the economy, can have serious effects on the world of business.**

V. ENVIRONMENTAL EFFECTS ON BUSINESS

- WASTE
- SUSTAINABLE DEVELOPMENT OF RAW MATERIALS
- EMISSIONS
- ENVIRONMENTAL RISKS TO BUSINESS
- CLIMATE
- FREQUENT EXTREME WEATHER
- DECREASED DEMANDS
- GLOBAL IMPACT

VI. RESULTS

Reduced gap in literacy rate between urban and rural areas – more informed and brand conscious consumer market opening up in rural areas.

More flexible labour markets, higher rates of female labour force participation, **more highly educated women, more open attitudes about women working and less illiteracy .**

Better infrastructure leading to more internal migration.

Higher **rate of migration is directly proportional to higher employment** , higher disposable income, bigger consumer market.

Rapid rise in the ratio of “working age” to “non-working age” population contributing to extremely fast economic growth.

India will add roughly 9 million people to its labour force each year over the next decade.

A company's products and services are more likely to appeal to certain age groups. **Younger people under 35 are often the first consumers to purchase high-tech products like cell phones, electronic books and video games.**

Environmental laws and good environmental citizenship prohibit the indiscriminate dumping of manufacturing by product, so businesses must decide how best to dispense with it. Many implement recycling programs, others sell what they can of the waste to other manufacturers who use it in their own manufacturing processes as raw material.

VII. CONCLUSION

People with lower incomes have less disposable income.

A company may best reach lower-income people through discount retailers and wholesalers and attract higher-income buyers in specialty retail shops.

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Fungal-bacterial Biofilms Differ from Bacterial Monocultures in Seed Germination and Indole acetic acid Production

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Abstract- Beneficial microorganisms used as biofertilizers enhance seed germination and vigour through breaking seed dormancy and hormonal effects. However, their higher production of hormones like indole acetic acid (IAA) result low seed germination. Therefore, they need a regulation of the IAA production for increased plant growth. Such control exists in developed fungal-bacterial biofilms (FBBs), fungal surface-attached bacterial communities. Therefore, present study compares two FBBs and their seven bacterial monoculture counterparts for IAA production and seed germination with maize as the test plant. Results showed that two biofilms increased seed germination and vigour significantly compared to the monocultures whereas, relatively low IAA concentrations, which were comparable with lower limit of the monocultures. IAA production of monocultures was related negatively to seedling vigour, confirming that relatively low IAA concentrations are more favorable for seed germination. Thus, results suggested a regulatory mechanism for optimizing IAA concentration, and/or factors other than IAA for plant growth benefits in the case of biofilms. In conclusion, it is clear that the FBBs differ from bacterial monocultures in regulating improved seed germination and plant growth. Consequently, FBBs warrant formulating biofertilizers in the biofilm mode for futuristic agriculture.

Index Terms- Bacteria, Fungal-bacterial biofilms, Indole acetic acid, Seed germination

I. INTRODUCTION

There is an increasing trend of application of naturally existing beneficial microorganisms as biofertilizers to reduce the use of CF in current agriculture. Nitrogen fixing bacteria, phosphorus solubilizing bacteria and fungi are some of them. They naturally inhabit in the rhizosphere and are called plant growth promoting rhizobacteria (PGPR) which belong to a wide range of genera. They ensure plant growth and development through different modes of actions such as biological nitrogen fixation (Afsal and Bano 2008; Cocking et al. 2005) and mobilization of plant unavailable nutrients, i.e. phosphorus, potassium and other minerals (Alikhani et al. 2006). In addition, production of plant growth regulators including IAA, Gibberellins and cytokinins has been observed to lead to diverse outcomes on the plant, varying from phytostimulation to pathogen suppression (Spaepen et al., 2007).

Biofertilizers mediated increase of seed germination has been reported in crops such as rice (Ng et al. 2012), maize (Nezarat and Gholami 2009) and soybean (Sreenivasa et al. 2009). In addition, their influence on enhanced seedling vigour (Vessey 2003; Ashrafuzzaman et al. 2009; Ng et al. 2012) and early seedling establishment (Noel et al. 1996; Khalid et al. 2004) have also been noted and ascribed the production of plant growth regulators. For example, rapid seed germination of *Dianthus caryophyllus* has been observed to be caused by the production of plant growth regulators like IAA, which overcomes seed dormancy (Roychowdhury 2012). The effect of IAA produced by *Azospirillum brasilense* and *Brayrhizobium japonicum* on increased growth of corn and soybean has been reported (Cassán et al. 2009). Further, the role of IAA produced by *Klebsiella* strains and fluorescent *Pseudomonas* on root growth of wheat (Sachdev et al. 2009) and groundnut (Jayasudha et al. 2010), respectively has been demonstrated. In many studies, it has been found that monoculture bacteria release a wide range of concentrations of IAA, but only relatively low concentrations of IAA favour the germination as well as the growth of radicles and plumules (Chauhan et al. 2009; Jayasudha et al. 2010; Swain et al. 2007). Thus, using these monocultures with high IAA producing capacity as biofertilizers results the low seed germination and reduced plant growth (Jayasudha et al. 2010) consequences low agricultural significance. This warrants the importance of optimizing the IAA concentration of biofertilizers for maximizing growth benefits to plants. Previously, we observed that there was a regulation of the production of IAA like substances in fungal-bacterial biofilms (FBBs), which was related to culture medium pH, whereas no such relationship occurred in monocultures or mixed cultures of bacteria with no biofilm formation (Seneviratne et al. 2008). As such, when bacteria are in biofilms, it seems that there is a possibility of manipulating IAA production at optimum level for higher plant growth benefits for effective formulations of biofertilizers. Therefore, present study was designed to investigate the action of developed biofilms in comparison to their bacterial monocultures in IAA production for seed germination and vigour, by using maize as the test plant.

II. IDENTIFY, RESEARCH AND COLLECT IDEA

Microbial cultures of nitrogen fixing bacteria and their biofilms. The study was carried out at laboratories of the Institute of Fundamental Studies (IFS), Kandy, Sri Lanka. Two developed FBBs (BF1 and BF2) of nitrogen fixing bacteria (Seneviratne et al. 2011) and the bacterial monocultures, which have been deposited in the IFS culture collection, were used in the study. The BF1 contained an *Aspergillus* sp. (*Aspergillus* sp. 1) and two N₂ fixing bacteria [*Azorhizobium* sp. (B1) and gram negative rod (B2)]. The BF2 contained another *Aspergillus* sp. (*Aspergillus* sp. 2) and *Acetobactor* sp. (B3), *Azotobactor* sp. (B4), *Azospirillum* sp. (B5), *Rhizobium* sp. (B6) and another gram negative rod (B7), in addition to the two N₂ fixers in the BF1. These two FBBs have been extensively tested and recommended for maize cultivation (Buddhika et al. 2012 a, b). Fungal monocultures alone were not used for the comparison, because a number of our previous experiments with their inoculation have shown significantly reduced seed germination of maize below 14%, in comparison to the control of no inoculation of over 25% (U.V.A. Buddhika, unpublished). This is because fungal species inhibit seed germination due to competition with plant embryo for available oxygen (Harper and Lynch 1981).

Seed germination test (Seed sterilization and microbial inoculation). Maize seed material used was hybrid variety Pacific, which is recommended by the Department of Agriculture, Sri Lanka. Seeds were surface sterilized with 80% ethanol for 3 minutes and then with 50% sodium hypochlorite for 15 minutes, and rinsed thoroughly in sterilized distilled water (Niranjan et al. 2003). All cultures (FBBs and bacterial monocultures) were grown in a low cost nutrient medium (exact composition cannot be revealed due to Intellectual Property Right reasons). Seeds were inoculated by overnight soaking with suspensions of bacteria (10⁸ cfu/ml) and FBBs (10¹⁰ cfu/ml). Seeds soaked in sterilized distilled water were used as the control. Seven bacterial monocultures and the two biofilms were considered as treatments for the study. Germination test was carried out by wet paper towel method by placing them on a filter paper wetted by sterilized distilled water (Niranjan et al. 2003). Each treatment had 45 seeds in a plastic tray and incubated in a growth chamber at 28 °C. After 7 days, number of germinated seeds was counted, and root and shoot lengths were measured for calculating vigour index using the following formula.

Vigour index = (mean root length + mean shoot length) × percentage germination (Abdul-Baki and Anderson 1973).

Quantification of the production of Indole Acetic acid (IAA) like substances. Microbial IAA production was quantified by the method of Patten and Glick (2002). All seven bacterial species and the two biofilms were grown in 75 mL of Tris-YMRT medium for seven days as described by Biswas et al (2000). After 7 days, the cultures were centrifuged at 6000 rpm for 20 minutes. Then, 1 mL of supernatant was transferred into another tube and mixed with 4 ml of Salkovski reagent (150 ml of concentrated H₂SO₄, 250 mL of distilled water, 7.5 mL of 0.5M FeCl₃.6H₂O, Gordon and Webber 1951) and incubated at room temperature for 30 minutes. The presence of IAA like substances was detected by pink color, which was measured by using a UV-spectrophotometer at 535 nm.

III. RESULTS AND DISCUSSION

A. Bits and Pieces together

Seed germination percentages of the bacterial monocultures were not significantly different ($P > 0.05$), and hence the germination data were pooled to form one dataset. Both FBBs significantly increased seed germination over the bacterial monocultures ($P < 0.05$, Table 1). Seed germination percentages close or equal to 100% were recorded by the FBBs, whereas the monocultures showed a relatively low germination percentage. Seeds inoculated with FBBs showed higher root lengths than the seeds inoculated with bacterial monocultures, whereas no such a difference was found in shoot length (Fig. 1). In general, root growth is attributable to the action of IAA (Sachdev et al. 2009; Jayasudha et al. 2010). Significantly higher seedling vigour was observed with the FBBs treatments than the bacterial monoculture treatments ($P < 0.05$, Fig. 2). It is evident from comparisons with literatures that the developed biofilms in the present study are more effective in seedling development than monocultures of microbes tested in some other studies. For example in Iran, out of seven microbes, *Azospirillum brasiliensis* showed the highest seedling vigour index of maize of 138% over a non treated control (Nezarat and Gholami 2009). In our study, the biofilms BF1 and BF2 increased the vigour index of maize up to 844% and 620%, respectively over the non treated control. Generally, a wide range of growth regulators produced by mono or mixed cultures of rhizobacteria enhances seed germination and vigour (Nezarat and Gholami 2009). Microbial combinations with different metabolic capacities go over the effects of monoculture inoculants making a series of phyto-effective metabolites (Höflich et al. 1994).

Results showed a wide range of IAA concentrations of the monoculture bacteria (Fig. 3), because IAA producing capacity of different bacteria varies naturally (Yasmin et al. 2009). All bacterial monocultures, except B1 and B2, showed significantly high IAA concentrations over the two biofilms ($P < 0.05$). Further, the IAA production of the monoculture bacteria was related negatively to seedling vigour index that showed a reducing trend of seedling vigor with relatively high IAA concentrations ($P < 0.05$, Fig. 4). This relationship was previously observed by Chaudhry (2005). It has also been demonstrated that relatively low IAA concentrations are important in increasing the growth of the root and shoots of some plants, e.g. *Dianthus caryophyllus* (Roychowdhury et al. 2012). Further, Swain et al (2007) have reported that a gradual increase of IAA tends to reduce seed germination after a critical value, because relatively low IAA concentrations are important in inducing enzymatic activities that leads for the favorable conditions for breaking seed dormancy. Going beyond that, present results showed same monoculture bacteria were formulated as biofilms, their IAA production was maintained at a relatively lower level. This is because, individuals in a microbial biofilm have a coordinated

response through QS to regulate biological functions including the production of organic compounds such as exoenzymes, biosurfactants, antibiotics and exopolysaccharides (West et al., 2007). Molecular mechanisms underline the genetic regulation of biofilms for cell to cell communication via QS enables the whole microbial community to make a coordinated response (Kolter and Greenberg, 2006; Lazdunski, 2004) for optimum production (West et al., 2007). Therefore, results suggested that the optimized IAA production of developed biofilms through a regulatory mechanism to maximize seed germination. Seneviratne et al (2008) have also observed such a regulation of the IAA production in developed biofilms.

However, Comparable IAA concentrations of the bacterial monocultures B1 and B2, with two biofilms (Fig. 3) showed different vigour indices, the biofilms depicting higher values than the monocultures (Figs. 2 and 4). This implies that there are factors other than IAA have been led for increased seedling vigour in the case of biofilms. Thus, developed biofilms can be suggested as a natural biological formulation to increasing maize seedling vigor through the creation of favorable environment required for breaking seed dormancy which is not yet understood fully in the application of biofertilizers. However, contribution of developed FBBs in making such environment for higher seedling vigor was confirmed by the increasing availability of diverse organic compounds (Herath et al. 2013) They observed a wide range of beneficial biochemical exudates in a developed FBB in comparison to its bacterial monocultures. In support to this, interactions among microbes for diverse release of organic compounds were observed by Saini et al (1986) and De Boer et al (2005), which cannot be seen in planktonic forms of them due to lack of coordinated biological functions. In conclusion, it is clear that the FBBs differ from bacterial monocultures in regulating maximum seedling vigor and IAA production, concerning their agricultural significance. This improved performance with the application of FBBs warrants formulating biofertilizers in the biofilm mode for futuristic agriculture. Different biofertilizers with higher IAA production which is negatively affected seedling vigor, but with any other agricultural significance can be formulated as biofilms in this manner to contribute their biological functions for plant growth benefit in agriculture. Further studies are however necessary for evaluating this with other crop plants.

B. Use of Simulation software

Normality of the data and constancy of residuals were confirmed. The data were subjected to one way analysis of variance (ANOVA) and means were compared using Dunnett's test at 5% probability level for comparing biofilm treatments with other treatments. Seed germination data of the monoculture bacteria, which were not significantly different, were pooled to form one source of data. Seed germination percentages were compared using χ^2 test. Relationship between IAA concentrations of all bacterial monocultures and their vigour indices was constructed by using linear regression analysis. All statistical analyses were performed using MINITAB 14 software.

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REFERENCES

- [1] A. A. Abdul-Baki. and J. D. Anderson. 1973. Vigor determination in soy bean seed by multiple criteria. *Crop Sci.* 13: 630-633.
- [2] A . Afsal . and A . Bano. 2008. Rhizobium and phosphate solubilizing in wheat (*Triticum aestivum*). bacteria improve the yield and phosphorus uptake. *Int. J. Agric. Biol.* 10: 85-88.
- [3] H. A. Alikhani., N. Saleh-Rastin and H. Antoun. 2006. Phosphate solubilization activity of Rhizobia native to Iranian soils. *Plant Soil*, 287: 35-41.
- [4] M. Ashrafuzzaman , F. A. Hossen, I. M. Razi, H. M. Anamul, I. M. Zahurul, S. M. Shahidullah and M. Sariah. 2009. Efficiency of plant growth- promoting rhizobacteria (PGPR) for the enhancement of rice growth. *Afr. J. Biotechnol.* 8: 1247-1252.
- [5] J. C. Biswas ., J. K. Ladha, F. B. Dazzo, Y. G. Yanni and B. G. Rolf. 2000. Rhizobial inoculation influences seedling vigor and yield of rice. *Agron. J.* 92: 880-886.
- [6] U. V. A. Buddhika., G. Seneviratne and C. L. Abayasekara 2012a. Biofilmed biofertilizers for sustaining maize cultivation. Available from <http://brightice.org/biotechnology> 2012.
- [7] U. V. A. Buddhika., G. Seneviratne and C. L. Abayasekara 2012b. Biofilmed biofertilizers for maize (*Zea mays*L.): effect of plant growth under reduced doses of chemical fertilizers, P. 8. In: Nimalathasan B., A. Ramanan, K. Thabotharan (eds). Jaffna University International Research Conference-2012, Jaffna, Sri Lanka.
- [8] F. D. Cassán, Perrig, V. Sgroy, O. Masciarelli, C. Penna and V. Luna. 2009. *Azospirillum brasilense* Az39 and *Bradyrhizobium japonicum* E109, inoculated singly or in combination, promote seed germination and early seedling growth in corn (*Zea mays* L.) and soybean (*Glycine max* L.). *Eu.r J. Soil Biol.* 45: 28-35.
- [9] E. C. Cocking., P.J. Stone and M.R. Davey. 2005. Symbiosome-like intracellular colonization of cereals and other crop plants by nitrogen-fixing bacteria for reduced inputs of synthetic nitrogen fertilizers. *Chin. Acad. Sci.* 48: 888-96.
- [10] N. Chaudhry. 2005. Morphogenetic effects of IAA and HgCl₂ on the seedlings of *Pisum Sataivum* L. *Pak . J. Biol. Sci.* 8: 1643-1648.
- [11] J. S. Chauhan., Y.K. Tomar, I.N. Singh, S. Ali and A. Debarati. 2009. Effect of growth hormones on seed germination and seedling growth of black gram and horse gram. *J. Am. Sci.* 5: 79-84.
- [12] W. De Boer., L.B. Folman and R.C. Summerbell. 2005. Living in a fungal world, impact of fungi on soil bacterial niche development. *FEMS Microbiol. Rev.* 29: 795-811.
- [13] S. A. Gordon. and R.P. Webber. 1951. Colorimetric estimation of indole acetic acid. *Plant Physiol.* 26: 192-195.
- [14] S. H. T. Harper. and J.M. Lynch. 1981. Effects of fungi on barley seed germination. *J. Gen. Microbiol.* 122: 55-60.

- [15] H. M. L. I. Herath., D.M.N. Senanayake, G. Seneviratne and D.C. Bandara. 2013. Variation of biochemical expressions of developed fungal-bacterial biofilms over their monocultures and its effect on plant growth. *Trop. Agric. Res.* 24: 186 – 192.
- [16] G. Höflich., W. Wiehe and G. Kühn. 1994. Plant growth stimulation with symbiotic and associative rhizosphere microorganisms. *Experientia* 50: 897-905.
- [17] T. Jayasudha ., R. Rangeshwaran and N.V. Vajid. 2010. Relationship between indole acetic acid production by fluorescent *Pseudomonas* and plant growth promotion. *J. Biol. Control* 24: 349-359.
- [18] A. Khalid., M. Arshad and Z.A. Zahir. 2004. Screening plant growth promoting rhizobacteria for improving growth and yield of wheat. *J Appl Microbiol* 46: 473-480.
- [19] R. Kolter. and E.P. Greenberg. 2006. The superficial life of microbes. *Nature* 441: 300–302.
- [20] A. M. Lazdunski., I. Ventre and J.N. Sturgis. 2004. Regulatory circuits and communication in gram-negative bacteria. *Nat. Rev. Microbiol.* 2: 581–92.
- [21] S. Nezarat. and A. Gholami. 2009. Screening plant growth promoting rhizobacteria for improving seed germination, seedling growth and yield of maize. *Pak. J. Biol. Sci.* 12: 26-32.
- [22] L. C. Ng., M. Sariah, O. Sariam, O. Radziah and M.A.Z. Abidin. 2012. Rice seed bacterization for promoting germination and seedling growth under aerobic cultivation system. *Aust J Crop Sci*, 6: 170-175.
- [23] S. R. Niranjana., S.A. Deepak, P. Basavaraju, H.S. Shetty, M.S. Reddy and J.W. Kloepper. 2003. Comparative performance of formulations of plant growth promoting rhizobacteria in growth promotion and suppression of downy mildew in pearl millet. *Crop Prot.* 22: 579-588.
- [24] T. C. Noel., C. Sheng, C. Yost, R. Pharis and M. Hynes. 1996. *Rhizobium leguminosarum* as a plant growth promoting rhizobacterium: direct growth promotion of canola and lettuce. *Can. J. Microbiol.* 42: 279-283.
- [25] C. L. Patten. and B.R. Glick. 2002. Regulation of indole acetic acid production in *Pseudomonas putida* GR12-2 by tryptophan and the stationary-phase sigma factor. *RpoS Can. J. Microbiol.* 48: 635–642.
- [26] R. Roychowdhury., A. Mangain, S. Ray and J. Tah. 2012. Effect of gibberellic acid, kinetin and indole 3-acetic acid on seed germination performance of *Dianthus caryophyllus* (Carnation). *Agric. Conspec. Sci.* 77: 157-160.
- [27] D. P. Sachdev., H.G. Chaudhari, V.M. Kasture, D.D. Dhavale and B.A. Chopade. 2009. Isolation and characterization of indole acetic acid (IAA) producing *Klebsiella pneumoniae* strains from rhizosphere of wheat (*Triticum aestivum*) and their effect on plant growth. *Indian J. Exp. Biol.* 47: 993-1000.
- [28] H. S. Saini., P.K. Bassi, E.D. Consolacion and M.S. Spencer. 1986. Interactions among plant hormones, carbon dioxide, and light in the relief of thermo inhibition of lettuce seed germination, studies in a flow-through gaseous system. *Can. J. Bot.* 64: 2322-2326.
- [29] G. Seneviratne., L.K. Mihaly and I.R. Kennedy. 2008. Biofilmed biofertilizers: novel inoculants for efficient nutrient use in plants. Proceeding of a project (SMCN/2002/073). workshop held in Honai, Vietnam, 12-13 October 2007. ACIAR proceedings Canberra, Australia.
- [30] G. Seneviratne., A.P.D.A. Jayasekara, M.S.D.L. De Silva and U.P. Abeysekera. 2011. Developed microbial biofilms can restore deteriorated conventional agricultural soils. *Soil Biol. Biochem.* 43: 1059-1062.
- [31] S. Spaepen ., J. Vanderleyden and R. Remans. 2007. Indole-3-acetic acid in microbial and microorganism-plant signaling. *FEMS Microbiol. Rev.* 31: 425-448.
- [32] M. N. Sreenivasa., N. Naik and S.N. Bhat. 2009. Beejamrutha: A source for beneficial bacteria. *Karnataka. J. Agric. Sci.* 22: 1038-1040.
- [33] M. R. Swain., S.K. Naskar and R.C. Ray. 2007. Indole-3-acetic Acid and effect of sprouting of yam (*Dioscorea rotundata* L.) Minisets by *Bacillus subtilis* isolated from culturable cowdong microflora. *Pol J. Microbiol.* 56: 103-110.
- [34] J. K. Vessey. 2003. Plant growth promoting rhizobacteria as biofertilisers. *Plant Soil* 255: 571-586.
- [35] S. A. West., S.P. Diggle, A. Buckling, A. Gardner and A.S. Griffin. 2007. The social lives of microbes. *Annu Rev Ecol Evol Syst* 38: 53-77.
- [36] F. Yasmin., R. Othman, K. Sijam and M.S. Saad. 2009. Characterization of beneficial properties of plant growth promoting rhizobacteria isolated from sweet potato rhizosphere. *Afr Microbiol Res* 3: 815-821.

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Results:

Tables

Table 1: Germination percentages of maize seeds under the treatments of fungal-bacterial biofilms (BF1 and BF2) and bacteria monocultures. Data of bacterial monocultures were pooled, since they were not significantly different at 5% probability level.

Treatment	Germination (%)
BF1	98 a ± 2
BF2	100 a ± 0
Bacterial monocultures	92 b ± 2

Control	29 c ± 10
Germination ± SE	

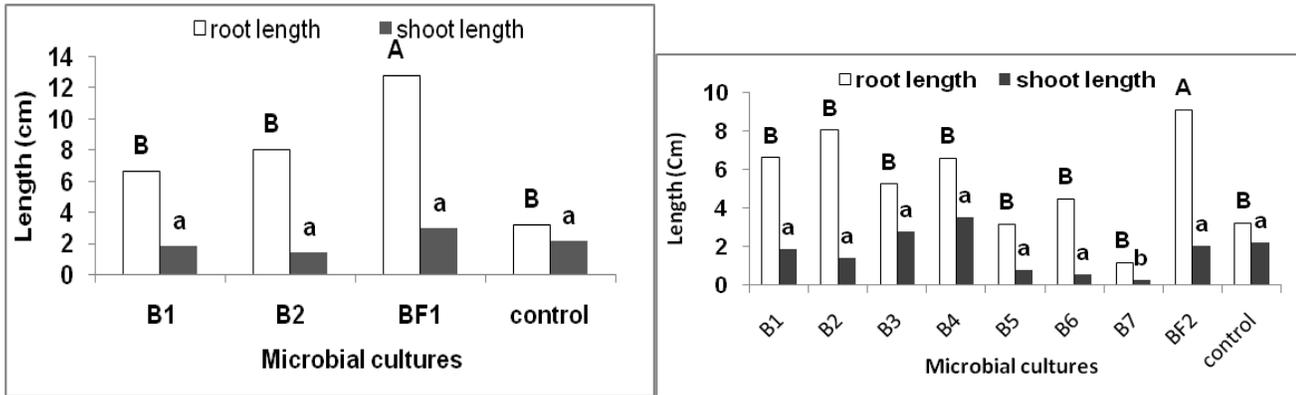


Figure 1: Effects of fungal-bacterial biofilms (BF1 and BF2) and bacterial monocultures (B1, B2, B3, B4, B5, B6, B7) on shoot and root lengths of maize. Columns with different letters are significantly different at 5% probability level, according to Dunnet's mean comparison test, which compares fungal-bacterial biofilms with it's bacterial monocultures.

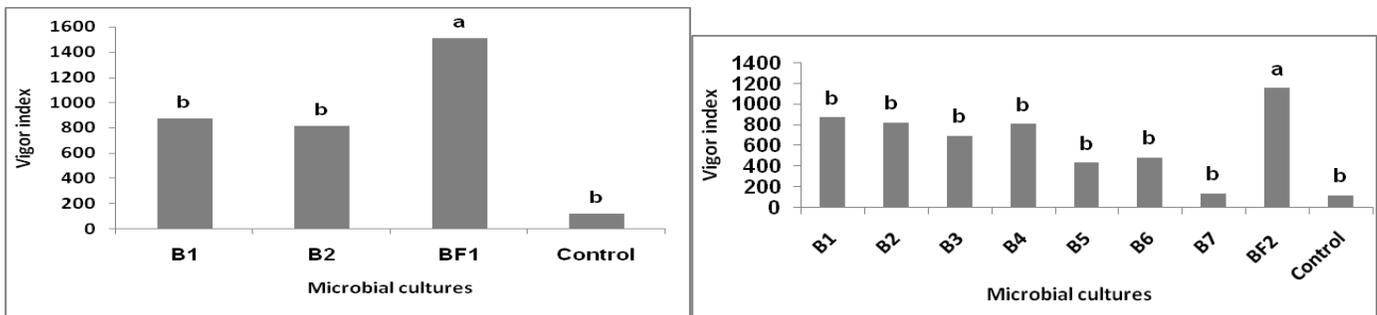


Figure 2: Effect of fungal-bacterial biofilms (BF1 and BF2) and bacterial monocultures (B1, B2, B3, B4, B5, B6, B7) on vigor index of maize. Columns with different letters are significantly different at 5% probability level, according to Dunnet's mean comparison test, which compares fungal-bacterial biofilms with it's bacterial monocultures.

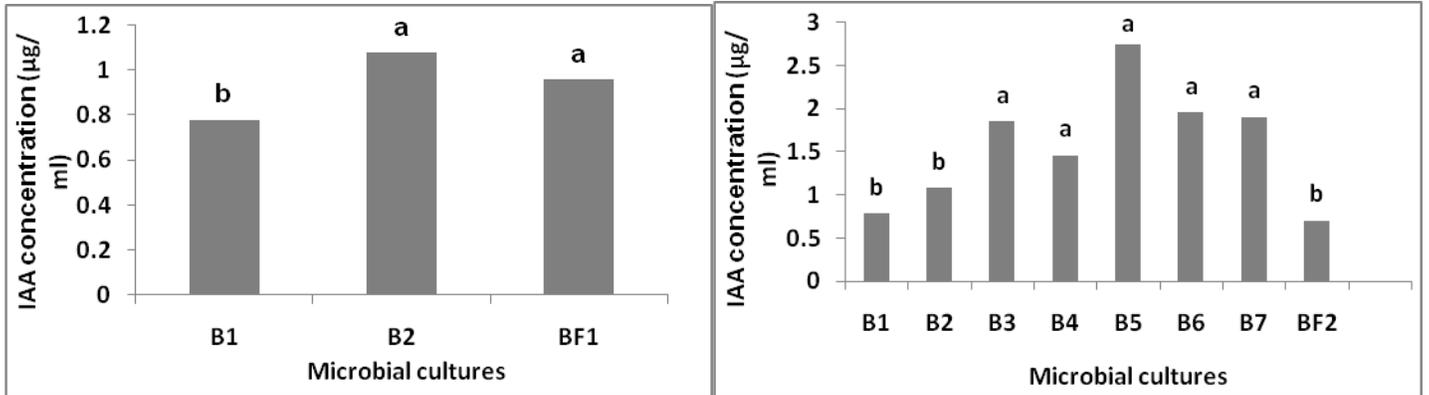


Figure 3: Indole acetic acid (IAA) production of fungal-bacterial biofilms (BF1 and BF2) and bacterial monocultures (B1, B2, B3, B4, B5, B6, B7). Columns with different letters are significantly different at 5% probability level, according to Dunnet's mean comparison test, which compares fungal-bacterial biofilms with it's bacterial monocultures.

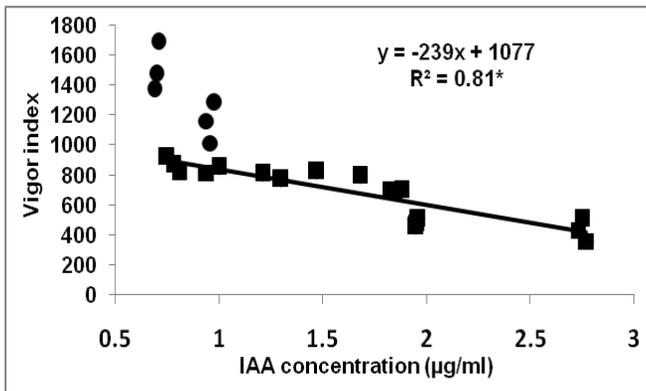


Figure4: Relationship between microbial Indole acetic acid (IAA) production and seedling vigor (bacterial monocultures, fungal-bacterial biofilms).

A Study on the Role of Sacred Groves in Conserving the Genetic Diversity of the Rare, Endangered and Threatened Species of Flora & Fauna of Chhattisgarh State (India)

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Abstract- Despite of extensive deforestation and land use changes in India, one of the most resilient features of the country's landscape is the temple or sacred forests. Because of their 'divine' protection, a number of tree species that have otherwise been heavily extracted from the forests continue to exist in the groves. However in recent years with the erosion of religious faith and encroachment of these sacred groves, there is a growing concern if the groves indeed can offer a refugium to the endemic and endangered species of the Chhattisgarh state. In this context, we examined the population genetic structure and genetic diversity of Chhattisgarh state, a canopy tree species in sacred groves of varying sizes.

Index Terms- Sacred Grove, Endemic, Endangered, Genetic Diversity, Refugium & Forest Fragmentation.

I. INTRODUCTION

'Sacred groves' are small patches of native vegetation traditionally protected and managed by local communities. In other words, sacred groves are the refuge of certain plant species preserved on religious grounds which can satisfy the aesthetic, scientific, cultural, and recreational needs of mankind (Bhakat, 1990). India ranks 10th in the list of most forested nations in the world with 76.87 million ha of the forest & tree cover i.e. 20.6 percent forest of the total geographical area of the country (ICFRE, 2013). The forests of India are estimated to contain about 5,00,000 of the 10 to 30 million species on earth (Gadgil, 1996). The country contains three of the mega diversity centers in the forests of Western Ghats, Eastern Himalayas and Indo-Burma. During the last three to four decades, increasing human pressures has to lead to severe land use changes. However, 'sacred groves' or sacred forests have remained resilient to extensive deforestation and land use changes. The sacred groves have played an important role in conserving the forest and its constituent biodiversity elements since ancient times. In recent years with the erosion of religious faith and encroachments of these sacred groves, there is a growing concern if the groves indeed can offer a refugium to the rare, endangered and endemic species. During the last one century the total area under the groves decreased substantially, due to fragmentation of the groves. Fragmentation of the groves has led to habitat disturbance and poor regeneration of many economically important species (Kushalappa and Bhagwat, 2001). The study was conducted to assess the genetic diversity of the species of

flora & fauna across the fragment size & also assess if a set of small fragments harbor more genetic variation among themselves, than a set of large forest fragments.

II. STUDY SITE

The study was carried out in the forest fragments represented by sacred groves in Chhattisgarh state (21⁰30' N latitude & 82⁰00' E longitude). It is estimated that over 44.6 percent of the geographical area of the state are under forest with much of the remaining area converted into paddy fields.

Tribals do not cut or damage the trees which are planted in sacred groves and their surrounding environment. Tribals perform various traditional religious rites and rituals inside these groves. Elderly tribal people have been found worshipping trees, small plants and animals in their sacred groves. A large number of social scientists and ethno- botanists have documented in their studies that tribals consider these sacred groves as an abode of their gods and goddesses whom they worship. Bhatla et al. (1984) have emphasized on the importance of plants which are traditionally worshipped in different parts of India. Pandey (1989) has described a number of sacred plants found in India and different religious rites being performed on them. Alcron (1996) emphasized the role of indigenous people in conservation of biodiversity. Godbole (1996) described the role of tribals in preservation sacred forests in India & has described these sacred groves which are found in India have religious importance and many species which are becoming rare and threatened due to deforestation are being conserved in such sacred groves. He further emphasized that these sacred groves play an important role for in-situ conservation of biological diversity.

III. METHODOLOGY

An ethno-botanical study has been conducted to record information on sacred groves existing in tribal pockets of Chhattisgarh State. The tribal communities were interviewed to collect information on existence of groves, plants and animals conserved their ethno- botanical information etc. The information was recorded from tribals who were of age group from 16 to 70 years and resided in villages of Chhattisgarh.

The study revealed that a large number of useful plants and animals are conserved by the tribals in sacred groves. Plants and animals conserved in sacred groves are documented with

scientific name, local name, worshipped as symbol to local deity, and presented in Tables 1 & 2, respectively, along with their present status in IUCN Red lists in this paper

Figure No. 1: Structure of the New IUCN Categories

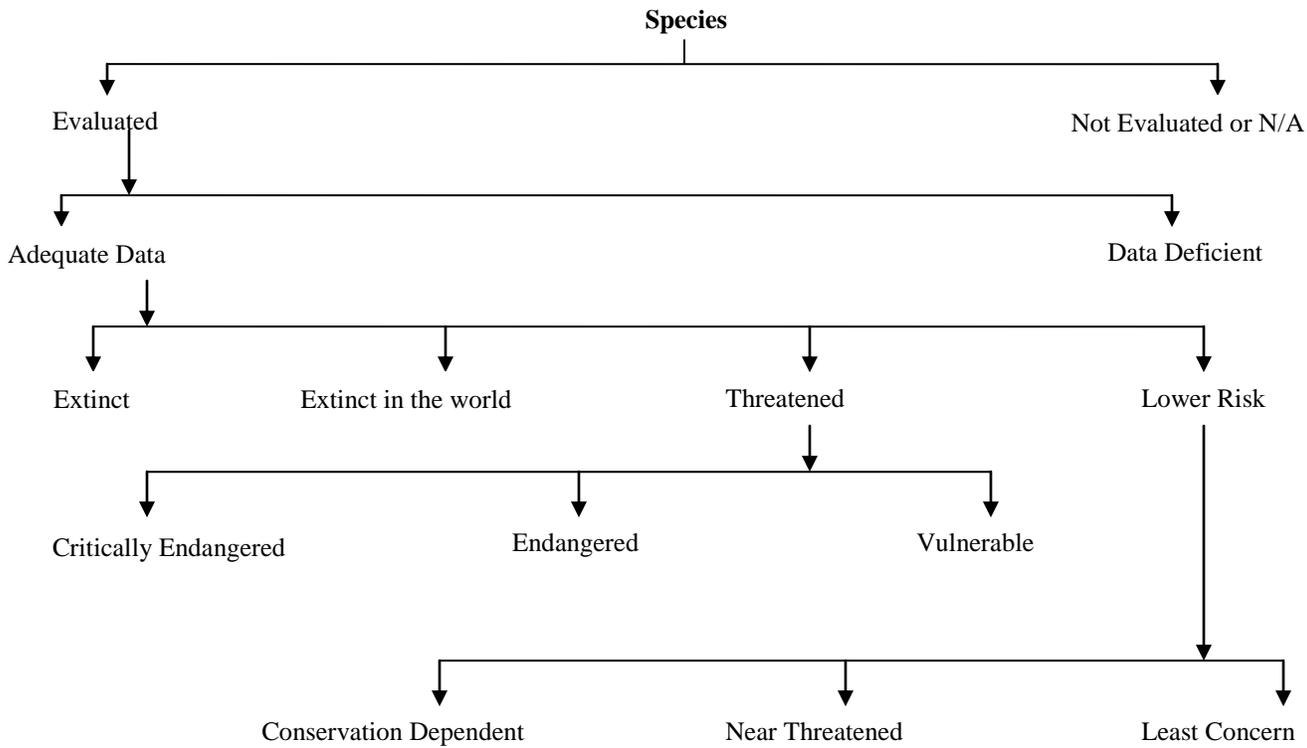


Table No. 1: Flora Associated With the God/Goddess and Other Unseen Powers:

S.No.	Trees/Plants	Botanical Name	Status	Associated with Gods/ Goddesses
1.	Akh	<i>Calotropis procera</i>	Threatened	Shiva, Fertility cult
2.	Amalaki/ Amla	<i>Emblca officinalis</i>	N/A	Laksmi, Kartik, Fertility cult
3.	Amaltas	<i>Cassia fistula</i>	N/A	Krishna, Vishnu, Fertility cult
4.	Amati/ Kachnar	<i>Bauhinia malabarica</i>	Threatened	Ram, Fertility cult
5.	Anjan	<i>Hardwickia binnata</i>	N/A	Fertility cult
6.	Arjun	<i>Terminalia arjuna</i>	Near Threatened	Vishnu, Fertility cult
7.	Ashwagandha	<i>Withania somnifera</i>	Rare	Fertility cult
8.	Asoka	<i>Saraca indica</i>	Endangered	Buddha, Indra
9.	Bahera	<i>Terminalia bellirica</i>	Threatened	Vishnu, Fertility cult
10.	Bael	<i>Aegle marmelos</i>	Vulnerable	Mahesver, Spirits, Shiva
11.	Bhelwa	<i>Semecarpus anacardium</i>	Endangered	Spirits
12.	Bhirra	<i>Chloroxylon swietenia</i>	Vulnerable	Fertility cult
13.	Bija	<i>Pterocarpus marsupium</i>	Endangered	Shiva, Vishnu
14.	Chandan	<i>Santalum album</i>	Endangered	Vishnu, Shiva, Brahma, Fertility cult
15.	Char	<i>Buchanania lanzan</i>	Low Risk	Krishna, Fertility cult
16.	Dhatura	<i>Datura alba</i>	N/A	Shiva, Krishna, Fertility cult
17.	Dhawda	<i>Anogeissus latifolia</i>	N/A	Fertility cult
18.	Dumar	<i>Ficus glomerata</i>	N/A	Vishnu, Rudra
19.	Giloy	<i>Tinospora cordifolia</i>	Vulnerable	Fertility cult
20.	Gulmohar	<i>Delonix regia</i>	N/A	Shiva, Fertility cult
21.	Hajari	<i>Plumeria rubia</i>	N/A	Lakshmi, Vishnu, Parvati, Shiva
22.	Haldu	<i>Adina cordifolia</i>	N/A	Vishnu, Fertility cult
23.	Harra	<i>Terminalia chebula</i>	Near Threatened	Vishnu, Fertility cult

24.	Imli	<i>Tamarindus indica</i>	N/A	Spirits, Witches
25.	Jamun	<i>Syzygium cuminii</i>	N/A	Fertility cult
26.	Jungle Jalebi	<i>Pithecolobium dulce</i>	N/A	Krishna
27.	Kadamba	<i>Anthocephalus cadamba</i>	N/A	Krishna, Fertility cult
28.	Kala siris	<i>Albizia lebeck</i>	N/A	Fertility cult
29.	Kali musli	<i>Cholrophytum tuberosum</i>	Endangered	Fertility cult
30.	Kalihari	<i>Gloreosa superb</i>	Endangered	Fertility cult
31.	Kapok	<i>Ceiba pentandra</i>	N/A	Fertility cult
32.	Karanj	<i>Pongamia pinnata</i>	Least Concern	Krishna, Spirits
33.	Karpur	<i>Hedychium spicatum</i>	Near Threatened	Moon
34.	Karra	<i>Cleistanthus collinus</i>	Vulnerable	Spirits
35.	Khamar	<i>Gmelina arborea</i>	Least Concern	Shiva
36.	Kullu	<i>Sterculia urens</i>	Near Threatened	Krishna, Fertility cult
37.	Kumbhi	<i>Pachira rosea</i>	N/A	Shiva, Lakshmi, Kali mata
38.	Kusum	<i>Schliechera oleosa</i>	Threatened	Kuber, Krishna
39.	Mahaneem	<i>Ailanthus excelsa</i>	Threatened	Shitla, Witches, Varun
40.	Mahua	<i>Madhuca latifolia</i>	Endangered	Krishna, Fertility cult
41.	Mango	<i>Mangifera indica</i>	N/A	Laksmi, Goverdhan, Fertility cult
42.	Mundi	<i>Mitragyna parvifolia</i>	N/A	Shiva, Fertility cult
43.	Narikel	<i>Cocos nucifera</i>	Endangered	Shiva, Brahma, Visnu, Sri Hari, Kuber, Lakshmi, Fertility cult
44.	Neem	<i>Azadirachta indica</i>	Data Deficient	Sitala, Manasa, Witches
45.	Palasa	<i>Butea monosperma</i>	Data Deficient	Brahma, Gandharva
46.	Parijaat	<i>Nyctanthus spp.</i>	Endangered	Vishnu, Lakshmi, Shiva, Brahma
47.	Peltaforum	<i>Peltaphorum pterocarpum</i>	N/A	Vishnu
48.	Pipal	<i>Ficus religiosa</i>	N/A	Visnu, Ancestor worship, Krishna
49.	Sagon	<i>Tectona grandis</i>	Least Concern	Shiva, Vishnu, Brahma
50.	Saja	<i>Terminalia tomentosa</i>	Near Threatened	Vishnu, Fertility cult
51.	Sal	<i>Shorea robusta</i>	N/A	Vandurga, Lakshmi
52.	Salfi	<i>Caryota urens</i>	Endangered	Mahadeva
53.	Sarpagandha	<i>Rauwolfia serpentine</i>	Vulnerable	Fertility cult
54.	Satavari	<i>Asparagus racemosus</i>	N/A	Fertility cult
55.	Semal	<i>Bombax ceiba</i>	N/A	Visnu, Fertility cult
56.	Soma	<i>Amanita muscaria</i>	N/A	Moon
57.	Tendu	<i>Diospyros melanoxylon</i>	Endangered	Fertility cult
58.	Tulsi	<i>Oscimum sanctum</i>	N/A	Laksmi, , Ancestor Worship
59.	Vata	<i>Ficus bangelensis</i>	N/A	Brahma, Visnu, Sri Hari, Kuber, Muni

Table No. 2: Fauna associated with God /Goddesses in sacred groves:

S.No.	Animals/Birds/Butterflies	Zoological Name	Status	Associated with Gods/ Goddesses
1.	Bat	<i>Pteropus giganteus</i>	Least Concerned	Shiva, Narad Muni
2.	Beer	<i>Melursus ursinus</i>	Threatened	Hanuman
3.	Bull	<i>Taurus indicus</i>	Endangered	Siva
4.	Chital	<i>Gazelle gazella</i>	Least Concerned	Jesus
5.	Crocodile	<i>Crocodylus palustris</i>	Endangered	Ganga, Varuna
6.	Crow	<i>Corvus splendens</i>	Least Concerned	Lord Shaneeshwarar
7.	Deer	<i>Axis axis</i>	Threatened	Vayu, Rama
8.	Eagle	<i>Aquila chrysaetos</i>	Threatened	Visnu
9.	Elephant	<i>Elephas maximus</i>	Threatened	Indra, Ganesha
10.	Fox	<i>Vulpes bengalensis</i>	Threatened	Muni
11.	Honey bee	<i>Apis spp.</i>	Least Concerned	-
12.	House sparrow	<i>Passer domesticus</i>	Least Concerned	Rama

13.	Kite	<i>Milvus migrans</i>	Least Concerned	Varun, Indra
14.	Koel	<i>Eudynamys scolopacea</i>	Least Concerned	Narayana
15.	Hyena	<i>Hyena hyena</i>	Threatened	Spirits, Witch
16.	Monkey	<i>Macaca fascicularis</i>	Near Threatened	Rama, Kama, Varuna
17.	Myna	<i>Acridotheres tristis</i>	Least Concerned	Kama
18.	Nilkanth	<i>Coracias benghalensis</i>	Threatened	Shiva
19.	Owl	<i>Glaucidium radiatum</i>	Least Concerned	Laksmi
20.	Parrot	<i>Psittacula krameri</i>	Least Concerned	Kama
21.	Peacock	<i>Pavo cristatus</i>	Least Concerned	Kartika, Saraswati, Krishna
22.	Rat	<i>Rattus norvegicus</i>	Least Concerned	Ganesha
23.	Serpent	<i>Naja naja</i>	Threatened	Siva, Sun, Vishnu
24.	Squirrel	<i>Sciurus carolinensis</i>	Least Concerned	Rama
25.	Swan	<i>Cygnus atratus</i>	Least Concerned	Saraswati
26.	Tiger	<i>Panthera tigris</i>	Endangered	Katyayani, Dattatreya
27.	Tortoise	<i>Geochelone elegans</i>	Least Concerned	Yamuna, Lakshmi
28.	Vulture	<i>Gyps indicus</i>	Critically Endangered	Sani
29.	Blue Mormon Butterfly	<i>Papilio polymnestor</i>	Threatened	Fertility Cult
30.	Common Yellow Swallowtail	<i>Papilio Machaon</i>	Near Threatened	Fertility Cult
31.	Large Cabbage White	<i>Pieris brassicae</i>	N/A	Fertility Cult
32.	Tawny Coster	<i>Acraea violea</i>	N/A	Fertility Cult
33.	Sailers	<i>Neptis hylas</i>	Least Concerned	Fertility Cult
34.	Indian Red Admiral	<i>Vanessa indica</i>	Least Concerned	Fertility Cult
35.	Common Mormon	<i>Papilio polytes</i>	N/A	Fertility Cult

IV. RESULT & DISCUSSION

Habitat fragmentation is a pervasive threat to forest ecosystems throughout the world, eventually leading to a decline in biological diversity and impairment of ecological processes. A number of studies in the last couple of decades have addressed the ecological, demographic and genetic consequences of small fragmented populations. These studies highlight the importance of a set of small groves in harboring the variability among them in an endemic and endangered species of both flora & fauna. Thus, while designing conservation strategies for the groves, due importance should also be given to smaller groves as much as is given to large groves.

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REFERENCES

- [1] Alcron, Janis B. (1996). Is Biodiversity conserved by indigenous people? *Ethnobiology in Human Welfare* (Jain S.KL, ed.). Deep Publications, New Delhi, pp. 233-238.
- [2] Bhakat, R.K. (1990). Tribal Ethics of Forest Conservation. *Yojana* (March 16-31): 23-27.
- [3] Bhatla, N., Tapan Mukerjee and G. Singh (1984). *Plants and Traditional Worshipping*. Indian Journal of Historical Science, 19 (1) : 37-42.
- [4] Gadgil, M. 1996. Documenting diversity; an experiment. *Curr. Sci*, 70(1): 36-44.
- [5] Godbole, Archana (1996). Role of tribals in preservation of sacred forests. *Ethnobiology in Human Welfare* (Jain, S.K., ed.). Deep Publications, New Delhi, pp. 345-348.
- [6] Kushalappa, C.G. and Bhagwat, S.A. 2001. Sacred Groves: Biodiversity, threats and conservation. In: Uma Shaanker, R., Ganeshiah, K.N. and Bawa, K.S. (eds), *Forest Genetic Resources: Status, Threats and Conservation Strategies*, Oxford and IBH Publishing Co. Pvt. Ltd. Pp. 21-29.
- [7] Pandey, B.P. (1989). *Plants of Human Kind. Sacred plant: of India*, Deep Publications, New Delhi.

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The effect of fertilization on growth & yield of rain fed Blackgram in custard apple based Agri-horti-system with Alley Cropping Pattern on Vindhyan soil.

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Abstract- One- year field experiments were conducted to evaluate the effect of fertilization on growth & yield of rainfed blackgram in custard apple based agri-horti-system with alley cropping pattern on Vindhyan soil. The factors under study comprised of Control plot (T₁), 2% urea spray (twice fifteen days intervals)(T₂), 100% RDF (T₃), 50%RDF + 25kg Zinc sulphate(T₄), 50% RDF + 2% urea spray + 25 kg zinc sulphate (T₅), 100%RDF + 25kg Zinc sulphate(T₆) and 2% urea spray + 25kg Zinc sulphate(T₇) were laid out in randomized block design. The treatments were replicated three times. However, a significant increase in grain yield was observed under 100% RDF + 25kg Zinc sulphate (T₆). It was recorded maximum net return Rs.18143/ha in case of 100% RDF + 25 kg zinc sulphate under the alley cropping.

Index Terms- Alley cropping pattern, Agri-horti-system, Fertilization, Black gram, Growth, yield and net return.

I. INTRODUCTION

Agroforestry integrates trees into farmland and rangeland and in so doing diversifies and sustains production for increased benefits for farmers and the environment. Agroforestry systems complement conservation agriculture systems in the provision of soil cover, animal feed, nutrients, household fuel, and hillside protection against soil erosion and wind erosion control through shelter belts (Sims *et al.*, 2009).

Alley cropping research has indicated few detailed studies of the effects of competition for moisture and nutrients. This may be partly reduced by assumption that trees place their roots deeper in the soil profile than most crops and that competition is therefore avoided.

Khalifa and Ong (1990) and Lin (2007) were of the opinion that shading may be beneficial when crops frequently experience supra-optimal temperatures, as is well documented for agroforestry systems (Jonsson *et al.*, 1999), (Ong *et al.*, 2006) and Ong *et al.* (1999) concluded from their study that competition between neighbouring roots occurred when the nutrient depletion zones around the roots overlap, which was caused by the uptake of nutrients into the roots. Ovalle and Avendano (1987) reported that crop yield losses in alley cropping systems were affected directly from competition for soil water.

The custard apple (*Annona squamosa*) is commonly cultivated in tropical South America, not often in Central America, very frequently in Southern Mexico, the West Indies, Bahamas and Bermuda, and occasionally in southern Florida. Black gram originated in India and cultivated on marginal land by resource-poor farmers. In the past seven years, it has been observed that the total 15.5 lakh tones in India. Andhra Pradesh is the largest producer of black gram in India. Madhya Pradesh, Uttar Pradesh, Tamil Nadu, Rajasthan and Orissa are other major producing states. Black gram (*Vigna mungo*) was grown in a black gram/ mustard (*Brassica juncea*) crop sequence and was given 0, 15 or 30 kg N/ha, 0, 30 or 60 kg P₂O₅/ha and 0 or 60 kg S/ha with a uniform application of 25 kg K₂O/ha to all treatments.

II. METHOD

Field experiments were conducted over one years (2009-10) under rainfed and invariably poor fertile status at the experiment was carried out at the Agronomy farm of Rajiv Gandhi South Campus, Brakachha (Banaras Hindu University) Mirzapur which is situated in Vindhyan region of district Mirzapur (25°10' latitude, 82°37' longitude and altitude of 427 meters above mean sea level) occupying over an area of more than 1000 ha where variety of crops like agricultural, horticultural, medicinal & aromatic plants etc are grown. This region comes under agro-climatic zone III A (semi-arid Eastern plain zone). Black gram is the P U-7 and developed at Govind Vallabh Bhai Patel (G.B.) Pantnagar University of Agriculture & Technology, Pantnagar, Uttarakhand, Net plot size was 5.25 m². The soil at the site was a sandy loam. The factors under study comprised of under control plot (T₁), 2% urea spray (twice fifteen days intervals) (T₂), 100% RDF (T₃), 50% RDF + 25 kg. zinc sulphate (T₄), 50% RDF+2% urea spray+25Kg Zinc sulphate (T₅), 100% RDF + 25 kg Zinc sulphate (T₆) and 2% urea spray + 25 kg Zinc sulphate (T₇) were laid out in randomized block design with three replications. The sowing was done in furrows on the 14 August 2009 in 2009-10 in same fertilized furrows at 35 cm apart opened by spade and covered with soil after seeding at appropriate spacing (10 cm) and depth (5 cm). A seed rate of 15Kg/ha was used for the experiment. In this experiment, Urea, Zinc sulphate and DAP were used as source of nitrogen, zinc and phosphorus respectively. The desired fertilizer doses were placed below the seed in the respective rows at seeding. The standard analysis of

variance for randomized block design to draw a valid conclusion (Cochran and Cox 1963). The treatment differences were tested by Fisher's Method (F test of significant) on the basis of null hypothesis. Critical differences (CD) were worked out at 5 per cent level of probability where 'F' test was significant.

III. RESULTS AND DISCUSSION

1. Growth:

The nutrient combination had significant effect on the plant height, which was measured at different stages of the crop. The plant height of blackgram under different nutrient combinations at harvest stage ranged from 25.67 to 49.70 cm. The maximum plant was recorded in the treatment T₆ (100% RDF + 25 kg. Zinc sulphate) at 20, 40 DAS and at harvest stage of crop which was statistically at par with T₃ and T₅ at 20 DAS, harvest stage and T₃ at 40 DAS and T₄ at harvest stage. The treatment T₆ of proved statistically superior to the remaining treatments. The lowest plant height (12.90, 22.27, 24.17 cm) was observed in control plot at varying stages. As such the plant height increased by 85, 83 and 93 percent at 20, 40 DAS and harvest stage respectively.

As regards dry matter production (g) and number of trifoliolate leaves, Leaf area index and Grains ear/ head (No.) trend of the results was similar to that noted in plant height.

2. Yield and Yield attributes:

The maximum number of pods in alley cropping system was also recorded in T₆. The pod number ranged from 6.60 to 30.07pods/ plant, the lowest number being T₁. Treatment T₆ proved significantly instrumented in enhancing the pod number in comparison to rest of the treatment. As regards Test weight (g.) trend of the results was similar to that noted in no. of pods/ plants.

The maximum seed yield in alley crop was recorded in 100%+ 25Kg. Zinc sulphate (T₆) (8.74 q/ha) which was significantly superior to others. However, the lowest seed yield was recorded with control (3.23 q/ha). As regards straw yield and no. of pods/ plants trend of the results was similar to that noted in Test Weight (g.). Chauhan *et al.* (1995) observed similar that agricultural crop yield was increased with increasing the crop distance from the tree base.

Table 1: Growth and yield influenced by various treatments in alley cropping system of Blackgram

Treatment	Plant dry weight (g.)	Plant height (cm)	Trifoliolate leaves/ plant	Test weight (g.)	No. of pods/ plants	Seed yield (q/ha)	Straw yield (q/ha)
	At harvest	At harvest	40 DAS				
T ₁	22.67	24.17	4.67	41	6.60	3.23	3.61
T ₂	28.67	26.87	5.80	40	12.40	4.91	5.09
T ₃	44.00	38.23	8.00	41	16.00	6.24	6.38
T ₄	30.64	31.27	7.13	40	19.60	6.32	6.43
T ₅	34.77	34.40	7.70	43	20.40	8.37	8.66
T ₆	47.70	46.70	7.93	44	30.07	8.74	8.97
T ₇	29.73	27.10	6.03	41	10.40	4.67	4.78
Sem±	3.05	2.32	0.66	1.36	2.04	0.39	0.37
CD(%)	6.66	5.05	1.43	2.97	4.45	0.86	0.81

Table 2: Gross return and benefit: cost ratio as influenced by various treatments in alley cropping system of black gram

S.No.	Treatment	Cost of cultivation (Rs./ha)	Sole Crop System		
			Gross return (Rs./ha)	Net return (Rs./ha)	Benefit: Cost ratio
1.	Control	10924	11666	782	0.07
2.	2% urea spray (twice fifteen days intervals)	11520	17694	6174	0.53
3.	100% RDF	12583	22478	9895	0.78
4.	50% RDF + 25 kg Zinc Sulphate	12629	22447	9812	0.77
5.	50% RDF + 2% urea spray + 25 kg zinc sulphate	12975	30161	17186	1.32
6.	100% RDF+ 25 kg Zinc sulphate	13344	31487	18143	1.35
7.	2% urea spray + 25 kg zinc sulphate	12520	16823	4303	0.34

Chart 1: Growth and yield influenced by various treatments in alley cropping system of Blackgram

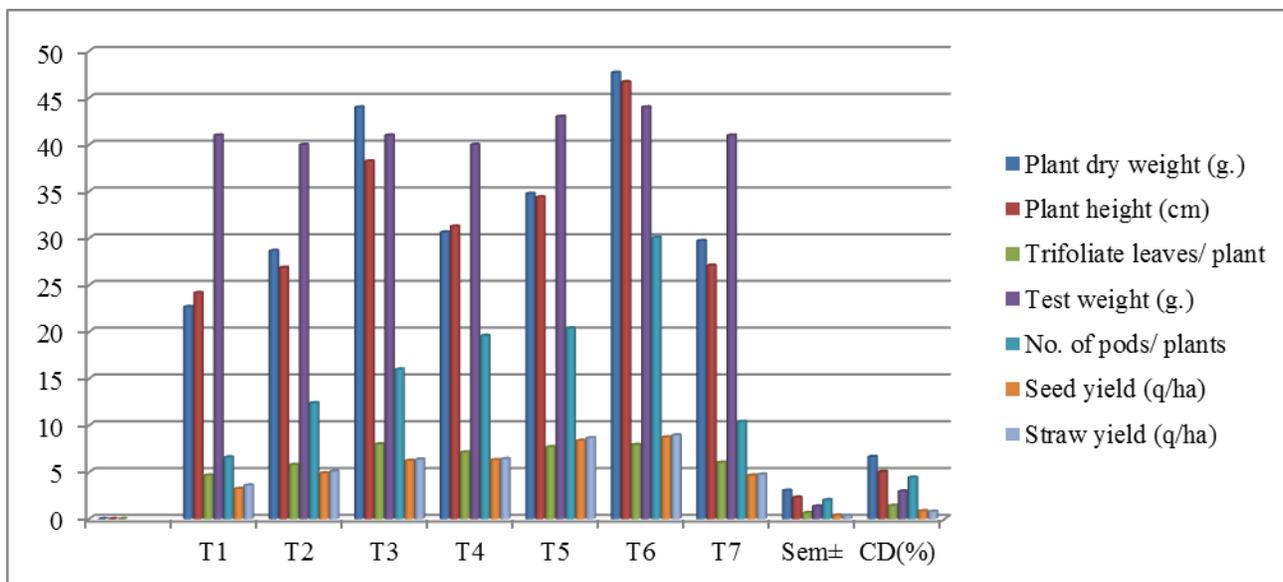
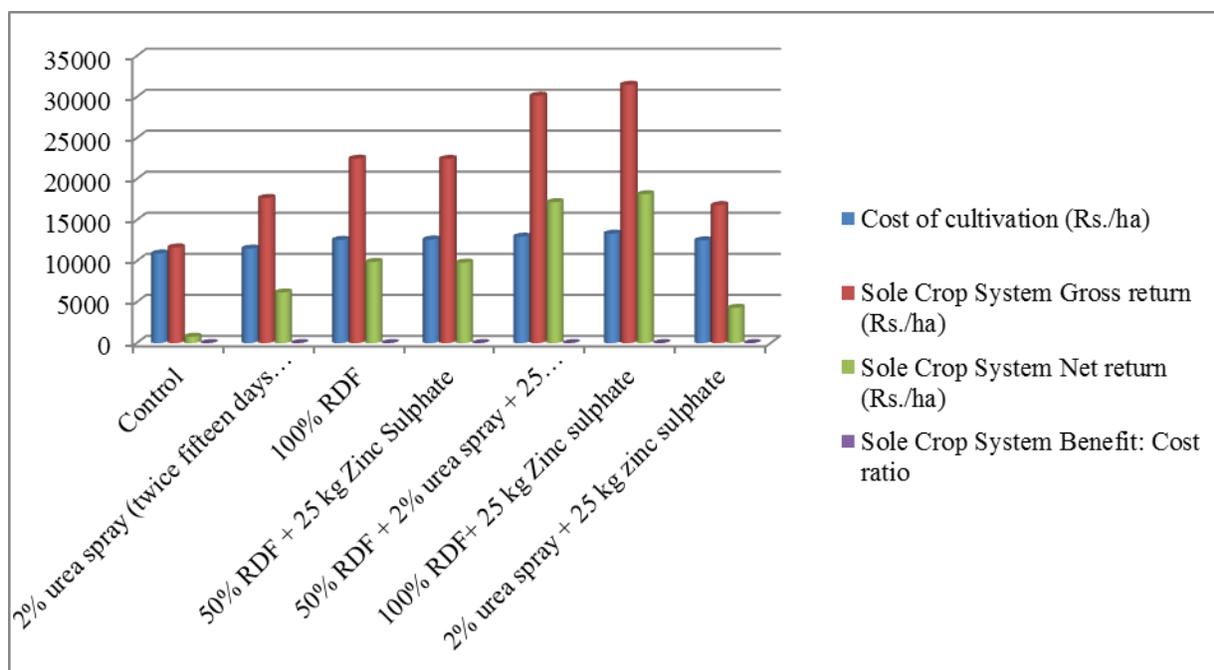


Chart 2: Gross return and benefit: cost ratio as influenced by various treatments in alley cropping system of black gram



IV. ECONOMIC

The total cost of cultivation was maximum (Rs. 13344.00/ha) with 50% RDF + 2% urea spray + 25kg Zinc sulphate while minimum (Rs.10924.00/ha) was noted with control. The different fertilizer combination and nutrient levels recorded maximum gross return (Rs. 31487.00/ha) was recorded with 100% RDF (20N:40P kg/ha) + 25kg Zinc sulphate. The maximum net return of Rs. 18143.00/ha in alley with 100% RDF (20N:40P kg/ha) + 25 kg Zinc sulphate and minimum under Rs. 782.00/ha with control. The maximum benefit cost ratio 1.35 were recorded with 100% RDF (20N:40P Kg/ha) + 25 kg Zinc

sulphate under alley cropping, respectively. Bheemaiah and Subrahmanyam (2001) reported that yield and economic of legumes under ber based agri-horticultural system with different levels of fertilizers.

APPENDIX

RDF: Recommended doses of fertilizer
DAS: Days after sowing
DAP: Di-ammonium Phosphate
PU-7: Variety of Black gram released by G.B. Pant Nagar University

CD: Critical Differences

REFERENCES

- [1] Chauhan, V.K., Sood, S.K., Bhargava, J.N. and Mishra, V.K. (1995). Effect of different trees on the yield of rainfed wheat crop. *Annual of forestry* 3 (2): 147-151.
- [2] Cochran, W.G. and G.M. Cox (1963). *Experimental design*. First low priced edition. Asia Publishing House, New Delhi.
- [3] Jonsson, K., Ong, C.K. and Odongo, J.C.W. (1999), Influence of scattered nere and karate trees on micriclimate, soil fertility and millet yield in Burkina Faso, *Expl. Agriculture*. 35, pp. 39-53.
- [4] Khalifa, F.M. and Ong, C.K. (1990), Effect of supra-optimal temperatures on germination of pearl millet (*Pennisetum glaucum* (L) R.BR.) hybrids, *Annual Arid Zone* 29, pp. 279-288.
- [5] Lin, B.B. (2007), Agroforestry management as an adaptive strategy against potential microclimate extremes in coffee agriculture, *Agric. For. Met.* 144, pp. 85-94.
- [6] Ong, C.K. Muthuri, C.W. and Black, C.R. (2006), Modifying forests and agroforestry for improved water productivity in the semi-arid tropics. *CAB Reviews: Perspectives in Agriculture, Veterinary Sciences, Nutritional Natural Resources*. 65, pp. 1-19.
- [7] Ong, C.K., Deans, J.D., Wilson, J., Mutua, J., Khan, A.A.H. and Lawson, E.M. (1999), Exploring below ground complementarily in agroforestry using sap flow and root fractal techniques. *Agroforestry Systems*. 44, pp. 87-103.
- [8] Ovalle, C. and Avendano, J. (1987), Interactions of the tree layer with the herbaceous understorey layer in the plant- communities of *Acacia caven* in Chile.1. Tree influenc on the botanical composition, production and phenology of the herbaceous stratum, *Acta Oecol.* 8, pp. 385-404.
- [9] Sims, B., Friedrich, T., Kassam, A. & Kienzle, J. (2009): Agroforestry and conservation agriculture: complementary practices for sustainable development, *Journal: Agriculture for Development* 2009 No. 8 pp. 13-18.

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Zig-Bee and Wi-Fi based Mine Safety Application

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Abstract- Real time monitoring of process parameters inside the underground or open cast mines in a reliable manner is a technical challenge for the mine industry. Real time monitoring can provide accurate information about different critical mining parameters like rise in humidity and temperature, presence of dangerous gases, presence of light etc. This monitoring can also pave way for the safety of the miners. Conventional wired communication has severe drawback regarding real time monitoring. This paper develops an ARM based embedded system which monitors the critical parameters inside the mine and transmits the data in wireless manner for better monitoring and visualization.

Index Terms- ARM, Mine Safety, Temperature, Humidity

I. INTRODUCTION

In mining industry, safety of human life is the primary concern. Negligence in the safety guidelines can damage the high quality equipments, hamper production or can cause loss of human life. To avoid any types of unwanted phenomena all mining industry follows a standard guideline. Underground mining was in existence at Rajapura-Dariba in 13th century BC in India. So India has some of the oldest mines of the world. Several legislations have been administrated by Director General of Mine Safety in India [1]. In India large scale mechanization of all mines is not possible due to varying geo mining conditions, low grade and scattered deposits and high cost of imported machinery. Traditional coal mine monitoring systems tend to be wired network systems, which play an important role in coal mine safe production. With continuous enlarging of exploiting areas and extension of depth in coal mine, many laneways become monitoring blind areas, where are lots of hidden dangers. Moreover, it is inconvenient to lay cables which are expensive and consume time [5]. So in this critical scenario, wireless mode of communication is a reliable option. Wireless mining communication networks transport data, voice, and video, supporting applications that are essential to efficient and safe mine operations.

This paper develops a wireless application which will sense different physical parameter inside the mine and transmit them in wireless medium to the outside world for a better monitoring and control. ARM microcontroller is used for the purpose of monitoring, control and wireless communication.

II. LITERATURE REVIEW

Different researchers have developed different embedded system for mine safety. This section reviews some of the state of art embedded system developed for mine safety.

J. Song et.al [5] developed a wireless sensor node based automatic monitoring system for coal mine safety. T Maity et.al [4], developed zigbee based monitoring system for coal mines. D. Bhattacharjee et.al [3], developed wireless sensor node with different sensors embedded in the node. L. K Bandopadhaya et.al [2], developed wireless information and safety system for mines.

III. ARM BASED EMBEDDED SYSTEM DESIGN

The ARM (Advanced RISC Machine) is a 32-bit microcontroller created by a consortium of companies and manufactured in many different kind of versions. And it is widely used in modems, cell phones, cameras, personal audio, pagers, and many more embedded high end applications. The LPC2148 is a low-power Complementary metal-oxide-semiconductor (CMOS) 32-bit microcontroller used the enhanced RISC architecture. Through executing powerful instructions in a single clock cycle, the LPC2148 achieves throughputs approaching 17 MIPS sustained 25 MHz permit the system designer, to optimize power consumption versus processing speed, operating Voltage range for this microcontroller is - 4.5V - 5.5V.

Xbee module with LPC2148

Low power Xbee 802.15.4 and extended range Xbee PRO 802.15.4 use the IEEE 802.15.4 networking protocol for fast point to multipoint and peer to peer networking. The Xbee module has low power output of 1mW and the range of Xbee module is up to 100 ft (30m) and the range of Xbee Pro is up to 1 mile (1.6km). The interface rate is 115.2 kbps. The **Xbee modules** work at the 2.4 GHz frequency. **Xbee modules** have the ability to transmit Digital, PWM, Analog or Serial RS232 signals wirelessly. To communicate over **UART** or **USART**, three basic signals namely, RXD (receive), TXD (transmit), GND (common ground) are needed. These modules use direct sequence spread spectrum configuration. Figure 1 shows the interfacing circuit of Zigbee module and ARM-7 microcontroller.

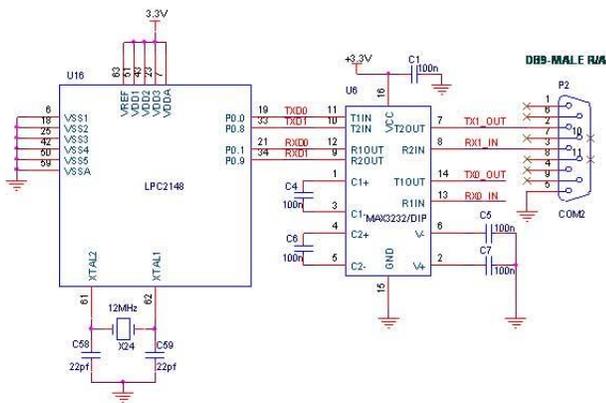


Figure 1: Interfacing circuit of Zigbee and ARM-7

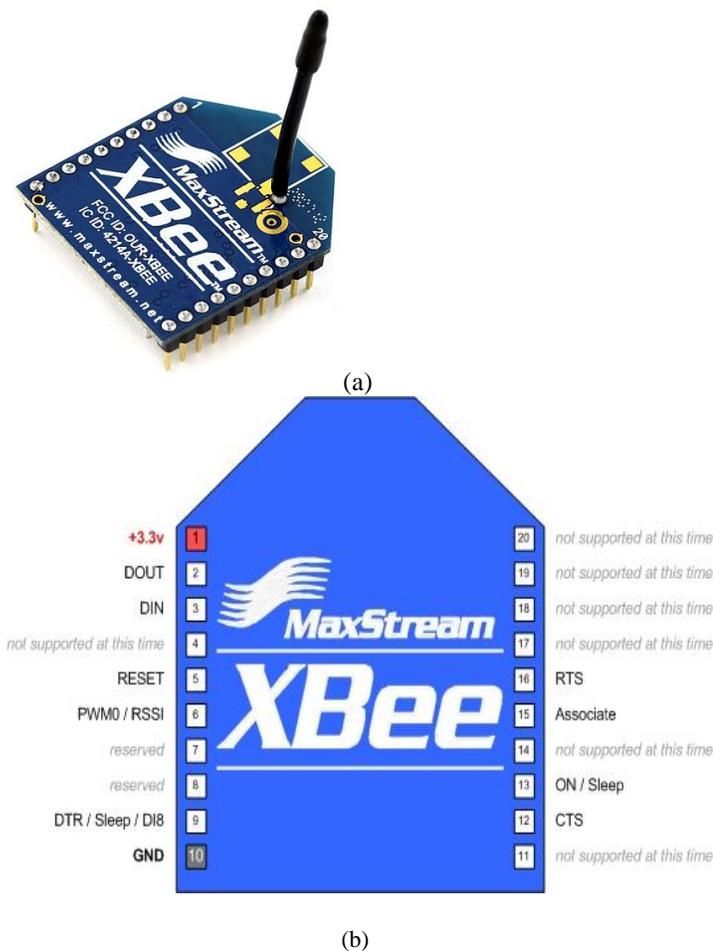


Figure 2: (a) Xbee Module (b) Pin out of Xbee module

IV. EMBEDDED SYSTEM FOR SAFETY OF MINES

Temperature Sensor

The LM35 is an integrated circuit sensor that can be used to measure temperature with an electrical output proportional to the temperature (in °C). The LM35 generates a higher output voltage than thermocouples and may not require that the output voltage be amplified. For LM35, the scale factor is 0.01V/°C meaning the nominal output voltage is 250mV at 25°C and 1.000V at

100°C. It does not require any external calibration or trimming. The most important characteristic of the LM35 is that it draws only 60µA from its supply and produces a low self heating capability. The general equation used to convert from the output temperature to temperature is $\text{Temperature (}^\circ\text{C)} = \text{Vout} * 100 \text{ }^\circ\text{C/V}$

Methane and CO Gas Sensor

MQ-4 is suitable for sensing natural gas and presence of CH₄ concentrations in the air. It can detect natural gas concentrations anywhere from 200 to 10000ppm. This sensor has a high sensitivity and fast response time. The sensing element is comprised of a metal oxide semiconductor layer formed on an alumina substrate of a sensing chip together with an integrated heater. In the presence of a detectable gas, the sensor's conductivity increases depending on the gas concentration in the air. A simple electrical circuit can convert the change in conductivity to an output signal which corresponds to gas concentration. The sensor MQ-7 has high sensitivity to carbon monoxide. The detecting range of this sensor is 20 ppm - 2000 ppm of carbon monoxide. The resistivity of this sensor depends on the concentration of the gas. Its resistance varies from 2k-20k ohms. One special property of this sensor is that the heater coil is given pulsating power supply. For 60 sec the heater is given 5 volt supply and for the next 90 sec it is given 1.4 volt supply. The sensor MQ-4 has high sensitivity to Natural Gas and Methane (CH₄) and has small sensitivity to alcohol and smoke. The detecting concentration of this sensor is from 200 ppm – 10000 ppm for Natural gas and Methane. The sensor resistance varies from 10k – 60k ohms. These sensors (MQ-4 and MQ-7) are composed by micro Al₂O₃ ceramic tube, Tin Dioxide (SnO₂) sensitive layer, measuring electrode and heater which are fixed into a crust made by plastic and stainless steel net. The heater provides necessary work conditions for work of sensitive components.

Measurement of Light Intensity

The TSL235R light-to-frequency converter is a three pin integrated circuit which combines a silicon photodiode and a current-to-frequency converter on a single monolithic CMOS integrated circuit. Output is a square wave (50% duty cycle) with frequency directly proportional to light intensity (irradiance-E_e) on the photodiode. The digital output allows direct interface to a microcontroller or other logic circuitry. The device has been temperature compensated for the ultraviolet-to-visible light range of 320 nm to 700 nm and responds over the light range of 320 nm to 1050 nm. Higher resolution and accuracy is obtained using frequency measurement. Frequency measurement provides the additional benefit of averaging out random or high frequency variations (jitter) resulting from noise in the light signal. Resolution is limited mainly by available counter registers and allowable measurement time. Frequency measurement is well suited for slowly varying or constant light levels and for reading average light levels over short periods of time. Integrating the accumulation of pulses over a very long period of time, can be used to measure exposure (the amount of light present in an area over a given time period). Under test condition of E_e = 430 µW/cm² for the monochrome light of wavelength λ_p = 635 nm, the output frequency varies from 200 kHz to 300 kHz for different intensity of light.

Transmitter and Receiver System

Figure 3 shows the block diagram of receiver and transmitter section of the embedded safety application.

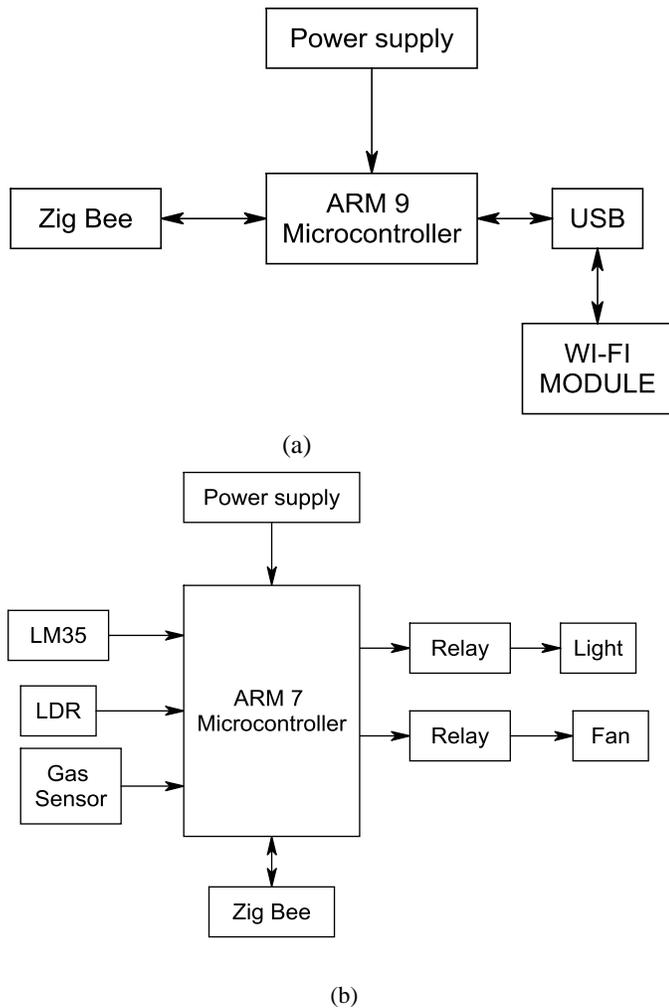


Figure 3: (a) Receiver Section (b) Transmitter Section

The transmitter section is deep inside mine and sensors are connected to the microcontroller for data acquisition and subsequent control. The temperature sensor (LM35) measures the temperature inside the mine, gas sensors (MQ-4 and MQ-7) detect the presence of methane (CH₄) and carbon monoxide (CO) and LDR detects the light intensity respectively. If the temperature is above a permissible limit then the relay connected in the output port of ARM-7 actuates the fan unit to cool down the temperature. Similarly if the light intensity is low then the relay connected to the output port of ARM-7 actuates the light bulb to provide proper light. The display unit displays the current reading of temperature, light intensity and presence of gas (in ppm). Simultaneously the microcontroller sends the data via Zigbee to the base station stationed outside the mine in a secured location. The receiver section receives the value of temperature, light intensity and gas sensor reading (ppm). The basic flow chart for operation of the embedded system is shown in figure 4.

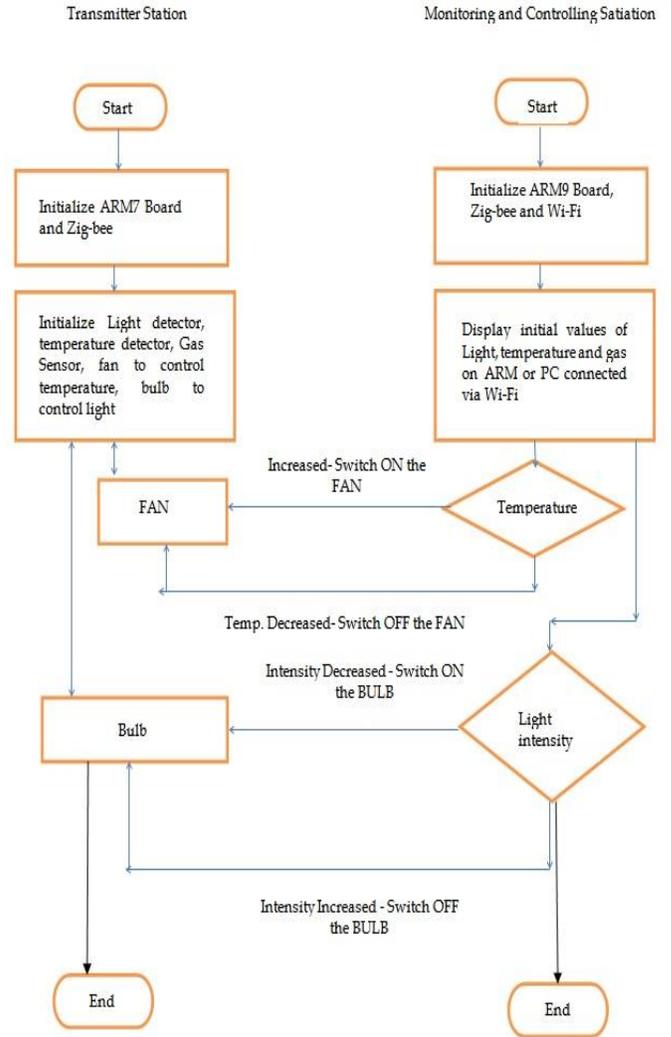


Figure 4: Flow chart for coal mine safety monitoring and control

V. RESULTS AND DISCUSSION

Section IV describes the working of the mine safety application. The proposed architecture is modeled in the lab environment and section V shows the results. Figure 5 shows the prototype model of transmitter section which has to be placed deep inside the coal mine whereas figure 6 shows the prototype model of receiver station which has to be placed in a secured location outside the mine. Figure 7 shows the web based monitoring of embedded application.



Figure 5: Hardware unit of embedded safety application: coal mine station

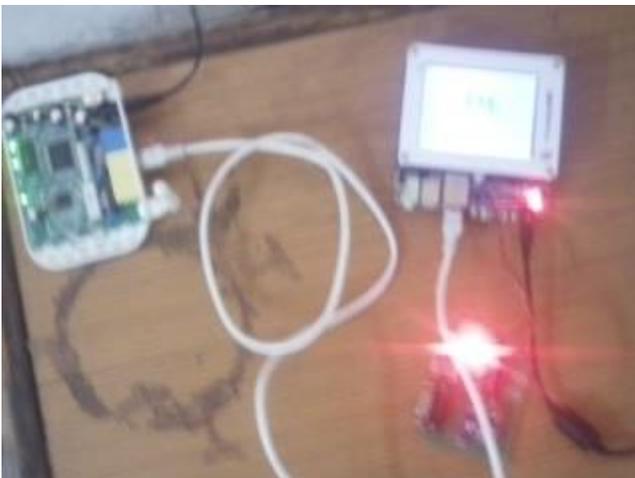


Figure 6: Hardware unit of embedded safety application: Base Station

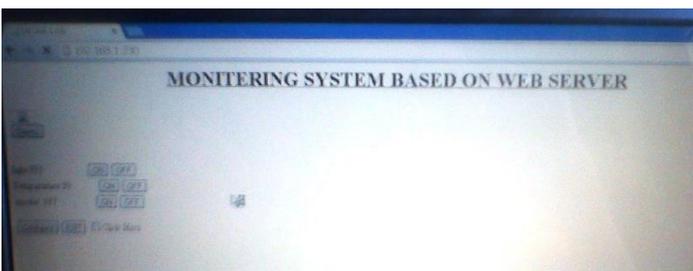


Figure 7: Web based monitoring of embedded application

cast mines using wireless communication and microcontroller. Real time values of temperature, gas readings (in ppm) and light intensity is monitored inside the mine and is sent via a wireless media to a base station situated outside the mine, which eventually updates the current information in a local web server and updates the website.

As a future scope other sensors like pressure, humidity, dew sensors can be interfaced so that all total information can be gathered.

REFERENCES

- [1] Director General of Mine Safety, Government of India, Ministry of Labour and Employment (dgms.net)
- [2] L.K. Bandopadhyay et.al, "Wireless information and safety system for mines," Journal of Scientific and Industrial research, vol. 68, Feb 2009, pp. 107-117.
- [3] Dipanjan Bhattacharjee et.al, "Design and development of wireless sensor node," International Journal of Computer Science and Engineering, vol.2, no. 7, 2010, pp. 2431-2438.
- [4] Tanmoy Maity et.al, "A wireless surveillance and safety system for mine workers based on zigbee," Proc. 1st Int. Conf. Recent Advances in Information Technology, 2012,
- [5] J. Song et.al, "Automatic monitoring system for coal mine safety based on wireless sensor network," in Proc. 2011 Cross Strait Quad-Regional Radio Science and Wireless Technology Conference, 2011, pp. 933-936.

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VI. CONCLUSION

This paper develops a safety system for underground and open

Phytoremediation of Heavy Metal Toxicity and Role of soil in Rhizobacteria

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Abstract- Our surrounding is filled up with a large number of toxicants in different forms. They contaminate our water, land and atmosphere where we live. Heavy metal pollution of soil is a significant environmental problem and has its negative impact on human health and agriculture. Rhizosphere, as an important interface of soil and plant, plays a significant role in phytoremediation of contaminated soil by heavy metals, in which, microbial populations are known to affect heavy metal mobility and availability to the plant through release of chelating agents, acidification, phosphate solubilization and redox changes. Phytoremediation of toxic heavy metals could be carried out by using specific metallophytes. Green plants are the lungs of nature with unique ability to purifying impure air by photosynthesis and remove or minimize heavy metals toxicity from soil and water ecosystem by absorption, accumulation and biotransformation process. This article paper reviews some recent advances in effect and significance of rhizobacteria in phytoremediation of heavy metal toxicity in contaminated soils. There is also a need to improve our understanding of the mechanisms involved in the transfer and mobilization of heavy metals by rhizobacteria and to conduct research on the selection of microbial isolates from Rhizosphere of plants growing metal contaminated soils for specific restoration programmes.

Index Terms- Environmental, heavy metal toxicity, Rhizobacteria, Phytoremediation, Rhizosphere, Metallophytes, Metal accumulation.

I. INTRODUCTION

A major environmental concern due to dispersal of industrial and urban wastes generated by human activities is the contamination of soil. Controlled and uncontrolled disposal of waste, accidental and process spillage, mining and smelting of metalliferous ores, sewage sludge application to agricultural soils are responsible for the migration of contaminants into non-contaminated sites as dust or leach ate and contribute towards contamination of our ecosystem. A wide range of inorganic and organic compounds cause contamination, these include heavy metals, combustible and putrescible substances, hazardous wastes, explosives and petroleum products. Major component of inorganic contaminates are heavy metals they present a different problem than organic contaminants. Soil microorganisms can

degrade organic contaminants, while metals need immobilization or physical removal. Although many metals are essential, all metals are toxic at higher concentrations, because they cause oxidative stress by formation of free radicals. Another reason why metals may be toxic is that they can replace essential metals in pigments or enzymes disrupting their function [3]. Thus, metals render the land unsuitable for plant growth and destroy the biodiversity. Heavy metals are conventionally defined as elements with metallic properties (ductility, conductivity, stability as captions, ligand specificity, etc.) and an atomic number >20. The most common heavy metal contaminants are Cd, Cr, Cu, Hg, Pb and Ni. Metals are natural components in soil with a number of heavy metals being required by plants as micronutrients. However, pollution of biosphere by toxic metals has accelerated dramatically since the beginning of the industrial revolution. As a result of human activities such as mining and smelting of metals, electroplating, gas exhaust, energy and fuel production, fertilizer, sewage and pesticide application, municipal waste generation, etc. (Kabata-Pendias and Pendias, 1989), metal pollution has become one of the most severe environmental problems today. Human eagerness to perform better and better with respect to production of food, energy and convenience product in order to ameliorate. The ways of living are the causes of chemicals especially heavy metal pollution. This eagerness led to a tremendous growth in production and use of various chemicals like Arsenic, Chromium, Cadmium, Copper, Mercury etc. are common toxic heavy metal. Some heavy metals in trace amount are essential for normal growth in both animal and plant but it's become harmful if taken in excess Metal and metalloid occur in variety of form as ions, compound and complexes in the environment over use of these metals and metal based heavy industrialization resulted metal pollution in the biosphere. Mercury, Cadmium, Chromium, Lead and Nickels are chief toxic metal. These metals caused much severe toxic and deleterious effect on human health by producing various kinds of metabolic problems and even chronic diseases. In plant they also reduced productivity due to lose in there chlorophyll and protein contents. Exposure of algae Chlorella, Botryococcus, Dunaliella, Nostoc and anabaena to elevated concentration of all these test metal exerted toxic effect on metabolic machinery. Phytoremediation of toxic heavy metals could be carried out by using specific metallophytes. Green plants are the lungs of nature with unique ability to purifying impure air by photosynthesis and remove or minimize heavy metals toxicity from soil and water

ecosystem by absorption, accumulation and biotransformation process. Vascular plant absorb toxicant either directly from the atmosphere through the leaves or from soil or water through roots. Studies on aquatic plants have shown that uptake of heavy metal is mostly initiated by a phase of rapid and passive absorption. In Elodea and Eichornia the uptake of water born toxicants by the stem and leaves where more important than the absorption by the root. The metal tolerant plants including algae protect themselves from metal toxicity by producing extra amount of some secondary metabolites & Remediation technology.

II. MATERIALS AND METHODS

As mentioned above, rhizobacteria secretion may play a major role among mechanisms of phytoremediation assisted by rhizobacteria. Indirect mechanisms include preventing phytopathogens from inhibiting plant growth and development while direct mechanisms include: nitrogen fixation; synthesis of siderophores which can solubilize and sequester iron from the soil; production of phytohormones such as auxins and cytokinins, which can enhance plant growth; and solubilization of minerals such as phosphorus (Kloepper et al., 1989; Glick, 1995; Glick et al., 1999; Patten and Glick, 1996). Rhizobacteria produce metal-chelating agents called siderophores, which have an important role in the acquisition of several heavy metals (Leong, 1986). Microbial siderophores are used as iron chelating agents that can regulate the availability of iron in the plant rhizosphere (Barnes et al., 1992; Loper and Henkels, 1999). It has been assumed that competition for iron in the rhizosphere is controlled by the affinity of the siderophore for iron and ultimately decides the rhizosphere population structure. The important factors, which participate, are concentration of various types of siderophore, kinetics of exchange, and availability of Fe-complexes to microbes as well as plants (Loper and Henkels, 1999). Interestingly, the binding affinity of phytosiderophores for iron is less than the affinity of microbial siderophores, but plants require a lower iron concentration for normal growth than do microbes (Meyer, 2000). Metal contaminated soil can be remediated by chemical, physical and biological techniques. These can be grouped into two categories.

- **Ex-situ method-**

It requires removal of contaminated soil for treatment on or of site, and returning the treated soil to the resorted site. The conventional ex-situ methods applied for remediating the polluted soils relies on excavation, detoxification and/or destruction of contaminant physically or chemically, as a result the contaminant undergo stabilisation, solidification, immobilisation, incineration or destruction.

- **In-situ method-**

It is remediation without excavation of contaminated site. Reed et al. defined in-situ remediation technologies as destruction or transformation of the contaminant, immobilization to reduce bioavailability and separation of the contaminant from the bulk soil. In-situ techniques are favored over the ex-situ techniques due to their low cost and reduced impact on the ecosystem. Conventionally, the ex-situ technique is to excavate soil contaminated with heavy metal and their burial in landfill

site. But the offsite burial is not an appropriate option because it merely shifts the contamination problem elsewhere and also because of hazards associated with the transport of contaminated soil. Diluting the heavy metal content to safe level by importing the clean soil and mixing with the contaminated soil can be an alternative of on-site management. On-site containment and barriers provide an alternative; it involves covering the soil with inert material. Immobilization of inorganic contaminant can be used as a remedial method for heavy metal contaminated soils. This can be achieved by completing the contaminants, or through increasing the soil pH by liming. Increased pH decreases the solubility of heavy metals like Cd, Cu, Ni and Zn in soil. Although the risk of potential exposure to plants is reduced, their concentration remains unchanged. Most of these conventional remediation technologies are costly to implement and cause further disturbance to the already damaged environment. Plant based bioremediation technologies have been collectively termed as phytoremediation; this refers to the use of green plants and their associated micro biota for the in-situ treatment of contaminated soil and ground water. The idea of using metal accumulating plants to remove heavy metals and other compounds was first introduced in 1983, but the concept has actually been implemented for the past 300 years. The generic term 'Phytoremediation' consists of the Greek prefix photo (plant), attached to the Latin root remedium (to correct or remove an evil). This technology can be applied to both organic and inorganic pollutants present in soil (solid substrate), water (liquid substrate) and the air. The physico-chemical techniques for soil remediation render the land useless for plant growth as they remove all biological activities, including useful microbes such as nitrogen fixing bacteria, mycorrhiza, fungi, as well as fauna in the process of decontamination. The conventional methods of remediation may cost from 10 to 1000 per cubic meter. Phytoextraction costs are estimated to be as low as 0.05 per cubic meter. Phytoremediation consists of five main processes, shown in Table 1.

Table-1. Phytoremediation includes the following processes and mechanisms of contaminant.

NO.	Process	Mechanism	Contaminant
1	Rhizofiltration	Rhizosphere accumulation	Organics/Inorganics
2	Phytostabilisation	Complexation	Inorganics
3	Phytoextraction	Phytoextraction Hyper-accumulation	Inorganics
4	Phytovolatilization	Volatilisation by leaves	Organics/Inorganics
5	Phytotransformation	Degradation in plant	Organics

Rhizobacteria have been shown to possess several traits that can alter heavy metals bioavailability (Lasat, 2002; McGrath et al., 2001; Whiting et al., 2001) through the release of chelating substances, acidification of the microenvironment, and by

influencing changes in redox potential (Smith and Read, 1997). For example, Abou-Shanab et al. (2003a) reported that the addition of *Sphingomonas macrogoltabidus*, *Micro bacterium liquefactionis*, and *Micro bacterium arabinogalactanolyticum* to *Alyssum murals* grown in serpentine soil significantly increased the plant uptake of Ni when compared with the un-inoculated controls as a result of soil pH reduction. However, heavy metals are known to be toxic to plants and most organisms when present in soils in excessive concentrations. Giller et al. (1998) reported that there was a detrimental effect to soil microbial diversity and microbial activities (indexes of microbial metabolism and of soil fertility) in metal-polluted environment. The specificity of the plant-bacteria interaction is dependent upon soil conditions, which can alter contaminant bioavailability, root exudates composition, and nutrient levels. In addition, the metabolic requirements for heavy metals remediation may also dictate the form of the plant-bacteria interaction i.e., specific or nonspecific. Along with metal toxicity, there are often additional factors that limit plant growth in contaminated soils including arid conditions, lack of soil structure, low water supply and nutrient deficiency.

- **Role of Rhizobacteria on Phytoremediation-**

Rhizosphere microorganisms, which are closely associated with roots, have been termed plant growth promoting rhizobacteria (PGPR) (Glick, 1995). Plant growth-promoting rhizobacteria include a diverse group of free-living soil bacteria that can improve host plant growth and development in heavy metal contaminated soils by mitigating toxic effects of heavy metals on the plants (Belimov et al., 2004). Table-2 Bioavailability of toxic heavy metals Soil rhizobacteria can also directly influence metal solubility by changing heavy metal speciation in the rhizosphere. Study of the roles of mycorrhiza in metal speciation in the rhizosphere and the impact on increasing host plant tolerance against excessive heavy metals in soil showed that speciations of Cu, Zn and Pb changed significantly in the rhizosphere of AM (arbuscular mycorrhiza) infected and non-infected maize in comparison to bulk soil; The greatest change was exchangeable Cu that increased by 26% and 43% in non-infected and AM-infected rhizosphere, respectively, than in bulk soil. With the exception of organic bound Cu in AM, other speciations were stable in the rhizosphere of AM and non-AM treatments. It is understandable that Cu was activated by inducing rhizobacteria (Huang et al., 2005). The organic bound Zn and Pb increased significantly in the rhizosphere in comparison to those in the bulked soil. In contrast, carbonate and Fe-Mn oxides of Zn and Pb did not exhibit significant changes. The results might indicate that mycorrhiza could protect its host plants from the phytotoxicity of excessive copper, zinc and lead by changing the speciation from bioavailable to the non-bioavailable form. The fact that copper and zinc accumulation in the roots and shoots of mycorrhiza infected plants were significantly lower than those in the non-infected plants might also suggest that mycorrhiza efficiently restricted excessive copper and zinc absorptions into the host plants (Huang et al., 2005).

- **Rhizofiltration-**

It is defined as the use of plants, both terrestrial and aquatic; to absorb, concentrate, and precipitate contaminants from

polluted aqueous sources with low contaminant concentration in their roots. Rhizofiltration can partially treat industrial discharge, agricultural runoff, or acid mine drainage. It can be used for lead, cadmium, copper, nickel, zinc and chromium, which are primarily retained within the roots. The advantages of rhizofiltration include its ability to be used as in-situ or ex-situ applications and species other than hyper accumulators can also be used. Plants like sunflower, Indian mustard, tobacco, rye, spinach and corn have been studied for their ability to remove lead from effluent, with sunflower having the greatest ability. Indian mustard has proven to be effective in removing a wide concentration range of lead (4 – 500 mg/l). The technology has been tested in the field with uranium (U) contaminated water at concentrations of 21-874 µg/l; the treated U concentration reported by Dushenkov was < 20 µg/l before discharge into the environment.

- **Future of Phytoremediation-**

One of the key aspects to the acceptance of phytoextraction pertains to the measurement of its performance, ultimate utilization of by-products and its overall economic viability. To date, commercial phytoextraction has been constrained by the expectation that site remediation should be achieved in a time comparable to other clean-up technologies. So far, most of experiments have taken place in the lab scale, where plants grown in hydroponic setting are fed heavy metal diets. While these results are promising, scientists are ready to admit that solution culture is quite different from that of soil. In real soil, many metals are tied up in insoluble forms, and they are less available and that is the biggest problem, said Kochian. The future of phytoremediation is still in research and development phase, and there are many technical barriers which need to be addressed. Both agronomic management practices and plant genetic abilities need to be optimised to develop commercially useful practices. Many hyper accumulator plants remain to be discovered, and there is a need to know more about their physiology. Optimisation of the process, proper understanding of plant heavy metal uptake and proper disposal of biomass produced is still needed. One of the key aspects to the acceptance of phytoextraction pertains to the measurement of its performance, ultimate utilization of by-products and its overall economic viability. To date, commercial phytoextraction has been constrained by the expectation that site remediation should be achieved in a time comparable to other clean-up technologies. So far, most of the phytoremediation experiments have taken place in the lab scale, where plants grown in hydroponic setting are fed heavy metal diets. While these results are promising, scientists are ready to admit that solution culture is quite different from that of soil. In real soil, many metals are tied up in insoluble forms, and they are less available and that is the biggest problem, said Kochian. The future of phytoremediation is still in research and development phase, and there are many technical barriers which need to be addressed. Both agronomic management practices and plant genetic abilities need to be optimised to develop commercially useful practices. Many hyper accumulator plants remain to be discovered, and there is a need to know more about their physiology. Optimisation of the process, proper understanding of plant heavy metal uptake and proper disposal of biomass produced is still needed.

- **Effect Heavy Metals toxicity in soil-**

Heavy metals are elements having atomic weight between 63.54 and 200.59, and a specific gravity greater than. Trace amount of some heavy metals are required by living organisms, however any excess amount of these metals can be detrimental to the organisms. Nonessential Heavy metals include arsenic, antimony, cadmium, chromium, mercury, lead, etc; these metals are of particular concern to surface water and soil pollution. Stimulation of transport protein. Bacterial survival and proliferation in the environment as well as within various hosts are critically dependent on the uptake and sequestration of transition metals such as manganese, zinc, and iron. For example, cells may stringently regulate intracellular zinc levels, since high concentrations of zinc are toxic to cellular functions and have evolved several types of proteins involved in binding and transport of zinc (Claverys, 2001). Bacteria may also stimulate the sulfate transport protein, located in the root plasma membrane, which also transports selenate (Leggett and Epstein, 1956). Inorganic Hg uptake in higher plants has not been well investigated, but has been linked to the passive uptake of lipophilic chloride complexes in phytoplankton (Mason et al., 1996). Heavy metal toxicity consists of five main processes, shown in Table 2.

Table-2. Heavy metal toxicities include the following sources and Effect of contaminant.

S.N.	Metal	Sources	Effects
1	Arsenic	Industrial dusts, Polluted water.	Perforation of nasal septum respiratory cancer, peripheral neuropathy, dermatoses, skin cancer,
2	Cadmium	Industrial dusts & fumes & Polluted water & food.	Glucosuria, Osteomalacia, aminoaciduria and emphysemia.
3	Chromium	Polluted water & food, Industrial dusts.	Ulcer and respiratory cancer.
4	Lead	Industrial dusts & fumes & Polluted food.	Anemia, Peripheral, neuropathy.
5	Mercury	Industrial fumes, vapour, polluted water & food.	Chronic rhinitis and sinusitis, respiratory cancer, dermatitis.

III. CONCLUSION

Phytoremediation is a fast developing field, since last ten years lot of field application were initiated all over the world, it includes Phytoremediation of Organic, Inorganic and Radionuclide's. This sustainable and inexpensive process is fast emerging as a viable alternative to conventional remediation methods, and will be most suitable for a developing country like India. Most of the studies have been done in developed countries and knowledge of suitable plants is particularly limited in India. When evaluating the effect of rhizobacteria on phytoremediation in contaminated soil, regardless of the precise effects used by the bacterium to protect plants, the results from literature suggest that certain bacteria may eventually find a use in the development of phytoremediation strategies. In this regard, heavy metals may be removed from polluted soil either by increasing the metal-accumulating ability of plants or by increasing the amount of plant biomass. In heavily contaminated soil where the metal content exceeds the limit of plant tolerance, it may be possible to treat plants with plant growth-promoting rhizobacteria, increasing plant biomass and thereby stabilizing, revegetating, and remediating metal-polluted soils. However, there are many areas of poor understanding or lack of information where more research is needed. They include:-

1. Little has been done to investigate the microorganism induced changes in the rhizosphere of hyper accumulator plants in relation to metal accumulation. Similarly, it is difficult to clarify specific features of microbial-plant and microorganism-soil interactions in the rhizosphere.
2. Further research is also needed to quantify the effect of rhizospheric processes induced by rhizobacteria on the phytoavailability of heavy metals.
3. Minimal work has been done to examine heavy metal speciation changes in the rhizosphere and to determine whether such changes could have altered the accumulation and distribution of heavy metals.
4. Rhizobacteria encounter soil solution before it enters the root and the sequestration of heavy metals by rhizobacteria from soil solution may play an important part in plant metals uptake. The role played by bacteria from soil solution in plant Cd uptake is still poorly understood.
5. Finally, we need to further understand the mechanisms involved in mobilization and transfer of metals in order to develop future strategies and optimize the phytoextraction process. Such knowledge may enable us to understand the role and mechanism of soil rhizobacteria on phytoremediation.

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REFERENCES

- [1] Adriano D. C., (1986): Trace elements in the terrestrial environment. – Springer- Verlag, New York., pp. 533.
- [2] Alloway, B. J. (1990): – In Heavy Metals in Soils (ed Alloway B. J.), Blackie, Glasgow.
Henry J. R. (2000): In An Overview of Phytoremediation of Lead and Mercury. – NNEMS Report. Washington, D.C.; pp, 3-9.
- [3] Abou-Shanab RA, Angle JS, Delorme TA, Chaney RL, van Berkum P, Moawad H, Ghanem K, Ghazlan HA. Rhizobacterial effects on nickel extraction from soil and uptake by *Alyssum murale* . N Phytol. 2003;158(1):219–224. doi: 10.1046/j.1469-8137.2003.00721.x. [Cross Ref]
- [4] Abou-Shanab RA, Delorme TA, Angle JS, Chaney RL, Ghanem K, Moawad H, Ghazlan HA. Phenotypic characterization of microbes in the rhizosphere of *Alyssum murale* . Int J Phytoremediation. 2003;5(4):367–379. doi: 10.1080/16226510390268766. [PubMed] [Cross Ref]
- [5] Alloway, B.J. and Jackson, A.P. (1991): The behavior of heavy metals in sewage-sludge amended soils. – Sci. Total Environ. 100: 151-176.
- [6] Baker A.J.M, Walker P.L., (1990): in Heavy Metal Tolerance in Plants: Evolutionary Aspects. (ed Shaw AJ). – Boca Raton: CRC Press. pp 155–177
- [7] Body, P.E., Inglis, G.R. and Mulcahy, I. (1988): Lead Contamination in Port Pirie, South Australia. – Report No.101 Adelaide, SA
- [8] Barber SA, Lee RB. The effect of microorganisms on the absorption of manganese by plants. N Phytol. 1974;73(1):97–106. doi: 10.1111/j.1469-8137.1974.tb04610.x. [Cross Ref]
- [9] Bar-Ness E, Chen Y, Hadar Y, Marchner H, Romheld V. Siderophores of *Pseudomonas putida* as an iron source for dicot and monocot plants. Plant Soil. 1991; 130(1-2):231–241. doi: .1007/BF00011878. [Cross Ref]
- [10] Chander K, Brookes PC. Effects of heavy metals from past applications of sewage sludge on microbial biomass and organic matter accumulation in a sandy loam soil and silty loam UK soil. Soil Biol Biochem. 1991; 23(10):927–932. doi: 10.1016/0038-0717(91)90172-G. [Cross Ref]
- [11] Chaney RL, Brown SL, Li YM, et al. US-EPA “Phytoremediation: State of Science”, 2000 May 1-2. Boston, MA: 2000. Progress in Risk Assessment for Soil Metals, and In-situ Remediation and Phytoextraction of Metals from Hazardous Contaminated Soils.
- [12] Chaudri AM, McGrath SP, Giller KE. Survival of the indigenous population of *Rhizobium leguminosarum biovar trifolii* in soil spiked with Cd, Zn, Cu and Ni salts. Soil Biol Biochem. 1992;24(7):625–632. doi: 10.1016/0038-0717(92)90040-5. [Cross Ref]
- [13] Dueck TA, Visser P, Ernest WHO, Schat H. Vesicular-arbuscular mycorrhizae decrease zinc toxicity to grasses in zinc polluted soil. Soil Biol Biochem. 1986;18(3):331–333. doi: 10.1016/0038-0717(86)90070-2. [Cross Ref]
- [14] Duffy BK, Défago G. Zinc improves biocontrol of *Fusarium crown and root rot* of tomato by *Pseudomonas fluorescens* and represses the production of pathogen metabolites inhibitory to bacterial antibiotic biosynthesis. Phytopathology. 1997;87(12):1250–1257. [PubMed]
- [15] Reed, D.T., Tasker, I.R., Cunnane, J.C. and Vandegrift, G.F. (1992): – In Environmental Remediation Removing Organic and Metal Ion Pollutants. (ed G.F. Vandegrift, D.T. Reed and I.R. Tasker) Amer Chem Soc, Washington DC.; pp. 1-19.
- [16] McNeil, K. R. and Waring, S. (1992): – In Contaminated Land Treatment Technologies (ed. Rees J. F.), Society of Chemical Industry. Elsevier Applied Sciences, London.; pp. 143-159.
- [17] Smith, B. (1993): Remediation update funding the remedy. – Waste Manage. Environ. 4: 24-30.
- [18] Williams, G.M. (1988): Land Disposal of Hazardous waste. – Engineering and Environmental issues. pp 37-48.
- [19] Musgrove, S. (1991): – In, Proceedings of the International Conference on Land Reclamation, University of Wales. Elsevier Science Publication, Essex, U. K.
.29 . Mench, M.J., Didier, V.L., Loffler, M., Gomez, A. and Masson, P. (1994): – J. Environ. Qual. 23; 785-792.
- [20] Sadowsky, M. J. (1999): In Phytoremediation : Past promises and future practices. – Proceedings of the 8th International.
- [21] Smalle J, van der Straeten JD. Ethylene and vegetative development. Physiologia Plantarum. 1997;100(3):593–605. doi: 10.1034/j.1399-3054.1997.1000322.x. [Cross Ref]
- [22] Smith SE, Read DJ. Mycorrhizal Symbiosis. San Diego: Academic Press Inc; 1997.
- [23] Tam PCF. Heavy metal tolerance by ectomycorrhizal fungi and metal amelioration by *Pisolithus tinctorium* . Mycorrhiza. 1995;5(3):181–187. doi: 10.1007/s005720050057. [Cross Ref]
- [24] Whiting SN, de Souza MP, Terry N. Rhizosphere bacteria mobilize Zn for hyperaccumulation by *Thlaspi caerulescens* . Environ Sci Technol. 2001;35(15):3144–3150. doi: 10.1021/es001938v. [PubMed] [Cross Ref]
- [25] Yang X, Baligar VC, Martens DC, Clark PB. Plant tolerance to nickel toxicity. II. Nickel effect on influx and transport of mineral nutrients in four plant species. J Plant Nutr. 1996;19(2):265–279.

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Business Correspondent Model vis-à-vis Financial Inclusion in India: New practice of Banking to the Poor

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Abstract- Financial inclusion i.e., access to adequate and timely credit, and other financial services is of utmost importance for socio-economic development of poor and unbanked sections. It enables them to alleviate their poverty levels through self-employment generation and promotes them as a part of rural banking system. Accordingly, Indian Government is being initiated various financial measures in the banking sector, and different microfinance models have been playing an active role in providing microfinance and other financial services to the rural poor. However, despite these efforts, a large number of social groups remained excluded from the basic opportunities and services provided by the formal financial sector. In these circumstances, as a part of financial inclusion drive, Indian government with the help of Reserve Bank of India (RBI), has come up with a new model in the realm of banking sector, called as 'Business Correspondent (BC) model'. This model primarily aims at providing affordable banking facility to the hitherto unbanked population with the help of Information and Communication Technology (ICT) based application and capacity building. Against this backdrop, this paper attempts to introduce the concept of financial inclusion and highlights its need. It briefly reviews the Indian banking sector and reports the level of financial exclusion in India. In the second part, it provides a brief understanding on Business Correspondent model and emphasizes how BC model could significantly helps in promoting financial inclusion of the hitherto excluded population. It concludes by emphasizing some of the operational challenges in its functioning and suggests a way forward.

Index Terms- Business Correspondent Model, Financial Exclusion, Financial Inclusion, Self-help Groups.

I. INTRODUCTION

Financial inclusion is a global phenomenon that has gained wider currency in the development literature in contemporary times. Given the magnitude of poverty in the Third World economies, wherein a large segment of the population do not have access to basic financial services, the idea of financial inclusion – commonly understood as 'banking to all' – has become conspicuous in these economies. A recent United Nations (UN) study observes that financial inclusion of the poor is a global challenge to the achievement of the Millennium Development Goals (MDGs) (2006:1). This report draws attention to a plethora of problems that are being faced by poor in accessing financial services, and reveals the stark reality that a large number of people are not in a state of saving money as

formal banking services are not within their 'reach'.¹ According to this report, structural barriers prevent the poor from accessing banking facilities, thereby resulting in financial exclusion. The study further argues that the poor do not have savings bank accounts, let alone insurance policies (Ibid).

The increasing body of literature delves into the causes for financial exclusion. A recurring theme in financial exclusion is 'access to institutional finance' and lack of it, which not only leads to income inequality but also results in slower economic growth. Lack of access to adequate institutional credit and other financial services compel poor individuals and small enterprises to depend on their own limited savings and earnings. This restricts their choice to invest in their small business enterprises and take advantage of growth opportunities (Ellis, 2007:82; Kunt and Patrick, 2009:119; World Bank, 2012: ix). Outlining the causes of financial exclusion, Arora points out that poor human development, high illiteracy and poor awareness levels prevent a large section of the population, particularly women, from accessing basic financial services, which prevent them from reaping the benefits of formal financial institutions² (2012:179). Recent estimates show that, globally, over three billion people lack access to basic financial services, of which about 90 percent are from Africa, Asia, Latin America and the Middle East. This has led to a considerable demand from the developing countries for a more inclusive financial system that would cater to the demands of the poor in these regions (John, Julius and Worapot, 2009:55 and Consultative Group to Assist the Poor (CGAP), 2012:1).

The absence or the lack of formal institutional arrangements to provide sustainable financial services is believed to be one of the basic causes that force the poor to increasingly turn to and depend upon the informal financial institutions. For instance, the United Nations (2006:1) and CGAP (2012:1) reports assert that poor households with inadequate access to finance largely depend upon semi-formal or informal financial providers, such as private microfinance institutions (MFIs), pawnshops and conventional moneylenders, and other rotating savings and credit associations. However, these informal financial institutions seem

1 Here, the term 'reach' not only signifies the availability of various financial services, but also accessibility related issues.

2 Primary activities of a financial institution is buying, selling or holding financial assets. Financial institutions provide various types of financial services. Formal financial institutions such as banks, credit unions, post offices etc. largely run by Government. For more details on Indian financial system, see Ratti (2012), Indian Financial System & Indian Banking Sector: A Descriptive Research Study, pp.1-8.

to be less reliable and insecure, and also expensive than the formal financial institutions. Inadequate access to financial services, along with the overarching dominance of the informal financial providers, may impede the decision-making capability of the poor as they are restrained from making a rational choice while deciding the investments.

Given this background, financial inclusion is increasingly becoming a major focus of research, and the recent literature on the subject focuses on emphasizing the possibilities and prospects of well-designed financial arrangements. Scholars note that better financial services lead to the social and economic development of the rural population. With a view to economic development, scholars argue, a 'well-functioning financial system'³ with access to adequate institutional finance enables the poor to start investing money in various income-generating activities and maximize the returns, and reduce their vulnerability to the financial risks that they encounter in their daily lives. It helps to bring poor people into the mainstream of the economy, and allows them to contribute more actively to their personal economic development. It enhances mobilization of savings and contributes to economic growth by supporting capital accumulation. While correlating access to banking in terms of savings with social development, it is argued that savings in banks enable the poor to invest in education and health that facilitate a better living standard, along with a marked social development. Having a bank account and access to other financial services through formal financial institutions helps the low-income segments to accumulate funds in a secure place. This, in turn, will have a sobering influence on the informal sector, and hence benefiting those who were otherwise excluded from it (Kirkpatrick, 2000:366; United Nations, 2006: iii; Ellis, 2007:82; Beck, et al., 2009: 120).

II. FINANCIAL EXCLUSION

Financial exclusion is broadly related to lack of adequate access to a range of financial services. People belonging to the lower income strata are unlikely to get access to mainstream financial services and products, and reap the benefits out of it. Further, it prevents the poor and disadvantaged segments in

3 A financial system is the set of institutions and of institutional arrangements that have been established to serve the financial needs of the people. The main objectives of a financial system are to meet the borrowing requirements of business firms, individuals and government; to gather and to invest savings; and to provide a payment mechanism. A well-functioning financial system has some important characteristics. Those are as follows: (i) a clear and appropriate policy regulatory framework that is implemented effectively; (ii) adequate, credible information available to different market players (including providers, consumers and regulators); (iii) appropriate knowledge-based services to the same players; (iv) access to an effective payments infrastructures; (v) effective competition between suppliers; (vi) a diversity of sustainable suppliers and (vii) an innovation in products and process. For more details, see Ratti (2012), Indian Financial System & Indian Banking Sector: A Descriptive Research Study, pp.1-8.

taking key decisions regarding human and physical capital accumulation. Given the above, the repercussions of financial exclusion could be a far-reaching, which not only destabilize the livelihood opportunities but also push them into a complex phenomenon of 'poverty trap'⁴ (Mahmoud et al., 2011:5 and Joshi, 2011:81). Some scholars extend this argument beyond accessibility dimension by relating financial exclusion to income status of the poor. Income levels of an individual in any country determine the propensity to save from it. Underlining this view, Joshi (2011:14) observes that majority of population in India neither has savings accounts nor receives credit from formal financial institutions. They seldom make or receive payments through formal financial institutions. Apart from access and income dimension, Sharma (2008:3) discusses that exclusion can be due to problems related with geographical conditions, transaction cost, lack of experience in marketing or self-exclusion in response to negative experiences or perceptions. It is becoming clear from the above arguments that financial exclusion is primarily due to lack of income, access and limited exposure to the financial sphere. These constraints invariably have serious repercussions on living standards of the poor.

III. INDIAN BANKING SECTOR AND LEVEL OF FINANCIAL EXCLUSION

Banking system forms the fulcrum of financial system in India. It carved out a niche in the public sector by providing a variety of financial services to the people. Post independent India (particularly during 1947-1980) has initiated several measures in the banking sector such as state cooperative banks (1955), the Reserve Bank of India (1955), nationalization of banks (1969) and creation of Regional Rural Banks (1976) etc. (Misra et al., 2008:279). The 1980s had witnessed a significant shift in the Indian rural credit by setting up of National Bank for Agricultural and Rural Development (NABARD). This period was marked by the active involvement of RBI and NABARD in providing microcredit to the rural poor. Banks allocated large proportions of credit to priority sector, including agriculture,

4 It is argued that poverty traps exist and account for the continued existence of poverty in low-income economies, and there are many factors which contribute to poverty trap in these countries. A poverty trap arises when poor individuals with limited access to credit and capital markets, low income or asset endowments and poor infrastructure. The Chronic Poverty Report (2008-09) identifies five main traps that underpin poverty. Those are (i) insecurity, (ii) limited citizenship (iii) spatial disadvantage (iv) social discrimination and (v) poor work opportunities. The report analyses that the poor people frequently live in insecure environments and they have limited assets or entitlements to cope with the shocks and stresses. They do not have meaningful political voice and lack effective political representation. Remoteness, lack of political representation, weak economic integration, lack of access to public and private goods and services and work opportunities etc put them under poverty trap. For more details see, The Chronic Poverty Report (2008-09), "Escaping Poverty Traps", Chronic Poverty Research Centre.

small-scale industries and other sectors; and identified them as critical for bringing about economic and social change in rural areas (Basu, 2008:20). In addition to these, financial reforms were initiated in the banking sector in the early 1990s to create an efficient, competitive and stable financial sector and to enhance the efficiency and profitability of the banking system. During this phase, the banking sector had introduced two innovations in the rural credit structure. These include the initiation of microfinance scheme by the NABARD (1992) and launching of the Kisan Credit Card⁵ (KCC) scheme (1998) by RBI. Both innovations exclusively targeted to cater to the financial needs of the farmers, the poor and women to improve their socio-economic conditions (Government of India, 1999:61). Despite a well-developed banking system in India, a large number of groups remain excluded from the basic opportunities and services provided by the financial sector for a variety of supply and demand side reasons.⁶ In one of the major and first of its kind, the All India Rural Credit Survey (AIRCS) in 1954 documents that the credit needs of the financially excluded population are often met by the informal, non-institutional sources rather than the formal institutions. The excluded sections are drawn from the small and marginal farmers, women, unorganized sector workers including artisans, the self-employed and pensioners (Dev, 2006: 4310). A more recent study on financial exclusion in India point out that only 55 percent of the population have deposit accounts, while only a handful 9 percent have credit accounts with banks. Indeed, India has the highest number of households (145 million) that are excluded from banking system (Biju, 2013:57). The 59th round survey of National Sample Survey Organization (NSSO) (2008) reports that 89 million farmer households in the country (73%) do not have access to credit either from institutional sources. Among the excluded, the plight of financial exclusion of the dalit households is deplorable. The All India Debt and Investment Survey (AIDIS) (2002-03) claims that dalit households in rural India obtained more than half of their total debt from informal sources. The share of formal sources in the total debt of these households was only 44.8 percent, lower than the corresponding share of 59 percent for non-dalit households. Among informal sources,

conventional moneylenders were the predominant sources of debt for these households⁷.

In terms of region-wise, the report of the Committee of Financial Inclusion (2008:5) observes a geographic dimension to understanding the extent of financial exclusion. The report cites that, inaccessibility, distance and lack of proper infrastructure are the reasons for financial exclusion in a country like India with a large rural population. Thus, the report underscores the need for expansion of geographical coverage and ensuring outreach of various financial services to the entire population without any demand and supply constraints. This strengthens the fact that financial exclusion in India is high in general, and it also varies widely across regions and social groups in India. Thus, the absence of institutional credit and the vacuum created by the state as a major credit facilitator was gradually filled up by the private sector. Under these conditions, in order to provide an alternative banking structure to branch-based banking services, the RBI in the year of 2006 adopted the technology based agent bank model through Business Correspondents (BCs)/ Business Facilitators (BFs) model.

IV. BUSINESS CORRESPONDENT MODEL

With the objective of ensuring greater financial inclusion and increasing the outreach of the banking sector, the RBI in the year 2006 adopted the technology based agent bank model through business correspondent (BC)/business facilitator (BF). It is being acknowledged as an alternative banking structure to branch-based banking services, which enables public sector banks to use the services of Non-Governmental Organisations/Self-Help Groups (NGOs/SHGs), Microfinance Institutions (MFIs) and other Civil Society Organizations (CSOs) as intermediaries in providing financial and banking services (RBI, 2006). The model primarily intended to reach out to the geographically diverse population, particularly rural areas and those who remained financially excluded from the mainstream banking fold. The significant feature of this model is to ensure doorstep delivery of financial products and services to the above said sections. According to the RBI guidelines, the BCs are permitted to carry out financial transactions on behalf of bank agents, which is called as branchless banking. This model is being aided by technology oriented tools as point of service handheld devices, mobile phones and a biometric scanner (Karmakar, 2009:7).

Frost and Sullivan (2009) are of the view that the BC is an authorized agent to undertake transactions on behalf of a specified bank. The BCs or bank agents have the advantage over bank branches as they can deliver banking services doorstep across the geographical landscape. One of the significant advantages of this model is that it helps people to overcome regional barriers of language and culture, and inadequate infrastructure in rural areas. Khan (2012:1450) stresses that BCs can bridge the gap between the service providers (the banks) and the service seekers (clients) who are under-served and unbanked;

5 The Government of India (GoI) introduced Kisan Credit Card (KCC) scheme in August 1998, which aims at providing adequate and timely support in a flexible and cost-effective manner to farmers by catering to their cultivation needs, including the purchase of seeds, fertilizers, pesticides and livestock. Currently KCC is being implemented by all the District Central Cooperative Banks, Regional Rural Banks (RRBs) and Public Sector Commercial Banks throughout the country. As on 31 March 2012, the banking system has issued 11.39 crore KCCs. The total amount sanctioned is INR. 5, 72,617 crore. See NABARD Annual Report, 2011-12: 63.

6 In India there are 30,000 rural and semi-urban commercial banks, 14,000 Regional Rural banks (RRBs), around 12,000 District Cooperative Credit Banks (DCCBs) and 1,12,000 Primary Agricultural Credit Societies (PACS) at the village level (however, around 66,000 PACS are stated to be functional; the remaining are dormant) [Report of the Steering Committee on Micro-Finance and Poverty Alleviation, 2007:12].

7 Cited in Pallavi (2007): Access to Bank Credit: Implication for Dalit Rural Households, Economic and Political Weekly, p.3219.

and this model evolved to counter the scarcity of required manpower to reach all people in the current banking system. The following table provides an understanding of the BC Model.

Table. I: Salient Features of BC Model

Salient Features of BC Model	Guidelines for engaging BCs
Applicable to	The scheduled commercial banks including RRBs and Local Area Banks (LABs). The banks may formulate a policy for engaging BCs with their Board's approval.
Eligible individual/entities as BC	<ul style="list-style-type: none"> • Individuals like retired bank employees, retired teachers, Retired bank employees, retired teachers, retired government employees and ex-servicemen, individual owners of kirana/medical/Fair Price shops, agents of Small Savings schemes of Government of India/Insurance Companies, authorized functionaries of well run Self Help Groups (SHGs) which are linked to banks etc. • NGOs/MFIs set up under Societies/Trust Acts and Sections 25 Companies; • Cooperative Societies registered under Mutually Aided Cooperative Societies Acts; • Post Offices; and • Companies registered under the Indian Companies Act, 1956 with large and widespread retail outlets. <p>The banks will be fully responsible for the actions of the BCs and their retail outlets/sub agents.</p>
Scope of activities may include	<ul style="list-style-type: none"> • Identification of borrowers • Collection and preliminary processing of loan applications including verification of primary information/data; • Creating awareness about savings and other products and education and advice on managing money and debt counseling; • Processing and submission of applications to banks; • Promoting, nurturing and monitoring of Self Help Groups/Joint Liability Groups/Credit Groups/others; • Post-sanction monitoring; • Follow-up for recovery, • Disbursal of small value credit, • Recovery of principal/collection of interest • Collection of small value deposits • Sale of micro insurance/mutual fund products/pension products/other third party products and • Receipt and delivery of small value remittances/other payment instruments. <p>The above activities can be conducted by BCs at places other than bank's premises.</p>
KYC norms	Banks may use the services of BC for preliminary work relating to account opening formalities. However, ensuring compliance with KYC norms under the BC model continues to be the responsibility of banks.
Payment of commission/fee	The banks may pay reasonable commission/fee to the BC but the BCs cannot charge any fee to the customers directly for services rendered by them on behalf of the bank. The banks (and not BCs) are permitted to collect reasonable service charges from customers in a transparent manner.

Source: FICCI (2012), Promoting Financial Inclusion: Can the constraints of political economy be overcome?, FICCI Federation House, New Delhi.pp.66-67.

V. BUSINESS CORRESPONDENT MODEL VIS-A-VIS FINANCIAL INCLUSION: THE POSSIBILITIES

BC model aims at developing and strengthening the relationship between unbanked people and the formal financial

system. The salient features of this model include identifying the borrowers, collection and verification of loan applications, creating awareness on various financial services, products and transactions, post-sanction monitoring, collection of small value deposits etc. The best advantage through BC model is, on the one hand banks get vast exposure to the rural population without its physical presence in terms of branches while on the other the unbanked people belonging to the remote areas get easy access to basic banking facilities at their doorstep by the person among themselves. It also promotes and nurtures SHGs/JLGs wherever relevant and works as a potential contributors in creating awareness about various financial operations. It is, therefore recognized as an economically feasible and customer-friendly banking model for the poor

Scholars note that under BC model, an authorized agent (who may or may not be a direct employee of the financial institution) personally travels within a wide geographical area, particularly rural regions, to enroll people as bank clients, and further delivers loans, and collects repayments (Frost and Sullivan, 2009:19). On the functioning of the BC model, the report of the committee of financial inclusion (2008:ii) observes that adopting appropriate technology enables the business correspondent directly go to the customer instead of the other way round. Banks can use the services of BCs for opening a bank account, under the compliance with KYC norms⁸. The RBI guidelines strictly instructed the banks to ensure that BCs cannot charge any fee to the customers for services on behalf of the bank. Recently, the RBI has expanded the scope of BC model responding to government policy of opening 'no frills accounts'⁹ and some of the electronic benefits has been transferred to these accounts to process government payments such as the National Rural Employment Guarantee Scheme, Pensions and other social payments with the help of POS devices (CGAP, 2012:3). In this regard, BC models can have the potential to deliver the services even to the rural and geographically typical regions, which is one of the core strategies of accelerating financial inclusion.

8 With a view to simplify the applying procedures for the customers, the Reserve Bank India introduced Know Your Customer (KYC) norms in August 2005. According to the RBI norms, banks can accept any evidence to their satisfaction for establishing the identity and address proof of the customer. In other words, these KYC norms simplified the procedures to open an account for those whose financial transactions are of modest amounts. See Ramji (2007:16).

9 The 'no-frills account' (NFA) is an important financial product that allows financially excluded individuals to access banking services with low or nil minimum balances; and also either with low or no charges. NFA encourages the poor people to save more by providing the credit in the form of overdraft facility. See Khan (2012).

Table.II: Key Statistics of BC model

Key Statistics on BC model upto March, 2013	
Total No. of Bank Branches	105753
Rural Bank Branches	39336
No. of BCs appointed by banks	195380
No. of villages covered under BC model	221341
No. of Point of Sale (POS) devices installed	967740

Source: Reserve Bank of India, Census 2011: Telecom Regulatory Authority of India.

VI. ISSUES AND CHALLENGES

Although BC model shows great promise and holds potential to cater the financial needs of the rural unbanked populace, the experiences are still mixed. Some of the major reports argue that the model has not taken off in the way it was envisioned in 2006. As far as the viability of this model is concerned, CGAP report (2013:4) reveals the existing regulations do not allow sufficient flexibility for the BC arrangement to be viable. It argues that most of the banks have not really encouraged and promoted the BC banking channel, as required. Further, the report adds, majority of the no-frills accounts opened under this model are not operational. Opening of such accounts to provide deposit services, in order to make these accounts profitable, have not made the desired progress. This has made it unviable for the banks to consider this framework further. Similarly, RBI annual report (2011-12) observes, despite the efforts of the banks to provide training to BC staff, the capacity for internalizing new technologies, new products and systems remain a big challenge. From the business correspondent's perspective, it is pointed out that mobilizing communities for accessing financial services, particularly savings, became a big challenge for them. Due to shortage of sufficient funding, BCs at the village level are unable to mobilize and conduct group meetings in the case of SHGs/JLGs to explain the advantages and to promote BC model.

Pertaining to the performance of the BC model, FICCI's Report (2012:34) highlights the lacunae regarding the recruitment of BCs and functioning of BC model. It identifies that although RBI permitted variety of individuals to work as BCs, very few have been engaged by banks. Regarding the performance of BC staff, the report throws a light on lack of professional orientation. It identifies that they are mostly irregular in the maintenance of records and delay the processing of loans, which subsequently generates a low volume of business for banks. With regard to the operational aspects, it observes that the handling of a large amount of cash is risky, particularly in the hilly regions due to higher security risks, difficult terrain and poor connectivity. Since the BC staff often operates in isolation, there are high chances of fraud and misappropriation. RBI's report on Business Correspondent model (2009:7) reveals that computer based technology is an issue because of lack of standard-training and maintenance. Due to the absence of appropriate technology, BC face problems in finger print storage and retrieval needs. Above all, lack of proper financial education of the clientele is a barrier to the effective utilization of the banking facility provided to the clients through this model.

VII. WAY FORWARD

The literature on this subject comes up with certain measures that would address some of the critical challenges faced by the BC model. In fact, it requires a holistic approach on the part of banking sector, business correspondents and customers as well to improve its service offerings and financial performance. Without an operationally and financially viable channel, the promise of reaching basic financial services to the underprivileged and unbanked population will not likely be possible with the BC model. In this concern, the banks ought to play an instrumental role in developing and promoting BC model. Besides, the banks also create awareness on easy accessing and optimum utilization of various financial services under BC framework. The RBI review report on BC model (2009:16) recognizes the fact that the process of financial inclusion involves the three critical aspects: (i) access to banking markets, (ii) access to credit markets and (iii) financial education. It is, therefore the BC model should encompass each of the above three aspects in order to be able to address the issue of financial inclusion in a holistic manner.

Grameen Foundation report (2013) suggests that the technology and infrastructure should be robust and easily upgradable. Importantly, it should be cost effective. Training of BCs and financial literacy must be emphasized. BC model should be customer centric, in which it must address customer needs, delivers high quality demand-driven services and invest in customer awareness. The end beneficiaries need to be financially literate to make apt use of banking services. Particularly, women and low-income groups must cultivate the habit of utilizing all available financial services and products under this model, which is essentially redesigned and aimed at their economic upliftment. Given the right impetus by the banks and other financial institutions, the BC banking channel has the great potential to ensure the process of financial inclusion and bring the rural unbanked population within the banking fold.

REFERENCES

- [1] Basu, Priya. "A Financial System for India's Poor", Economic and Political Weekly, Vol. 40, No. 37, pp. 4008-12, 2005.
- [2] Beck, Kunt and Patrick. "Access to Financial Services: Measurement, Impact and Policies", The World Bank Research Observer, Vol. 24, No. 1, pp.122-33, 2009.
- [3] Dev, Mahendra S. "Financial Inclusion: Issues and Challenges", Economic and Political Weekly, 2006, Vol. 41, No. 41, pp. 4310-13.
- [4] Ellis, Karen. "Is Financial Liberalization enough to promote Financial Inclusion?", Overseas Development Institute, Working paper, 2009, pp.82-83.

- [5] Frost and Sullivan. "Bringing financial services to the masses: An NCR White Paper on Financial Inclusion", NCR Corporation, 2009, pp. 54-61.
- [6] Joshi, Deepali Pant, The Financial Inclusion Imperative and Sustainable Approaches. Delhi: Foundation Books, 2011, pp.13-19.
- [7] Karmakar, K.G. and Mohapatra, N.P. "Emerging Issues in Rural Credit", The Microfinance Review, 2009, Vol.1, No. 1, pp.1-17.
- [8] Karmakar, K.G. et al. Towards Financial Inclusion in India. New Delhi: Sage Publications. 2011.
- [9] Khan, R. Harun. "Issues and Challenges in Financial Inclusion: Policies, Partnerships, Processes and Products", RBI Monthly Bulletin, 2012, pp.1447-57.
- [10] Kirkpatrick, C. "Financial Development, Economic Growth, and Poverty Reduction", The Pakistan Development Review, 2000, Vol. 39, No. 4, pp.363-88.
- [11] Mahmoud, Mohieldin, Iqbal Zamir, and Xiaochen Fu. "The Role of Islamic Finance in Enhancing Financial Inclusion in Organization of Islamic Cooperation (OIC) Countries", Policy Research Working Paper, World Bank, 2011, No.5920, pp.1-17.
- [12] Misra, Biswa Swarup and. Rau, P.K. Regional Rural Banks in India: Past, Present and Future. In Maboranjan Sharma (ed.), Dynamics of Indian Banking: Views and Vistas. New Delhi: Atlantic Publishers & Distributors (p) Ltd, 2008, pp.274-93.
- [13] Pallavi, Chavan. "Access to Bank Credit: Implication for Dalit Rural Households", Economic and Political Weekly, 2007, Vol. 42, No. 31, pp.3219-24.
- [14] Ramji Minakshi. "Financial Inclusion in Gulbarga: Finding Usage in Access", Institute for Financial Management and Research, Centre for Microfinance, Working paper series, 2009, No.26. pp.1-36
- [15] Ratti, Indian Financial System & Indian Banking Sector: A Descriptive Research Study, 2012 pp.1-8.
- [16] Sharma, M. "Index of Financial Inclusion A Concept Note", ICRIER Working paper No. 215, Indian Council for Research in International Economic Relations, New Delhi June 2008, URL: <http://www.icrier.org/pdf/mandira>
- [17] World Bank. "Finance for All?: Policies and Pitfalls in Expanding Access", World Bank Policy Research Paper, Washington DC. 2008.
- [18] World Bank. "Banking the Poor: Measuring Banking Access in 54 Economies", World Bank Research Paper, Washington DC, 2009.

Reports:

- [19] CGAP. "Business Correspondents and Facilitators: Pathway to Financial Inclusion?", Access Development Service, New Delhi. 2012.
- [20] Consultative Group to Assist the Poor (CGAP). "Advancing Financial Access for the World's Poor", CGAP, Washington, USA, 2012, pp.1-5.
- [21] FICCI. "Promoting Financial Inclusion: Can the constraints of political economy be overcome?", FICCI Federation House, New Delhi. 2012.
- [22] NABARD. "Status of Micro Finance in India 2009-10", 2011. URL: <http://www.nabard.org>
- [23] RBI Report. "Basic statistical returns of scheduled commercial banks in India", 2009. URL: <http://www.rbidocs.rbi.org.in/rdocs/Publications/PDFs/77950.pdf>
- [24] Report of the Committee on Financial Inclusion, Chaired by Dr. C. Rangarajan, January 2008. URL: <http://www.nabard.org/reportcomfinancial.asp>
- [25] World Bank. "Finance For All", World Bank Policy Research Report, Washington DC. 2008.
- [26] Report of the Steering Committee on 'Micro-finance and Poverty Alleviation: The Eleventh Five Year Plan (2007-08 - 2011-12)', Development Policy Division, Planning Commission, Government of India, New Delhi. 2012. pp.1-48.
- [27] RBI Report of the Working group to review the Business Correspondent Model. RBI. 2009.
- [28] The Chronic Poverty Report (2008-09), "Escaping Poverty Traps", Chronic Poverty Research Centre. 2009, pp.54-67. United Nations. "Building inclusive financial sectors for development". New York: United Nations. 2006.

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Captive breeding of endangered Barbs *Pethia manipurensis* (Menon et.al, 2000) by oral delivery of gonadotropic signaling molecular analogue WOVA-FH

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Abstract- Oral delivery of a salmon gonadotropic signaling molecules WOVA-FH @ of 0.2-0.4 mlkg⁻¹ to endangered Barbs *Pethia manipurensis* to induced spawning of 42-100% within 8-10 hr.

Index Terms- Ornamental fish, endemic, endangered species, artificial spawning, reintroduction

I. INTRODUCTION

Freshwater fish subfamily (Cyprininae) includes barbs which are characteristic in having large scales, bright colours, schooling behaviour and are easy to maintain and breed which made them popular in the aquarium trade (Clyde, et.al., 1997). *Pethia manipurensis* locally known as Ngaka meingangbi in Manipuri is an economically important fish for preparation of Hentak and Ngari, the two important solid substrate fermented fish products which enhance flavour of food for Manipuri (Sarojnalini and Vishwanath, 1988). The fish is having a medium value as fresh used to add flavour to vegetable curry preparation after smoking and drying. The fish also fulfils all the characters of ornamental fishes i.e., beautiful colourations, adaptability to aquarium condition, acceptable to artificial and natural food, peaceful nature etc., thus the fish becomes an ornamental species. The species is endemic to Chindwin basin (Vishwanath *et al.*, 2007). The fish is categorised under threatened according to the (IUCN 2010). In their natural habitats the species breed in ponds, lakes, paddy fields, rivers, streams and small pits. Artificial induction spawning behavior in *Puntius ganionotus* (Bleeker) was done by Liley and Tan (1895). Effect of ultrasonic sound on breeding performance of *Puntius sarna* (Hamilton) was done by Maily *et al.*, (2006). Orally induced spawning of Thai carp followed by co-administration of Gly 10 (D-Arg 6) SGnRH ethylamide and domperidone was done by Sukumaravin *et al.*, (2006). The species will be of important for the ornamental fish culture and sun dried fish for the preparation of a Hentak a fermented fish product of Manipur. Hence in order conserve the fish as well as to meet the demand of the fish for ornamental fish culture seed production of the fish is important. However, no experiment has been so far conducted on induced breeding of *P. manipurensis* with synthetic hormone WOVA-FH and any other hormones till date. The objective of the experiment is induced breeding of *P. manipurensis* by oral delivery of hormone

WOVA-FH a synthetic gonadotropin releasing hormone analogue (SGnRH).

II. MATERIAL AND METHODS

Fishes were collected by netting from Leimeram waterfall and streams of Baruni hills Chindwin basin. Live fishes were transported to the laboratory in polythene bags partially filled with oxygen by following the method of Esther (2008). For identification of fish, Kulander and Fang (2005) were followed for measurements and counts. Measurements were taken point to point with disital calipers measuring to 0.1 mm. Count were made on the left side of the species by using stereo zoom microscope. The technique of Clyde (1997) was followed for culture in aquarium. Fish were culture in laboratory aquaria of size 90 × 45 × 30 cm. Temperature of air and water were measured using a mercury thermometer. The pH of water was measured by digital pH meter and dissolved oxygen (DO) was measured by Winkler's Method (1948). Free CO₂ (FCO₂), Carbonate (CO⁻) alkalinity and Bicarbonate alkalinity (HCO₃) were measured by Welch Method (1888). Maturities of fishes were assessed on the basis of genitalia, oozing milt, swollen vent, body colouration and roughness body and pectoral fin. The experiment was conducted on 2+ year old *Pethia manipurensis* of 2-3 g body weight 20 gravid females and 40 males (n=60) in 20 aquarium sizes of 90 × 45 × 30 cm. Fish were kept starvation for one night. Artificial feed of fish were mixed with synthetic hormone WOVA-FH and fish were feed in the early morning at different doses @ 0.2-0.4mgkg⁻¹. After feeding the hormonal feeds, the brooders were randomly distributed into different aquaria at the male to female ratio of 2:1. After spawning the fecundity of each female was determined by randomly taking samples of eggs in a 10 ml graded tube. Total number of eggs in 1ml was counted and was multiplied by the total volume of eggs released. Fertilisation rates of eggs were determined by randomly taking a sample of approximately 100 eggs in a Petri dish. Only fertilized eggs with an intact nucleus were counted for the percentage of fertilization. The environmental conditions of breeding were as shown in Table 1. The significance of effects of WOVA-FH on the egg output, fertilization and hatching rate were calculated by analysis of variance (ANOVA) with a statistical software packaged SPSS version 17.0. The significance of the effects on the investigating traits was checked by F-test. A probability level of 0.05 was utilized to account for the statistical significance.

III. RESULT

Determination of optimum dose of WOVA-FH

Colouration of fishes increased after the injection of the hormones. A varied degree of hormonal response was observed in relation to different doses of the hormones. Chasing behavior was seen after 8-10 hr post oral delivery of feeds mixed with hormones. None of the control fish spawn, however all the groups delivered with WOVA-FH @ 0.2, 0.3 and 0.4 mlKg⁻¹ spawn successfully. One of the active male paired with female released milt, the female released eggs and external fertilization took place.

Effect of WOVA-FH on egg production, fertilization and hatching

Analysis of variance showed a significant effect (P < 0.5) of hormonal doses on egg output (P < 0.5) but the rate of fertilization was not significantly different between the treatments (P > 0.5). The lowest dose of WOVA-FH i.e., 0.2 mlkg⁻¹ led to 42.62 ± 3.625% spawning in females. The spawning rate and number of eggs in the fish treated either with CPE (Positive control) or with 0.4ml kg⁻¹ WOVA-FH were not statistically different (Table 1).

IV. DISCUSSION

Various environmental factors such as light, temperature, pH, DO., meteorological condition etc., are known to play important role in stimulating the release of gonadotropic hormones from the anterior lobe of pituitary glands within the organisms and thereby controlling breeding behaviors of fish (Motilan, et. al., 2013). Secretion of gonadotropic hormone and gene expression is controlled by the environmental factors (Ralston, et. al., 2008). However, the optimum environmental condition for natural breeding is not available in the aquarium. Hence, most of the fish lost their natural breeding behaviour. Gonadotropic Releasing Hormone (GnRH) is now the best available biotechnological tool for the breeding of fish (Bhattacharya, 2002 et. al). Synthetic hormone WOVA-FH oral delivery, at the doses of 0.4 mlkg⁻¹ body weight by-passes the environmental factors and is sufficient to induce 100% ovulation and spawning. WOVA-FH affected the percentage of fertilization, egg production and hatching rate. Similar observation was observed by Sukumaravin *et al.*, (2006) by oral delivery (50-100 µg kg⁻¹ body weight) and domperidone (25-50 mgkg⁻¹ body weight) to Thai carp. However no reports are available for standardizing the doses of WOVA-FH in *P. manipurensis*.

In the present observation, egg production, at the doses of 0.4 mlkg⁻¹ (6218.75 ± 32.75) is similar to that of crude pituitary extract (6464.25 ± 250.75). However, the egg production was significantly (P < 0.05) higher as compared to lower doses. This shows that the dose of 0.5 ml kg⁻¹ is significant to achieve ovulation with better results than with CPE. Similar results were obtained with *Anabas testudineus* that was treated with (0.3mlkg⁻¹) Ovateite (Bedajit *et al.*, 2011) and (0.3 mlkg⁻¹) WOVA-FH (Sarkar *et al.*, 2005), whereas Kuldeeg *et al.*, (2010) showed that higher doses of Ovaprim (1.5 mlkg⁻¹) is required to obtain early and extended normal spawning of *Anabas testudineus*. The objective of the present study was fulfilled and WOVA-FH

administration at a dose of 0.4 ml kg⁻¹ of body weight produces the highest spawning rate, egg production and hatching rate in *P. manipurensis*. The positive response of both male and female to a single dose of WOVA-FH is significant for commercial seed production and it can be utilized for species restoration, conservation. The experiment will also help in the income generation of the people.

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REFERENCES

- [1] Bedajit, Y., Saha H., Mandal. B and Tandal, R. 2011. Induced breeding in *Anabas testudinus* (Bloch, 1792) with Ovateite. The Israeli Journal of Aquaculture-Bamidgeh, IJA 63. 2011.766.
- [2] Bhattacharya, S., Dasgupta, S., Datta, M and Basu, D.2002. Biotechnology Input in Fish Breeding. Indian Journal of Biotechnology, 1: 29-38.
- [3] Clyde S., Tamaru, Cole. Richard, B. and Brown, C.1997. Manual for commercial production of Tiger Barb, *Copoptera tetrazona* temporary pair tank spawner. Center for Tropical Subtropical Aquaculture, Publication Number, 129. 1-48.
- [4] Kumar K., Mohanty. U. K., Dasgupta. S. and Sahu A. K. 2010. Induce Spawning of *Anabas* (*Anabas testudinus*, BLOCH) under captivity in pre-monsoon and monsoon months. Journal of Inland Fishery Society India, 42(2): 8-13.
- [5] Kullander S. O. and Fang F. 2005. Two new species of *Puntius* from Northern Myanmar. (Teleostei: Cyprinidae). Copeia, (2) 290-302.
- [6] Liley N. R. and Tan E. S. P. 1985. Artificial spawning behavior in *Puntius gonionotus* (Bleeker) by treatment with prostaglandins PGF₂. Journal of Fish Biology, 26.(5): 491-502
- [7] Motilan, Y., Bedajit., Y and Vishwanath, W. 2013. Induced breeding of carp minnow *Puntius chola* (Hamilton, 1822) with synthetic hormone WOVA-FH. NeBIO, vol. 4, no 3, pp. 21–23, 2013.
- [8] Ralston A and Shaw, K. 2008 "Environmental controls of gene expression," Sex determination and the onset of genetic disorders," Nature Education, vol. 1, p. 1,
- [9] Sarkar U. K., Deepak P. K., Kapoor D., Negi R.S., Paul S.K. and Singh, S. 2005. Captive breeding of climbing perch *Anabas testudineus* (Bloch, 1792) with WOVA-FH for conservation and aquaculture. Aquaculture Research, 36: 941-945.
- [10] Sarojinalini, Ch. and Vishwanath, W. 1988. Composition and digestibility of fermented fish foods of Manipur. Journal of Food Science Technology, 25(6): 349-351.
- [11] Sukumaravin, N., Leelapatra W., Lean E. Mc. and Donaldson E. M. 2006. Orally induced spawning of Thai carp *Puntius gonionotus* (Bleeker) following co-administration of des Gly¹⁰ (D-Arg⁶) s GnRH Ethylamide and domperidone. Journal of Fish Biology, 40(3): 477-479.
- [12] Tlusty, M. 2002. The benefits and risks of aquacultural production for the aquarium trade. Aquaculture, vol. 205, pp. 203–219
- [13] Winkler, L. 1888. The Determination Oxygen in Water, Mathematikais Terészettudományi Ertesit, vol. 6, pp. 273
- [14] Welch, P.S. 1948. Limnological methods. Mc Graw-Hill Book Cooperation New York, U. S. A. pp.1–38
- [15] Vishwanath W., Lakra W. S. and Sarkar, 2007. Fishes of North East India. National Bureau of Fish Genetic Resources (Indian Council of Agricultural Research) Lucknow.
- [16] W. Vishwanath, W., Ng, H.H., Britz, R., Singh, L.K., Shivaji, C and Conway, K. W. 2010 The status and distribution of freshwater fishes of the Eastern Himalaya region ICUN Red List, Status and distribution of freshwater biodiversity in the Eastern Himalaya, pp. 22–29

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Fig 1. Live photo of *Pethia manipurensis*

TABLE1: Physico-chemical parameters of the aquarium system

Atm.Temp (°C)	Water Temp(°C)	pH	DO (ppm)	FCO ₂ (ppm)	Carb.alk (ppm)	Bicarb.alk (ppm)
25 ±4.0°C	23± 2°C	6.8 ±0.9	7.2± 2.0	5±4	3±2	26±4

Table1. Result of induced breeding experiment of *Pethia manipurensis* by graded doses of WOVA-FH administered equally to males and females mlkg⁻¹ body weight.

Treatment (mlKg ⁻¹)	Spawning rate	Egg production (number g ⁻¹)	Fertilization rate (%)	Hatching rate (%)	Remarks
0.2	42.62 ± 3.625 ^a	2213.5 ± 167.5 ^a	87.295 ± 4.675	54.975 ± 3.225 ^a	Partial spawning
0.3	88.1 ± 3.6 ^b	3210.5 ± 81.5 ^b	88.95 ± 2.15	73.7 ± 3.2 ^b	Complete spawning
0.4	100 ^c	6218.75 ± 32.75 ^c	89.325 ± 2.125	92.525 ± 1.965 ^c	Complete spawning
100mg CPE	100 ^c	6464.25 ± 250.75 ^c	90.475 ± 2.075	81.525 ± 2.025 ^d	Complete spawning
0.5ml 0.7% saline	0	0	0	0	No spawning

Values are mean ± SEM (n = 5); different subscript letters indicate significant difference (p < 0.05). Spawning rate = number of fish spawned/total number of fish injected x 100 ; Egg production = number of egg released / g body weight of female; Fertilization rate (%) = total number of eggs having faint streak / total number of eggs in sample x 100; Hatching rate (%) = total number of hatched eggs as a percentage of tail of tail bud embryos.

A Study on Consumption Trends of Fuel Wood & their Impact on Forest in Kanker Forest Division of Chhattisgarh State (India)

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Abstract- The continuous dependency of man on fuel wood and service wood results in serious degradation of the forest in Kanker forest division. A study on the consumption trends of fuel wood & their impact on forest were carried out in Chivranj & Ichchhapur village of Kanker forest division of Chhattisgarh, and its rural environs. Results show that the villagers of Kanker are highly dependent on fuel wood for cooking purpose. In tribal village fuel wood are sold in the form of wood lots which contains about 20-30 kg fuel wood & averagely pricing about Rs. 110/ lots. Price value of these fuel woods varies from Rs. 20-30 according to their traders & fuel wood species. The rural population works under the community forest policy, but illegal harvesting in natural forests is indiscriminate and results in severe environmental degradation. This paper calls for some basic recommendations & guideline on sustainable management of these fuel woods & for reducing pressure on fuel wood consumption.

Index Terms- Fuel wood, Sustainable management, Consumption, Calorific value.

I. INTRODUCTION

Wood is one of the oldest source of energy and the commonest service material known to man & has been used for over 500000 years (Sharpe, 1976). Fuel wood gathered from the forest, either by lopping branches, collecting fallen wood or cutting down dry and diseased trees, is the most common source of domestic energy in the rural areas of many developing countries (Cecelski, Dunkerley and Ramsay, 1979). Demand for fuel wood, which together with animal dung and agricultural waste residue is one of the main cooking fuels, was thought to be leading to widespread forest degradation. There are

two ways relationship between fuel wood collection & deforestation. On the one hand, demand for fuel wood from common and forest causes resource degradation to the extent that collection exceeds sustainable yield. Forest degradation, on the other hand, leads to a mounting global 'fuel wood crisis' has been envisaged (Deweese, 1989). In addition, there are a number of other adverse consequences of forest degradation, including loss of biodiversity, deterioration of watershed management function, release of carbon into the atmosphere, soil erosion, etc.

II. STUDY SITE

The study was carried out in Kanker District to find out the consumption trend of fuel wood & their impact on forest. However sampling method was adopted for selecting village and forest compartments. Two villages namely Chivranj & Ichchhapur of Kanker district were surveyed. Village Chivranj & Ichchhapur is in the south of Kanker and is situated at a distance of 09 km & 11 km, respectively.

III. METHODOLOGY

A study has been conducted to record information on the fuel wood collection trend in tribal pockets of villages in Kanker forest division of Chhattisgarh State. The information was collected & recorded from tribal's interview of age group from 16 to 50 years and resided in villages of Kanker. The study revealed socio-economic survey, collection trend of fuel wood, quantity collection per household, time spend during fuel wood collection, collection season, collection rate, etc.

Table No. 01: Consumption of fuel wood in two villages of Kanker district (C.G.)

S.No.	Village	Total consumption in a week (in Kg)	Total Consumption in a year (in Quintal)
1.	Chivranj	79	300.25
2.	Ichchhapur	54	162.56
	Total	133	462.81

Table No. 02: Calorific value of some important fuel wood tree species

S. No.	Trees species	Botanical name	Family	Calorific value Kcal/Kg	Smoky/ Less Smoky
1.	Amaltas	<i>Cassia fistula</i>	Fabaceae	4200	Smoky
2.	Arjun	<i>Terminalia arjuna</i>	Combretaceae	5080	Less Smoky
3.	Babool	<i>Acacia nilotica</i>	Fabaceae	4950	Less Smoky
4.	Ber	<i>Zizyphus mauritiana</i>	Rhamnaceae	4878	Less Smoky
5.	Casuarina	<i>Casuarinas equisetifolia</i>	Casuarinaceae	4950	Less Smoky
6.	Dhawda	<i>Anogeissus latifolia</i>	Combretaceae	4900	Less Smoky
7.	Haldu	<i>Adina cordifolia</i>	Verbenaceae	3855	Smoky
8.	Imli	<i>Tamarindus indica</i>	Fabaceae	4950	Less Smoky
9.	Jamun	<i>Syzygium cuminii</i>	Myrtaceae	830	Smoky
10.	Jharberi	<i>Zizyphus jujube</i>	Rhamnaceae	4900	Less Smoky
11.	Jharul	<i>Langerstroemia spp.</i>	Lythraceae	4577	Less Smoky
12.	Kachnar	<i>Bahunia verigeta</i>	Fabaceae	4800	Less Smoky
13.	Karra	<i>Cleistanthus collinus</i>	Euphorbiaceae	4592	Less Smoky
14.	Khair	<i>Acacia catechu</i>	Fabaceae	4946	Less Smoky
15.	Kullu	<i>Sterculia urens</i>	Sterculiaceae	5244	Smoky
16.	Machimudi	<i>Lantana camara</i>	Verbenaceae	6500	Less Smoky
17.	Mahua	<i>Madhuca latifolia</i>	Sapotaceae	8742	Less Smoky
18.	Mango	<i>Mangifera indica</i>	Anacardiaceae	4742	Less Smoky
19.	Mulberry	<i>Morus alba</i>	Moraceae	4850	Less Smoky
20.	Neem	<i>Azadirachta indica</i>	Myrtaceae	4500	Smoky
21.	Nilgiri	<i>Eucalyptus spp.</i>	Myrtaceae	4880	Less Smoky
22.	Palas	<i>Butea monosperma</i>	Fabaceae	5030	Less Smoky
23.	Saja	<i>Terminalia tomentosa</i>	Combretaceae	4923	Less Smoky
24.	Sal	<i>Shorea robusta</i>	Dipterocarpaceae	4400	Less Smoky
25.	Salai	<i>Boswellia serrata</i>	Burseraceae	2300	Smoky
26.	Semal	<i>Bombax ceiba</i>	Fabaceae	4800	Smoky
27.	Shoe babool	<i>Leucaena leucocephala</i>	Fabaceae	4400	Less Smoky
28.	Siris	<i>Albizia spp.</i>	Fabaceae	4300	Less smoky
29.	Tendu	<i>Diospyrus melanoxylon</i>	Sapotaceae	5030	Smoky
30.	Oak	<i>Quercus spp.</i>	Fagaceae	4700	Less smoky

Source: S.S. Negi (1997)

IV. RESULT & DISCUSSION

Fuel wood from the forests common source of domestic energy in rural area of developing country as India. Where more than 70% population lives in villages and they totally depend on forest for their basic needs as firewood, fodder, timber, fruits and NTFP's produces.

The use of fuel wood with a higher specific gravity reduces the amount of wood used because such woods have higher calorific value. Green fuel wood with about 50% moisture content has 50% available heat energy while air dry fuel wood with about 20% moisture content has 80% available energy (Njiti,1984).

The fuel wood collections are depending on their daily needs for many purposes. Some fuel wood species *Anogeissus latifolia* (Dhawda, 4900 kcal/kg), *Cleistanthus collinus* (Karra, 4592 kcal/kg), *Terminalia tomentosa* (Saja, 4923 kcal/kg), *Shorea robusta* (Sal, 4400 kcal/kg), *Lantana camara* (Machhimudi, 6500 kcal/kg), and *Butea monosperma* (Palash, 5030 kcal/kg) are used due to their higher calorific value and less smoky properties. *Madhuca indica* has also higher calorific value

(8742 kcal/kg), but it is not used as fuel wood because of its aesthetic value.

An annual consumption of fuel wood at Chivranj & Ichchhapur of Kanker forest division is about 300.25 Quintals & 162.56 Quintals, respectively. Average incomes from fuel wood are @ 110 Rs. per lots (20-25 kg). The tribal peoples collect fuel wood from forest about 90-93 days average in a year and 3 days in a week. They collect firewood under the Indian forest policy and they collect commonly illegal (felling) from forest. This is the major causative factors of forests degradation in natural forest.

V. CONCLUSION

Firewood has very important value in tribal life, from the ancient time in Kanker district. The consumption trends of fuel wood fuel wood, collection of fuel wood as well as their marketing helps in improving socio-economic status and side by side protection of natural forest by JFM, Agroforestry, Social forestry to minimize the tough pressure on forest through alternative source of energy gathered with local population.

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REFERENCES

- [1] Cecelski, E., J. Dunkerley, and W. Ramsay (1979). "Household Energy and the Poor in the Third World". in Resources for the Future. Washington, D.C.
- [2] Clement Forkong NJITI (2002): Survey of fuel wood and service wood production and consumption in the Sudano-Sahelian region of Central Africa. IRAD/PRASAC, BP 415, Garoua, Cameroun.
- [3] Dewees, (1989): 'The Woodfuel Crisis Reconsidered: Observations on the Dynamics of Abundance and Scarcity', Dewees, P.A., in World Development, Vol. 17, No. 8, pp. 1159-1172 .
- [4] Negi, S.S., (1997). Manual of Indian forestry. Published by Gajendra Singh Gahlot, Dehradun. Vol.4, ppl 145-167.
- [5] Njiti C.F., (1984). Energy in wood : The effects of age, diameter, height, and specific gravity on the heat energy contents of Pin oak (*Quercus palustris* Muench) and Black oak (*Quercus velutina* Lam). Master. Southern Illinois University, Carbondale, USA.
- [6] Sharpe G.W., (1976). 'Introduction to forestry'. 4th edition. MacGraw-Hill Book company. New York. 554 p.

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Evaluation of Quality of Life Impairment in Depressive Patients

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Abstract- Depression has now become an universal health problem and the outcome of such disorder is physical, psychological, mental and social problems. Several studies have shown that depression results in impairment in the quality of life leading to decreased work performance. The purpose of this study is to find out the association between the levels of depression by scoring systems and the degree of impairment with the quality of life. This prospective study was carried out as part of a doctoral research in a prominent yoga centre in the city from January 2012 to July 2013. 34 subjects, both males and females in the age group 18 – 60 years, who sought yoga treatment for depression, who scored greater than 8 points with Beck's depression inventory and signed informal consent were enrolled for this study. The quality of life score were collected using SF – 36 questionnaire. Beck's depression scores and demographic details were used for statistical analysis using SPSS version 17.0 software. Pearson correlation coefficient analysis gave r values of -0.582 and -0.585 between depression and physical and mental health respectively and the p values was < 0.05 for both parameters. This study shows that quality of life is significantly affected by depression. The negative correlation reveals that the quality of life decreases as depression increases and mental health is more affected than physical health.

Index Terms- Depression, Quality of life, MDD, physical health, mental health, Beck's Score.

I. INTRODUCTION

Major depressive disorder (MDD) is the fourth leading disease causing functional impairment, disability and workforce loss worldwide. It is a prevalent health problem which is associated with substantial mortality, direct medical cost, diminished life quality, and significant physical and psychosocial impairment. Psychiatric illnesses are strongly associated with impairment in quality of life (QoL), frequently at levels that are equal to or exceed those of medical illnesses. Depression negatively impacts a myriad of facets of an individual's life including functioning, satisfaction with work, relationships, leisure, physical health, mental health, sexual functioning, sleep patterns, future outlook and overall sense of fulfillment or contentment with one's life. Studies have demonstrated that patients with MDD have significant impairments in QoL. An analysis from the Sequenced Treatment Alternatives to Relieve Depression (STAR*D) study revealed that severity of depressive symptoms was significantly associated with poor health-related QoL (1). A study demonstrated significant impairments in QoL

in subjects with a broad array of different depressive and anxiety disorders entering clinical trials. (2) and another study found that the degree of disability was related to severity of depression in patients with MDD (3).

According to Diagnostic Manual from American Psychiatric Association (DSM-IV) classification, a diagnosis of MDD is possible only when there is evidence of significant inference with normal functioning of an individual. Health-related quality of life is the most appropriate indicator of social functioning. However, despite the high prevalence of MDD in the general population, it is uncommon for clinicians to assess overall functioning in a systematic way before making such diagnosis. Impaired quality of life is a significant problem for people with MDD and is often not addressed through symptom remediation alone.

An important correlate of functioning is QoL, which is typically defined as "patient's own assessments of how they feel about what they have, how they are functioning, and their ability to derive pleasure from their life's activities". Individual's perception of QoL is an additional factor that should be part of a complete assessment. As health-related QoL is a purely subjective measure, patient-rated questionnaires have been found to be most important in this context.

Health-related QoL includes dimensions other than social functioning, which mostly include physical health and mental health (including both cognitive and affective problems). The Short form Health Survey (SF-36) includes subscales relating to physical and mental health, which, like the social functioning subscales, are measured in terms of degrees of well being.

QoL indices have been used in medical practice to estimate the impact of different diseases on functioning and well-being and to compare outcomes between different treatment modalities. An integrated view of the issue of quality of life in patients with depressive disorders can provide important information regarding the nature and extent of the burden associated with these disorders and may be useful in the development of strategies to deal with it.

QoL is used to assess the overall impact of medical treatments from the patient's perspective. Because depression affects a person's ability to function at work and at home, the evaluation of various treatments must include an assessment of patients' physical, social and psychological status (4). Quality of life has become an important outcome criterion for psychiatric interventions. In chronic disorders with no complete recovery, the improvement of QoL is an important treatment goal. (5). Measuring the individual QoL appears as an adapted needs assessment and helps the psychotherapist in focusing on the patient's problems and desires (6). The purpose of this study is

therefore to evaluate patients suffering from depression in terms of Beck's score to assess the QoL in terms of physical and mental health.

II. MATERIAL AND METHODS

Subjects

This study was conducted at Krishnamacharya Yoga Mandiram, Chennai, as part of a doctoral research work. The study was approved by the Centre's Ethics Committee. A total of 34 subjects, both males and females in the age group of 18 – 60 years (13 males and 21 females) were enrolled for this study.

Inclusion criteria: Subjects who scored 8 or more as per Beck's Depression Inventory and who were willing to provide details in SF – 36 questionnaire and sign an informal consent were included in this study.

Exclusion Criteria: Subjects with Psychotic symptoms, severe life threatening illness as well as those who are already undergoing yoga treatment were excluded.

Assessment

Each subject was interviewed briefly and was asked to complete the Beck's Depression inventory and SF36 questionnaire. An informal consent was obtained from each patient.

Becks Depression Inventory: This scale was developed by Aaron T Beck, a self-administered four point Likert scale containing 21-items, designed to assess the severity of the symptoms of depression. The total responses were added to determine the overall Beck's score ranging from zero to 63. Based on the total score, the severity of depression was classified as, 0 to 13 - minimal depression; 14–19 - mild; 20–28 – moderate and 29–63 - severe depression.

Statistical analysis

Statistical Package for Social Science (SPSS) version 17.0 (Chicago, IL, USA) was used to analyse the data. Descriptive statistics were used for all variables. Pearson's correlation analysis was done to find out the association between depressive scores and QOL. QOL and depression score of mild, moderate and severe depressive patients were compared using analysis of variance (ANOVA) test. Quantitative data are represented as the mean ± standard deviation (SD) and a p value of <0.05 was considered as an expected level of significance.

III. RESULTS

Table I
Parameters Analysed and Results

S. No.	Parameters Analysed	Result
1	Mean depressed scores (all subjects)	21.41 ±7.02 (x ± 2SD)
2	QOL - Physical health	44.97 ± 9.41 (x ± 2SD)
3	QOL - Mental health	36.17 ± 11.78 (x ± 2SD)
4	r and p values (depression	-0.582 ; p

	Vs Physical health)	<0.05
5	r and p values (depression Vs Mental health)	- 0.585 ; p <0.05

Table I gives the results obtained for depression scores as well as scores for physical and mental health. The mean depression score for all patients was 21.41 ± 7.02. Mean Quality of life scores was 44.97 ± 9.41 for Physical health and 36.17 ± 11.78 for mental health respectively. Pearson correlation coefficients obtained were -0.582 for physical and -0.585 for mental health respectively. The P value for both physical and mental health was found to be <0.05.

Table 2
Depression scores Vs QoL (ANOVA Test)

Depression score	Number of patients	QoL Physical health (x ± 2SD)	QoL – Mental health (x ± 2SD)
8 - 13	5	53.4 ± 7.23	49.2±10.03
14 - 18	7	50.85 ± 9.66	41.57 ± 8.94
19 - 28	15	41.86 ±7.81	33.53 ± 10.64
29 - 32	7	39.71 ± 7.76	27.14 ± 8.02
P value		0.008	0.002

Physical and Mental health scores of QoL was compared with minimal, mild, moderate and severe depression scores using ANOVA test. P values for physical and mental health parameters were found to be <0.01. As the stage of depression increased, QoL values (both physical and mental health scores) decreased.

IV. DISCUSSION

Both response and remission in patients with Generalised Anxiety Disorders (GAD) and remission in patients with MDD are correlated with a 'normal' quality of life enjoyment and satisfaction. The management of depression is very important to improve quality of life as well as distress. (7)

Although treatment may reduce the severity and frequency of target symptoms, the patient's assessment of QoL helps to differentiate a true treatment response and remission from a partial response. The evaluation of what constitutes an adequate treatment response or remission is complicated and likely requires multiple parameters assessment in order to develop a complete understanding. In both anxiety and depressive disorders, the patient suffers from impaired functioning, which results in increased healthcare utilization. Because these patients do respond to treatment, the idea of "wellness" as a high end state treatment outcome should be an important consideration when selecting a treatment option. (8)

In a study involving a large sample of the Australian population, all the dimensions of QoL, as measured by SF-36 items were poor among patients with depression with respect to the non-depressed general population, with the poorest level reached by patients with major depression.(9) Some studies indicate that the severity of Depression was significant in negatively influencing QoL of patients has been confirmed,

lower levels of QoL among patients with major depression with respect to those with dysthymia and adjustment disorders.(10)

The findings in this present study are consistent with other studies showing significant impairment of QoL in MDD patients such as STAR*D trial,(1) and the European Factors Influencing Depression Endpoints Research study (11) and another International six country study.(12) The literature investigating potential sex differences in MDD are quite extensive, but those investigating differences in QoL is sparse.(13) In the present study no differences in the measurement of QoL or functional impairment are based on sex.

V. LIMITATIONS

There are several limitations in this study. First, the sample size is small. Depression and QoL measures were self-reported. This study did not include a control group. Finally, this study used a sample of convenience of individuals who had consented to participate in the study. However, in spite of these limitations, the main results seem to be clear and relevant.

VI. CONCLUSION

Patients who are suffering with severe depression will have poor QoL and severe functional impairment. However, replication of the findings of this study in larger and cross-cultural samples is recommended. The results suggested the need to consider not only symptom based severity, but also functional impairment and QoL measures in the assessment and treatment of depressive patients.

REFERENCES

- [1] Trivedi MH, Rush AJ, Wisniewski SR, Warden D, McKinney W, Downing M, *et al.* Factors associated with health-related quality of life among outpatients with major depressive disorder: a STAR*D report. *J Clin Psychiatry.* 2006;67:185-95.
- [2] Rapaport MH, Clary C, Fayyad R, Endicott J. Quality-of-life impairment in depressive and anxiety disorders. *Am J Psychiatry.* 2005;162:1171-8.
- [3] Lépine JP, Gastpar M, Mendlewicz J, Tylee A. Depression in the community: the first pan-European study DEPRES (Depression Research in European Society). *Int Clin Psychopharmacol.* 1997;12:19-29.
- [4] Kennedy SH, Eisfeld BS, Cooke RG. Quality of life: an important dimension in assessing the treatment of depression? *J Psychiatry Neurosci.* 2001;26 Suppl:S23-8.
- [5] Aigner M, Förster-Streffleur S, Prause W, Freidl M, Weiss M, Bach M. What does the WHOQOL-Bref measure? Measurement overlap between quality of life and depressive symptomatology in chronic somatoform pain disorder. *Soc Psychiatry Psychiatr Epidemiol.* 2006 Jan;41(1):81-6. Epub 2006 Jan 1.
- [6] Frick E, Tyroller M, Panzer M. Anxiety, depression and quality of life of cancer patients undergoing radiation therapy: a cross-sectional study in a community hospital outpatient centre. *Eur J Cancer Care (Engl).* 2007 Mar;16(2):130-6.
- [7] Park HY, Lee BJ, Kim JH, Bae JN, Hahm BJ. Rapid improvement of depression and quality of life with escitalopram treatment in outpatients with breast cancer: a 12-week, open-label prospective trial. *Prog Neuropsychopharmacol Biol Psychiatry.* 2012 Mar 30;36(2):318-23. doi: 10.1016/j.pnpbp.2011.11.010. Epub 2011 Nov 28.
- [8] Meltzer-Brody S, Davidson JR. Completeness of response and quality of life in mood and anxiety disorders. *Depress Anxiety.* 2000;12 Suppl 1:95-101.

- [9] Goldney RD, Fisher LJ, Wilson DH, Cheek F. Major depression and its associated morbidity and quality of life in a random, representative Australian community sample. *Aust N Z J Psychiatry.* 2000;34:1022-9.
- [10] Trompenaars FJ, Masthoff ED, Van Heck GL, Hodiament PP, De Vries J. Relationship between mood related disorders and quality of life in a population of Dutch adult psychiatric outpatients. *Depress Anxiety.* 2006;23:353-63.
- [11] Reed C, Monz BU, Perahia DG, Gandhi P, Bauer M, Dantchev N, *et al.* Quality of life outcomes among patients with depression after 6 months of starting treatment: results from FINDER. *J Affect Disord.* 2009;113:296-302.
- [12] De Almeida Fleck MP, Simon G, Herrman H, Bushnell D, Martin M, Patrick D; Longitudinal Investigation of Depression Outcomes Group. Major depression and its correlates in primary care settings in six countries. 9-month follow-up study. *Br J Psychiatry.* 2005;186:41-7.
- [13] Angst J, Gamma A, Gastpar M, Lépine JP, Mendlewicz J, Tylee A; Depression Research in European Society Study. Gender differences in depression. Epidemiological findings from the European DEPRES I and II studies. *Eur Arch Psychiatry Clin Neurosci.* 2002;252:201-9.

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Case of HIV positive multiple solitary recurrent extra medullary plasmacytoma

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Abstract- Objective – HIV is known to increase the chances of occurrence of B-cell neoplasms. There have been citations of cases of primary solitary plasmacytomas at various sites in HIV positive patients. We present a case of HIV positive initially diagnosed a solitary extra medullary plasmacytoma post radiotherapy recurring as multiple solitary extra medullary plasmacytomas involving de novo soft tissue sites which is a rare presentation

Design – case report

Result—63yr old HIV positive male patient on HAART presented with solitary extra medullary plasmacytoma of left maxillary sinus in the year 2010 and was treated by radiotherapy alone. He presented in the year 2012 with recurrent multiple extra medullary plasmacytoma involving the recto sigmoid, chest wall skin and left axilla. This patient had absent M band on electrophoresis. Patient was operated with Hartmann's procedure and wide local excision for chest and axillary swellings.

Conclusion – extra medullary plasmacytoma can recur at multiple soft tissue sites. HIV infection is known to cause increase in severity of B-cell neoplasms. Literature search reveals cases of plasmacytoma associated with HIV. Case of multiple solitary recurrent plasmacytoma in a case of HIV is rare and has not been cited.

Index Terms- extramedullary plasmacytoma, recurrent EMP, HIV with EMP.

I. INTRODUCTION

Plasmacytoma is an immune proliferative, monoclonal disease of the B-cell line and is classified as non-Hodgkin lymphoma. It originates as a clone of malignant transformed plasma cells. Extra medullary plasmacytomas are unusual plasma cell tumors arising outside the bone marrow. Isolated EMPs are rare tumors and comprise 4% of all plasma cellular diseases. Preferred site of EMP is the Upper aero digestive tract in 82.2%. Human immunodeficiency virus (HIV) is likely to play a role in the onset of plasma cell tumors (PCT). In fact, HIV could be involved in plasmacytomagenesis in several ways most importantly chronic viremia and antigen presentation to B cells and dysfunctioning T-cells in a background of altered cytokines and interleukins.

We present a case which had a combination of uncommon presentations in the literature on EMP, in terms of being a recurrent case with multifocal involvement and involving the less common sites like colon and skin and being associated with HIV positivity.

II. CASE REPORT

A 63 yr old PLHIV male patient presented with the chief complaints of enlarging perianal, chest wall and axillary masses since 6 months. Patient was diagnosed of left maxillary sinus plasmacytoma in the year 2010 when he had received 25 cycles of radiotherapy totaling to 4000cGy. The then investigations included complete haemogram, chest roentgenogram which were normal. Serum electrophoresis revealed absent M band and bone marrow biopsy was normal. In the current presentation patient had a large 10*7 cms mass in the perianal region situated to the right of anal orifice. On per rectal examination the mass was extending along the anorectal wall occluding the lumen. The proximal extent of the mass was not identified.

There was a 4*4 cms mass on the anterior chest wall just right of midline non tender firm with excoriated overlying skin, non fluctuant reddish in color.

One more mass of 3*4 cms present in the left axilla close to the medial wall firm to hard in consistency, mild tenderness present. Not freely mobile. Overlying skin being normal. No associated neurovasculopathy in left upper limb

Figure 7 perianal mass





Figure 8 chest wall mass

Patient was moderately built and nourished. With no associated comorbidities in form of hypertension, diabetes, cardiovascular diseases. He had no significant past medical or surgical history.

Treatment history includes HAART for HIV with a CD4 count being 327

No abnormality found in systemic examination.

Complete haemogram revealed normal result. Renal and liver function tests were normal. Total serum proteins being 5.6 with maintained albumin and globulin ratio. Chest x-ray revealed calcified granuloma in the upper and mid lobes of right lung with bilateral bulk hila. No bony lesions were noted.

Patient did not consent for bone marrow examination in this admission. FNAC report from both chest wall and perianal lesions were suggestive of neoplastic lesions with plasma cells seen in clusters and containing large eccentrically placed nuclei suggestive of plasmacytoma.

Patient was operated with all universal precautions taken. Abdominoperineal resection of the mass was done by infra umbilical midline laparotomy. End sigmoid colostomy was done. Resection was done with a proximal 5 cms clear margin. Intra operatively there was evidence of 4*4 cms mass in the recto sigmoid region with the mass extending towards right involving the right levator ani muscle. And there was also involvement of anal sphincters. There was also another 3*3cms parietal peritoneal mass in lower abdomen. Laparotomy wound closed with tension wire suturing. Wide local excisions of Chest wall and axillary masses were done.

Histopathological report of all three masses was consistent with plasmacytoma.

Patient had an uneventful recovery with tension abdominal sutures removed on 21st post-operative day.

The limitations In this case were inability to perform a repeat bone marrow study in this admission due to lack of patient's consent and lack of immunohistochemistry testing at our facility to further investigate the patient. But in view of having a normal total protein and globulin levels, normal skeletal imaging, no anemia and renal failure, i.e. absence of major and minor criteria to diagnose multiple myeloma, the possibility of patient having progressed to multiple myeloma post radiotherapy in the past appears less likely.

Patient had been followed up for a period of 6 months and later lost for follow up.

III. DISCUSSION

Plasmacytoma, or plasmoma, was mentioned by Unna in 1891 and first described by Schridde in 1905. It is a tumor composed almost exclusively of plasma cells arranged in clusters or sheets with a scant, delicate, supportive, connective tissue stroma.

Plasma cell diseases originate from pathologic plasmablasts that dedifferentiate during the maturation process from primary and secondary B blasts to plasmablasts into malignantly transformed plasmablasts situated in the bone marrow. They migrate and then return to establish themselves in the bone marrow. In rare instances, with the assistance of adhesion molecules, they also may settle in soft tissue or in an extracellular connective tissue area. This is the origin for monoclonal plasma cell foci located outside the bone marrow, called extra medullary plasmacytoma (EMP)¹

The different types of plasma cell tumors are: 1.) MGUS 2.) Related organ or tissue injury (end organ damage). 3.) asymptomatic myeloma (smouldering myeloma) 4.) Symptomatic multiple myeloma. 5.) Solitary bone plasmacytoma. 6.)extra medullary plasmacytoma. 7.) Multiple solitary plasmacytomas (+/- recurrent) 8.) plasma cell leukemia². Isolated EMPs are rare tumors and comprise 4% of all plasma cellular diseases

In a review of more than 400 published articles, 82.2% of extra medullary plasmacytomas were found in the upper aero digestive tract with 17.8% arising in the gastrointestinal tract, urogenital tract, skin, lung, and breast in that order. Although liver, spleen, and lymph nodes are common extra medullary manifestations of multiple myeloma, primary extra medullary plasmacytomas of these organs—including the pancreas and adrenal gland—are extremely rare¹

Human immunodeficiency virus (HIV) is likely to play a role in the onset of plasma cell tumors (PCT). In fact, HIV could be involved in plasmacytomagenesis in several ways: it has the ability to lessen the immunosurveillance to such a degree as to impair the immune response against tumor cell growth³.

HIV-induced immune-cell activation is one of the few widely accepted hallmarks of HIV pathogenesis and disease progression. The hyper activation of B cells by HIV is characterized by several features: hypergammaglobulinaemia; increased polyclonal B-cell activation; increased cell turnover; increased expression of activation markers, including CD70, CD71 (also known as TFRC), CD80 and CD86; an increase in the differentiation of B cells to plasmablasts as measured by

phenotypical, functional and morphological measures; increased production of autoantibodies; and an increase in the frequency of B-cell malignancies⁴.

In general, there are no international guidelines for the treatment of EMP. However, based on the well-known radiation sensitivity of the plasma cell tumor, radiotherapy is accepted as the treatment of choice for EMP⁵.

Surgery alone or combined surgery and RT or chemotherapy has also been used in the treatment of EMP

The main findings in our case are

- i) Recurrent case of multifocal plasmacytoma involving the anorectal region with extension as a perianal mass, chest wall and axilla.
- ii) No anemia, no impaired renal functions, no hypercalcemia
- iii) Though serum electrophoresis was not done, in view of normal serum protein levels and normal albumin to globulin ratio and a normal urine routine and microscopy reports, M band is unlikely to have been present in this patient.
- iv) Patient is HIV positive on long term HAART.

These findings suggest this to be a case of multiple solitary plasmacytoma- recurrent type --- as per international working group on myeloma classification 2003.

In conclusion HIV positive patients are as such known to be increasingly susceptible for plasma cell neoplasms due to HIV induced B cell dysfunction. Plasmacytomas can occur at multiple sites and can be recurrent. Further studies are hence required to know if HIV positive status has a role in recurrence of plasmacytomas. Patients who are diagnosed with plasmacytoma should be screened for HIV status as this can predict a poorer prognosis/recurrence^{6,7}.

Further studies are required for establishing the role of PET CT and immunohistochemistry in routine work up of a diagnosed case and in establishing a protocol for follow up of patients with plasmacytomas.

REFERENCES

- [1] Alexiou, C., Kau, R. J., Dietzfelbinger, H., Kremer, M., Spieß, J. C., Schratzenstaller, B. and Arnold, W. (1999), Extramedullary plasmacytoma. *Cancer*, 85: 2305–2314. doi: 10.1002/(SICI)1097-142(19990601)85:11<2305::AID-CNCR2>3.0.CO;2-3
- [2] The International Myeloma Working Group (2003), Criteria for the classification of monoclonal gammopathies, multiple myeloma and related disorders: a report of the International Myeloma Working Group. *British Journal of Haematology*, 121: 749–757. doi: 10.1046/j.1365-2141.2003.04355.x
- [3] Vallisa D, Pagani L, Bertè R, Civardi G, Viale P, Paties C, Cavanna L.- Extramedullary plasmacytoma in a patient with AIDS: report of a case and review of the literature. PMID:9825007. PUBMED ABSTRACT
- [4] Moir S, Fauci AS. B cells in HIV infection and disease. *Nat Rev Immunol*. 2009;9:235–245.[PMC free article] [PubMed]
- [5] Susnerwala SS, Shanks JH, Banerjee SS, Scarffe JH, Farrington WT, Slevin NJ. Extramedullary plasmacytoma of the head and neck region: clinicopathological correlation in 25 cases. *Br J Cancer* 1997; 75:921–7.
- [6] Nair RG, Sudha S, Shameena P M, Ipe VV. Plasmacytoma of the oral cavity associated with HIV infection - Causal or casual coincidence?. *J Oral Maxillofac Pathol* 2004;8:91-93

- [7] Produl Hazarika, R. Balakrishnan, Rohit Singh, Kailesh Pujary, Benazim Aziz: Solitary Extramedullary Plasmacytoma of the Sinonasal Region : *Indian Journal of Otolaryngology and Head & Neck Surgery*, 2011, Volume 63, Number 1, Page 33.

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Management System of Islamic Private Schools in Nigeria, Madrasah Da'wah al-Islamiyyat, Case Study

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Abstract- This study discusses the establishment of *madrasah Da'wah al-Islamiyyah*, and the school's management systems comprised of the organization structure, finance and physical facilities. This study identifies some problems and obstacles that inhibit the effectiveness of the *madrasah*, followed by suggestions to improve the school. The data were collected through library research, interviews with headmaster and five teachers in the *madrasah* and direct observation. The principal of the *madrasah* perception of the problems faced by the Islamic private school in Nigeria referred to various problems, such as finance, lack of government support and lack of parental commitment. The researcher provides relevant suggestions to improve the *madrasah* and enhance student achievement.

I. INTRODUCTION

The establishment of Islamic school (*madrasah*) in Nigeria dated back to the pre-colonial era¹. The schools were founded to fulfill the educational needs of the Muslims community in the country then². However, it is a common knowledge that Nigeria is the most populous black nation in the world. The official figure of the population of the country in the 2006 national population census is 148 million, out of which Muslims account for 60% with 90 million headcounts, thus, constituting the majority of all the communities in the country³. Hence, since Muslims are the majority in Nigeria, the establishment of Islamic schools was necessary, given the adhering of the religion to knowledge. Thus, this was the rationale behind the establishment of Islamic schools, which flourished for decades, in the country, prior to the advent of the colonial masters⁴.

However, the period of the colonization of Nigeria by British between 1885 and 1960 was the period that marked the beginning of the decline of Islamic education as well as the Islamic schools in the country⁵. During the period, many Islamic schools were subdued for the Western oriented schools. This trend continued till the independence of the country in 1960. At that time, most of the Islamic schools were converted to Western oriented schools and they were subjected to the control of the regional and federal governments. However, although the teaching of Islamic studies continued in the schools, the teaching was not as efficient as it was, before the government takeover its control. This trend also led to the reemergence of private Islamic schools in the country.

A considerable number of private Islamic schools were established in the South-Western Nigeria, for the purpose of restoration of qualitative Islamic studies, during the period. Notable among the schools, is Islamic Preaching School which

management system in the matter of the research. The school is situated in *Ibadan*, the capital city of the South-Western Nigeria. Although, Islamic Preaching School has contributed immensely to the educational, religious and moral development of the Nigerian society, yet, there is a pressing need for the improvement to match the current global trends and the contemporary development goals of the country.

II. STATEMENT OF THE PROBLEM

The educational system *Madrasatu al-Da'watu al-Islamiyyah*, Ibadan, Nigeria (Islamic Preaching School, *Ibadan*, Nigeria), to the educational goals of the Muslim community in Nigeria, is questionable:

1. Meeting-up with the challenges of the modern world: one of the notable

problem that has been encountered by the Islamic private schools in the South-Western Nigeria today is the problem of how to meet the challenges of providing the most suitable and relevant education to the modern Muslims' children. Undoubtedly, the curriculum of *madrasah* in general, in Nigeria, needs to be overhauled because it had been designed before the colonial era. Although, it was suitable for the educational needs and challenges, however, it has become feeble and irrelevant after it was subdued by the introduction of Western secular curricular which substitutes the *madrasah* curriculum in Nigeria, especially, in the South-Western part of the country⁶. Although, religious education is part of the Nigerian national educational policy however, the curriculum did not fulfill the needs of the Muslims. This was what later led to the establishment of Islamic schools by some Muslim individuals in the country.

Lack of adequate qualified manpower: most of the teachers of the Islamic school are not qualified educators. They are mostly graduates of the same school where they work as teachers. In short, the majority of the teachers are *al-thĒnawiyah* certificate holders. It is a common knowledge that education is an institutionalized profession which requires certain qualification before it can yield the required result. This is absent in respect of Islamic Preaching School, Ibadan.

Absence of modern educational facilities: the modern educational facilities such as computers are not available in the school. The school management did not provide for such facilities. It is even worth mentioning that while school in the modern age are using electronic board or PowerPoint for their teaching and learning, what is still in use in the school is blackboard and white chalk.

In short, as far as research is concern, there is no previous research that examined the the management system of *madrasah* school in Nigeria.

Therefore, this study focused on the management system and problems of *madrasah* school, Ibadan, Nigeria, in order to contribute to better performance.

III. OBJECTIVES OF THE STUDY

1. Presenting the historic background of *madrasah Da'wah al-Islamiyyah* (IPS)
2. Identifying some problems and obstacles that inhibit the effectiveness of the *madrasah*
3. Contributing to the improvement of the *madrasah*

IV. ESTABLISHMENT OF ISLAMIC PREACHING SCHOOL (IPS)

The Proprietor

The proprietor of IPS, *Alhaji Ballo Alli Adelani*, is a native of Ibadan Oyo State Nigeria. He was born in 1921 at *iyalode* compound, *Itabale, isale Osun* area Ibadan Oyo State, Nigeria. The proprietor was the second sibling of his father. He learns *Qur'Énic* reading and teaching under the tutelage of *Alfa Agbaleke at Odeoluwo Bere* in Ibadan. Late *Alhaji Ballo Ali Adelani* died (29/9/ 1997.-28/5/1418.A.H)⁷.

He was a farmer by profession, and later to trading. He was a successful business tycoon. He was a devoted and pious Muslim that submits himself to the will of God. He devoted all his life to serve Islam through generous spending in the path of Allah. Specifically, the said icon had been known in Ibadan Oyo state of Nigeria for the establishment of IPS.

The founder and (proprietor) is a trader who had love for Islam. He was not versed in Islamic Education except that he can recite the *Qur'Én* and has fundamental knowledge of Islam. But for the fact of love he had for Arabic and Islamic Studies with the hope that Islam would attain its goal in nearest future, he established the school (Islamic Preaching School).

Madrasah Da'wah al-Islamiyyat (Islamic Preaching School) is the foremost private *madrasah* educational institution, which trains students in Islamic studies. Thirty six years had elapsed for the establishment of IPS. It was founded in 1974 in Ibadan. In the last 15 years or so, the IPS has developed tremendously and attracted many Muslim students. At the very beginning the students who graduated from the school were only five students namely, *Alhaji Basheer Imran, Alhaji Luqman Kharazi, Alhaja Nafeesat Musthapa, Alhaji Zainu Habeedin* and late *Alhaji Ishaq Yahaya*. Currently speaking, the proliferation and increment in the number of students is a measure of its success. Presently, there are three thousand students in the school, both girls and boys. Every year, large numbers of applications are turned down due to acute accommodation problem. The accommodation problem was so acute that several hostel rooms have been converted into classrooms.

The school began with five teachers and seventy five students. First time, in the history of the school *Ustadh Hafees Ibrahim*, a Saudi citizen was appointed as the principal of the

school. At present the school was headed by *Alhaji Basser Ballo Alli Adelani* one of the son of late *Alhaji Ballo Alli Adelani*⁸.

Philosophy, Motto and Vision of The School Explain below:

Philosophy: Where education is aimed at a balanced growth of personality, through *Tarbiyyah* of the spirit, the intellect, the emotions and the physical willingly and joyfully for the sake of Allah S.W.T.

Motto: Knowledge, Discipline and *TaqwÉ*: the Secret of Success.

Vision: To provide Muslim who is knowledgeable, Faithful, good ethics, owns etiquette and noble *akhlÉq* that are based on the *Al-Qur'Én* and *Sunnah*, who turned to be *al-taqwÉ* servant and vicegerent of Allah, and can contribute to civilization of the nation and country⁹.

V. AIMS AND OBJECTIVES OF THE SCHOOL

The aims and objectives of the school are:

1. To inculcate Islamic moral into Muslim youths by teaching them Arabic Language and Islamic studies, so as tackle the challenge of the day and rescue them from wrap of Christians who always wage war against Muslim and Islam in particular.
2. To enlighten the Muslim youths about their roles in the spread of Arabic Language and Islamic studies both in Ibadan and Nigeria as a whole.
3. To enable the qualified Muslim graduating students withstand the needs of the society and able to be able to confront the enemies of Islam¹⁰.

Structure of the School

The Islamic Preaching School and central mosque of the school are permanently situated at *Olorunsogo Akanran* Road Ibadan. It comprises of three giant buildings.

1st Building: it comprises three stories. The first floor contains three spacious classrooms, and the second floor of the building also contains three spacious classroom and Library.

2nd Building: the first floor of the building comprises of four lecture rooms, the second floor stands as hostels for students who came from outside Ibadan.

3rd Building: the third floor consists of lecture hall and reception rooms for visitors also consist the Central Mosque of the school.

Level of studies

There are three levels of studies in the school, they are:

- 1) Primary level: pupil would spend six academic years in accordance with the school syllabus.
- 2) Intermediate level: after the completion of primary level, pupil would promote to this level where he will spend three years.
- 3) Secondary level: students would spend three years before he would be graduated.

VI. GRADUATION OF STUDENTS

This school has started graduating students consecutively since the academic years of 1978-1979 sessions on continuity basis and most of its products have graduated from various universities in Nigeria and abroad especially Saudi Arabia, Egypt and Malaysia.

VII. TEACHING STAFF AND THEIR QUALIFICATION

For the academic year 2010, there are thirty teachers serving as academic staff in the school. Two of them were Master holders in Arabic and Islamic studies. Nine were B.A degree in Islamic Law (*SharĒNah*), another nine have Diploma holder while ten are *al-ThĒnawiyah* holders in Arabic and Islamic studies.

VIII. CENTRAL MOSQUE OF THE SCHOOL

In Islam, the mosque does not serve as a place of worship alone' despite the fact that *SalĒt* is the major *IbĒdah*, but it served as a four wall and center for Islamic propagation (Halim et. al, 2010). The prophet Muhammad (S. A. W) has decided to use mosque as a center for Islamic preaching where he prayed with his companions and deliver the revealed message of Islam to them (Damas & Sayida, 2011). The prophet (S.A.W) established knowledge and consolation center. This enables mosque to discharge its role. As a result, the mosque becomes meeting point for believers as center for knowledge, culture, preaching and assembling is concern ¹¹.

In view of the afore-mentioned, the Islamic Preaching School since its inception has prepared one left side of the first floor of the building for Mosque to enable students to observe their *Zuhr* prayer before they could proceed to their respective houses. This is also applies to the boarding students who normally observe their five daily prayers at the well prepared place for *SalĒt*. Furthermore, the proprietor sees it as matter necessary to build central Mosque once and for all. He built this central mosque before his death to enable the students to observe their five daily prayers together with *Jum'at* service prayer. This was done before the death of the proprietor in the year of 1418 A.H. corresponding to 1977 but it remains finishing touchiness such as painting, electricity and tap water for ablution. However, the place could no longer accommodate the students as a result of increasement in number of the students ¹².

FINANCIAL SUPPORT

For the fact that, IPS and its central mosque was built through the efforts of the proprietor late *Alhaj Bello Adelani*. The said proprietor was taking care of the salaries and wages of the teaching and non-teaching staff of the school, also the maintenance of both school and the central Mosque. This cost the late proprietor a lot of amount of money, but he insisted not to levy any school fees on the students.

In light of this, the board of governors of the school together with the children of deceased has decided to turn the school and central Mosque to (*Waqf*) for Allah sake¹³. This has become a reality seeing all the official and necessary documents before their legal fractioned in order to support their willingness ¹³.

On the order hand, in 1986, the proprietor and his son *Alhaji Basheer Adelani* jetted out to Kingdom of Saudi Arabia led by *Ustadh Hafees Ibrahim* from Saudi Arabia to showcase their packages but fortunately for them they were favored to get some assistance for the school. Furthermore they were also supported by Muslim World League in Makkah (*RĒbita*) and given some books by University of Medina. And at the same time *Shaykh Mohammed Nasr Al-Abudi*, Assistance Secretary General, Muslim World League Makkah Al- Mukarama visited Nigeria in 1982 and had written some story about the school ¹⁴.

IX. FINANCIAL PROBLEMS FACED BY THE SCHOOL

Financial management involves of functions including forecasting, planning, the application of funds and their control ¹⁵. The Islamic school systems in South-Western Nigeria are purely religious institution by virtue of its activities, and is not recognized by the Nigeria government. So, they are run and finance by scholars and well meaning Nigeria. These people are in fully support of this school by their generosity without receiving any fund from the government. To some extent, the education offered in some of these schools is free of charge. Some of these children are from poor family and less privileged children in the society. Moreover, the school curriculum of these schools was designed by various proprietors to meet their needs and aspirations.

The biggest problem facing IPS just like other *madrasahs* is that there has not been a collective platform through which the students graduating from *madrasah* could get direct or indirect admission into Government Universities in Nigeria and all efforts in avail. Of course, those students studying abroad are very small compare to those at home.

Also, the stipend or salary of teachers also come from charities obtained from the proprietor or generated fund from colorful graduation ceremony (*walĒmah*). In this graduations ceremony, monetary and non-monetary will be donated by some philanthropist to support the school and part of the monetary donation will be used to pay teachers' salary.

X. ACHIEVEMENT OF THE SCHOOL

IPS has contributed to the religious and educational development of the South-West immensely since its inception in 1974. Many notable scholars have been produced. Among them are *Shaikh Basheer Imran*, an Islamic cleric and a preacher in *Ibadan* land and Barrister *Ismail Zakariyah* a notable legal practitioner in *Ibadan*. Therefore, some of these students are situated in different parts of Nigeria and more importantly they are found in different countries of the world. For instance, gross of them are continuing their studies at al-Azhar University in Cairo, *Jamiat Imam* in Saudi Arabia, *Umul Qura*, *Jamiat IslĒmiyyah*, Saudi Arabia. Presently, there are numbers of ex-students of IPS studying at International Islamic University Malaysia and host of others.

Another major landslide contribution from Egypt since 18 years till date is that al-Azhar has been giving their unflinching support by sending their delegates for four years duration as a teacher. Another landmark achievement by the late proprietor,

Alhaji Ballo Alli Adelani is that he had converted many Christian students to Islam by virtue of his generosity and kindness.

XI. CURRICULUM OF THE SCHOOL

Having seen the challenges posed by curriculum in Islamic education in Nigeria and particularly in IPS, the researcher found that the reform of the curriculum is very paramount and needs to be restructured and reorganized to meet the standard requirement of school in meeting up with the challenges of modernity.

In addition, the content of the curriculum for Muslim communities in Islam were well laid out in the national Conference by the International Institute of Islamic Thought, held in Nigeria in 2005.

The content: the content of the curriculum for Muslim communities should be properly scrutinized and carefully selected in order to achieve the objective of building an Islamic community. Textbooks are an important medium through which curriculum content is delivered to student. As good companions of the learner at school and at home, they should therefore be reviewed with a view of Islamizing them without changing their fundamental content. Muslims must write textbooks in all areas of the curriculum so that un-Islamic views and theories that confuse young Muslims do not find way into the school system. Theories of evolution and the like, which emphasize nature and not Allah the creator, should not be taught in Muslim schools. The medium of instruction can remain a foreign language but Arabic as the language of Islam should have a prominent place in Muslim schools system. Physical activities, learning aids and other instructional materials should be in accordance with Islamic teaching¹⁶.

In brief the content of the curriculum in Islamic preaching school in *Ibadan* seems to suit the yearning and aspiration of the founder. Similarly it was also designed purposely to disseminate some significant and useful Islamic value.

The implementation of curriculum in Islamic Preaching School is something that designed long time ago after the establishment of the school which was aimed to implant *Qur'Ēnic* education and Islamic studies to the Muslim students in all levels. The researcher tends to find out the relevance of the curriculum norms to make it suitable for the needs of society. It is very obvious that the curriculum used by Islamic Preaching School is not embodied some subjects of Western education. However, the fact that the *madrasah* is a religious centre of learning does not mean that some of the subjects stipulated by the Ministry of Education in Nigeria should not be incorporated into *madrasah* education.

The contents of Islamic studies course at IPS cover all areas related to Islamic religious courses as proposed by all *madrasahs* in South-Western Nigeria. The subjects are as follow:

'Aqidah and AkhlĒq (Faith and Ethics), *Fiqh* (Islamic Jurisprudence) *Sirah* (Biography of the Prophet and History of Islam). *AkhlĒq to Allah* (S.W.T), human beings and environment *Qur'Ēnic* Methods, Arabic Reading, writing, Literature, Mathematics, English Language, Poetry, Reading, Dictation, Law of Inheritance, Etymology, Islamic Civilization, Method of Preaching and Composition.

It was found that the existing curriculum is totally devoid of the teaching of Arabic. This is contrary to the teaching of Islam.

It is also in conflict with the recommendation of second World Conference on Muslim Education held in 1980 at Islamabad that proposed the teaching of Arabic as extremely important for the preparation of Muslims of today in the understanding and the intellectualization of Islamic worldview¹⁷.

Since the IPS only provides one course (2 credit hours) for Islamic religious studies, this is not in keeping with aims and the contents of Islamic education which have been recommended by First and Second World Conference on Muslim Education and Muslim education scholars on Islamic education curriculum.

XII. TEACHING AND LEARNING PROCESS IN IPS

Islamic Preaching School in Ibadan, South-Western Nigeria has been using wide variety of creative and innovative approach to achieve teaching and learning process. However, the school also has been lacking some essential technology devices that can put them in the league of recognized school in South-West Nigeria. It is also being noted that school premises is not conducive and congested with ratio 40 students per teacher.

The following items explain the teaching and learning process of the IPS: using creative, innovative and interactive techniques and approaches; Adopting instructional, investigational and experiential learning approaches; Applying the 3 Rs: Reading, Writing and Arithmetic as foundations of learning; Using the collaborative approach to encourage collective learning through the spirit of brotherhood (*Ukhuwwah*) and teamwork (*JamaĒnah*); No technology aided tools and techniques; More student-teacher ratio 40:1.

In a nutshell, learning and teaching at Islamic Preaching School in Ibadan has been suffering from wide range of problem from a long time ago for example, outdated curriculum, financial doldrums, lack of essential basic facilities, and many others. The System has not been given adequate support as it required¹⁸.

XIII. EVALUATION

It is prerequisite for the government to design good curriculum for the use of the school and also for proper outcome and evaluation of the course. Educational evaluation is judging the success and merit of educational programs. This is essential once the goals have been set forth, and learning activities selected, a set of procedures is established to assess how well the curriculum effective to the goals and how far being carried out to achieve the desire objectives.

The Islamic Preaching School has been able to come out with something that has served little or no benefit to the overall requirement of the standard evaluation. Therefore, IPS has been using many ways to evaluate their students' performances and teachers' performances within and outside the school¹⁹. Basically, formative and summative evaluation is used in IPS.

Meanwhile, many giant strides have geared in the area of students' performance; to grade the promotion of the student from one class to another based on two grade system which minimum is 50 percent and maximum mark to be eligible to be promoted to another level is 100 percent²⁰.

Amongst the methods of evaluation process adopted by the Islamic Preaching School is to check and to improve the low performance of the students at all levels in *Qur'Ēnic* memorization and quick introduction of *Qur'Ēn* competition to address the performances of the student of the School. Then, a *Qur'Ēnic* school board (QSB) was formulated to foresee and fine tune the affairs of the student so that they can meet up the goal and objective of the Islamic Preaching School as mentioned in the curriculum. Because the school management believed that the evaluation process will help the Islamic Preaching School to accomplish its desire goal and objective to improve the overall performances of the student.

Another thing that researcher would not forget to mention is that the Islamic Preaching School activities are minimal as observed by the researcher and this has led to the current repositioning and restructuring of the curriculum of the school to meet the standard pattern of *madrasah* curriculum. For a simple reason evaluation cannot occur unless we know what we are trying to accomplish. Finally, the evaluation is a fundamental phenomenon to help in achieving some greatness curriculum in IPS. It is a tool which can be used to help teachers judge whether a curriculum or instructional approach is being implemented as planned, and to assess the extent to which stated goals and objectives are being achieved²¹.

XIV. DISCUSSION

The principals' perception (Alhaji Ballo Adelani) of the problems faced by the *madrasah da'wah al-Islamiyyah* referred to various problems such as financial problem, school facilities, teacher qualification, lack of government support and management problem. However, most teachers in the *madrasah* agreed that financial support is the main problem that is faced by the school. They mentioned that there are many available programs to enhance student's capability, public speaking, leadership training but the school is short of sources and funds. They cannot even make an effort to have mini library till now, that was the first problem they faced.

The second and last most common problem faced by *madrasah Da'wah al-Islamiyyat* is the lack of government support, since the schools are religious private schools, running the schools without receiving any support from government is a very challenging since there are many Muslims in the society.

XV. CONCLUSION AND RECOMMENDATION

In this short research, researcher been able to state the condition of *madrasah Da'wah al-Islamiyyat* (Islamic Preaching School) (IPS) located in Olohunsogo Akanran Roal, Ibadan, pert of Shout- Western Nigeria, highlighting the areas of positive impact on the educational system as well as the weaknesses of the *madrasah*. In this research, Reseacher found that teachers in *madrasah Da'wah* do not have enoght sufficient qualifications due to majorities Thanawiya certificates among their teachers and lack of modern technologies skills because the *madrasah* are still using the old method for teaching and learning. It can recommended that teachers of *madrasah Da'wah* should seek additional knowledge concerning teaching methodology,

producing teaching materials and using instructional resource in order to enhance the effective of teaching and learning process and it may upgrade their qualifications. In addition, the schools should foster a sense of community where students, parents and teachers feel they belong by maintaining an open line of community between all parties, where parents are encouraged to have active involvement in school life.

In a nutshell, it is not be denied that government have been playing his own part to inhibit the *madrasah* education system in Nigeria. If only for spiritual and moral developments which are the National Policy on Education 18981 is yearing for government should be more interested in Islamic Education.

REFERENCES

- [1] Aderinoye, R. A. (1993). Toward effective teaching and learning of Islamic studies in secondary school on Oyo State of Nigeria: A case study. *Muslim Education Quatterly*, 11 (1), 41-51.
- [2] Balogun, I. A. B. (1982). Arabic and Islamic studies vis-à-vis the Nigeria National policy on Education. Paper delivered at public lecture to mark the 10th anniversary of AISS, Ilorin.
- [3] Aisha, B. L. (2002). Religious education in Nigeria: a case study. Paper presented at Seminar held in Oslo, published by the Oslo Coalition on Freedom of Religion.
- [4] Fafunwa, R. I. (1975). *History of Education in Nigeria*. London: George Allen & Unwin Ltd.
- [5] David, C. W. (2001). Education reconstruction and post-colonial curriculum development: a comparative study of four African countries. *International Educational Journal*, 2 pp7.
- [6] Khalil, I'mĒd Din, (1990). Islamic of knowledge: Methodology of research in political Science. *The American Journal of Islamic Social Sciences*. Vol. 7, No. 2.pp 161-173.
- [7] Interview with Muili Abdul Azees Atanda, on 10 April 2010, member of the school board & Alhajah Shahadat Adelani, (Widow of late Alhaj Ballo Adelani).
- [8] Interview with ex-student Alahaji Basheer Imran on 17 May, 2010.
- [9] Establishment of IPS, Paper presented for 10 years anniversary in 1984).
- [10] Paper recorded, by Islamic preaching School (1982).
- [11] *History book of madrasah Da'wah Islamiyyat*, 1992.
- [12] Islamic Research Center for History, Culture and Arts (IRCICA). (1982). *The Muslim Pious Foundation (Awqaf) and Real Estates in Palestine, Istanbul, Abu al-Ajfan, Muhammad "al-Waqf ala almosjid Fi al Magrib Wa al- Andalus"* (Waqf on mosques in North West Africa and Andaluthia). In *Dirasat fi al-Iqtisad al- Islami*, International Center for Research in Islamic Economic, King Abd al-Aziz University, Jeddah, 1985, pp. 315-342.
- [13] Adelani Family' leger documents, (2001).
- [14] Interviewed with Alhaji, Bashir Ballo Adelani on 10 June, (2010).
- [15] Bhagia, N., Briggs, D and Bhagia, S. (1990) *Educational Administration in India and Other Developing Countries*. New Delhi: Commonwealth Publishers.
- [16] Baffa, S. A. & Mansur, U. M. (2005). *Muslim education reform activities in Nigeria*. Abuja: Benchamark Publishers Limited.
- [17] Saqeb, G. N. (1998). "A reflection on two decades of Islamization of educatin since the 1977 Makkah world conference: Accomplishments, Failures and tasks ahead into the 21st century". Working paper for National Seminar on Islamization of Education: Meeting the Challenge. Department of Education, International Islamic University Malaysia, 14th – 16th 1998.
- [18] Damas, Addeh & Sayida, Fuad. (2011). *The Legal framework of Mosque building and Muslim religious affairs in Egypt: towards a strengthening of State control*. Cornelis Hulsman January 15, 2011.
- [19] Fodiyo, M. B. U. (2002). *Nazm al-Awamil an-Nahwiyyah Lil-Imam Muhyidding ibn Muhammad al-Barkawi*. Edited and annotated by Abdullah Muhammad Adam. Sokoto: Al-Akadimiyau 'l-Islamiyyah.

- [20] Halim, Tamuri., Muhamad Faiz & Kamarul, Azmi. (2012). A new Approach in Islamic Education: Mosque Based Teaching and Learning. *Journal of Islamic and Arabic Education* 4(1), 2012-110.
- [21] Garba, S. (2005). *Curriculum development and Muslim education reform*. Abuja: Benchmark Publishers Limited.

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Fabrication of Embedded System for Dust Removal on Solar Photo Voltaic Cell

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Abstract- Turning over the pages of history it is found that the sincere effort are undertaken for gaining efficient output from solar energy but it has to face lot of shortcoming. While analysing toward different factor one of the factor is shadowing & effect of dust particle. In this topic the survey to this effect on overall performance of SPV is focused & an embedded System is design to solve this problem.

Index Terms- Challenges in SPV System, Performance of SPV on Intensity, Problem faced by SPV, Shadowing effect in SPV

I. INTRODUCTION

The significant challenged faced by 2000 era is “how to satisfy the overgrowing need of energy within limited resources??”

To answer this difficult question we have come forward with various renewable energy resources like wind, solar, tidal, biomass etc. And also with many alternative methods (to generate electricity from these sources).

The reliability of photovoltaic modules has always been one of the most important subjects as reliability and lifetime is the key for overall system performance and warranty. Photovoltaic (pv) reliability has gained attention as the photovoltaic industry has rapidly grown and the numbers of module makers have increased too. Pv systems produce power in proportion to the intensity of sunlight striking the solar array surface. The intensity of light on a surface varies throughout a day, as well as day to day, so the actual output of a solar power system can vary substantial. There are other factors that affect the output of a solar power system. These factors need to be understood so that the customer has realistic expectations of overall system output and economic benefits under variable environmental conditions over time.

II. MOST PROBLEMS REGARDING PHOTOVOLTAIC SYSTEMS

1. Power limitation by inverter to keep upper limit for line voltage
2. Partial shading in PV awnings by upper rows (Shadowing).
3. PV generator operating voltage below inverter input window.
4. Power loss due to undersized inverter
5. Gear thing or isolation faults

6. Bypass diode failure, faulty circuit breakers or switches (Given by: module, inverter, battery, conductors).
7. Dust accumulation

III. WHAT IS A SHADOWING?

The covering of some part of solar panel which distort the ray of light rather than absorbing which lead to low power output is known as shadowing.

The most obvious result of a shadow is a decrease in power output from the solar array. The amount of power loss is a function of the size and shape of the shadow, the geometrical and electrical lay-out of the cells in the array, and how the shadow falls across the particular solar cell array.

IV. CAUSES OF SHADOWING

1. Shade from building
2. Trees chimney obstacle
3. Clouds
4. Dust & Dirt
5. Snow & other light blocking obstacle
6. Improper Handling of SPV
7. Lack of Knowledge
8. Maintenance

V. UNDESIRABLE OUTCOMES

The undesirable out comes due to shadowing is:

1. Reduced energy Output
2. Mismatch Situation
3. Module Mismatch
4. Dominos Effect
5. Increased Temperature
6. Over Heating
7. Reduced Efficiency

VI. GRAPHICAL/PRACTICALLY REDUCED POWER RATIO

Series	Parallel	Output power	Percentage
1	1	Output power	94
4	1	Output power	91
16	1	Output power	86
1	4	Output power	58
2	4	Output power	52
8	4	Output power	48
16	4	Output power	47

Thus the block diagram can be designed like:

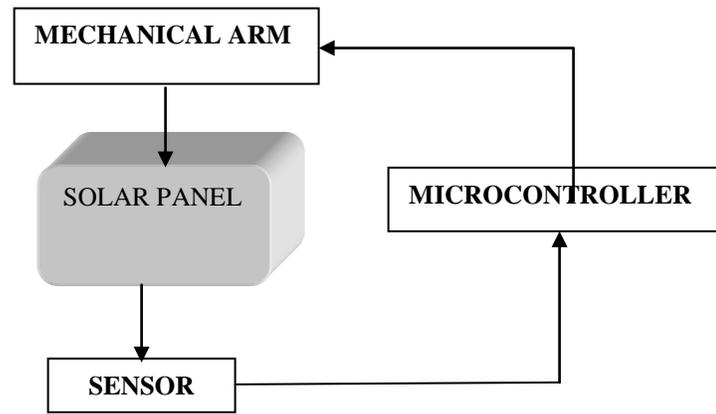


Fig. No. 2 Block Diagram

VIII. ALGORITHM

The flow chart for the algorithm is as follow

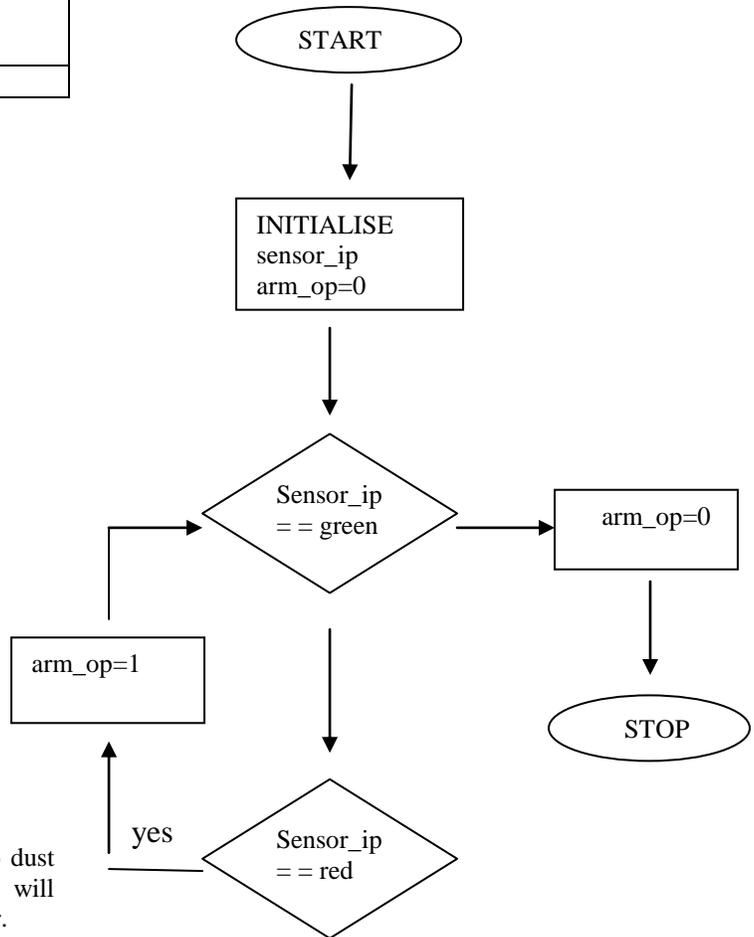
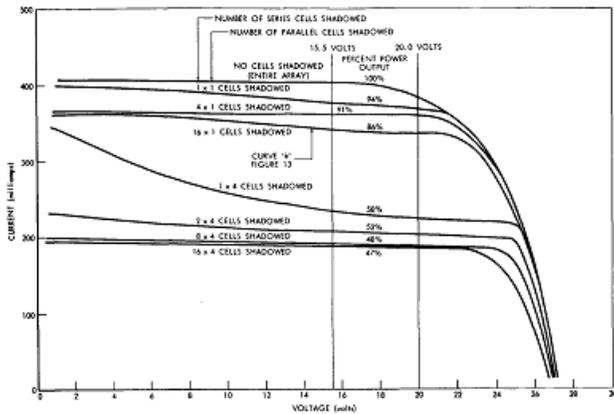


Fig.No.1The Effect of a Shadow which Covers Different Numbers of Cells in Series and parallel



VII. FABRICATION OF EMBEDDED SYSTEM

To overcome the problem of solar panel caused due to dust accumulation the embedded system is design which will automatically sense the dust on panel with the help of sensor. The output of the sensor will be the input to the microcontroller where the algorithm is written & according to the status of input the arm will be activated.

IX. ADVANTAGES

1. Low power consumption
2. Regular cleaning of solar panel
3. Reduce Maintenance cost
4. Increase performance of Solar panel
5. Reduce Battery related problem
6. Regulated power output from SPV System
7. Increase overall efficiency

X. DEMERITS

1. Cost of sensor
2. Dust Sensor are not readily available

XI. CONCLUSION

Keeping in account the overall performance of the SPV system the fabrication of such Automatic dust cleaner will overcome its demerits & will bring revolution in today's scenario where each & every country is facing the challenge of energy crises.

REFERENCES

- [1] P.N. Botsaris, K.P. Anagnostopoulos, O. Demesouka, "Using axiomatic design principles for designing a simple and innovative product: A case study", *International Journal of Design Engineering*, vol. 1, No. 3, 2008 pp. 300-315.
- [2] Skoplaki, E. and Palyvos, J.A., "On the temperature dependence of photovoltaic module electrical performance: A review of efficiency/power correlations", *International Journal of Solar Energy*, Elsevier 83, pp. 614-624, 2009.
- [3] Zondag, H.A., De Vries, D.W., Van Helden, W.G.J., Van Zolengen, R.J.C., Van Steenhoven, A.A., "The thermal and electrical yield of a PV-module collector", *International Journal of Solar Energy*, Elsevier, 72(2), 2002, pp. 113-28.
- [4] Skoplaki, E., Boudouvis, A.G., Palyvos, J.A., "A simple correlation for the operating temperature of photovoltaic modules of arbitrary mounting", *Solar Energy Materials & Solar Cells* 2008, pp. 1393-1402.
- [5] E. Molenbroek, D.W. Waddington, K.A. Emmery, "Hot spot susceptibility and testing of PV modules", *IEEE*, 1991, pp. 547-552.
- [6] J. Isenberg, W. Warta, Realistic evaluation of power losses in solar cells by using thermographic methods, *Journal of Applied Physics*, 2004; 95(9): pp. 5200.
- [7] A.Kaminski, B. Thuillier, J.P. Boyeaux, A. Laugier, "Application of infrared thermography to the characterization of multicrystalline silicon solar cells" *Proceedings of 5th International Conference on Intermolecular Interactions in Matter*, Lublin (Poland), 2-4 September 1999, pp. 73-77.
- [8] Sheng-Han Ho, Kuei-Hsiang Chao, Hang-Hui Wang, "Application of extension fault diagnosis method to malfunction, investigation of photovoltaic system", *Proceedings of TAAI 2005*, pp. 282-290.
- [9] H. Hermann, W. Wiesner, W. VaaBen, Hot spot investigations on PV modules-new concepts for test standard and consequences for modules design with respect to bypass diode, *Photovoltaic Specialists Conference*, 1997, Conference Record of the Twenty Sixth IEEE, Sept. 30-Oct. 3, pp. 1129-1132
- [10] Wang, M.H. and Chen, H.C., Application of extension theory to the fault diagnosis of power transformers, *Proc. 22nd Symp. On Electrical Power Engineering*, Kaohsiung, Taiwan, 21-22 Nov., 2010, pp. 797-800.
- [11] F. Ancuta, C. Cepisca, "Thermographic analysis of PV fault systems", *Proceedings of EPE 2010*, 6th International Conference on Electrical and Power Engineering 2010, pp. 353-356.
- [12] F. Ancuta, C. Cepisca, Analysis of PV Panels Faults by Thermography, *Proceedings of EVER Monaco 2011*, 31Apr -3 May, pp. 128.

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Physical and Emotional Symptoms Associated to Work Related Stress in IT Professionals

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Abstract- Based on report published by American Psychological Association, the number of Americans reporting extreme stress continues to be significant - around 20 percent in 2012, 22 percent in 2011, 24 percent in 2010 and 23 percent in 2009. Based on latest report from American Psychological Association, work is among the top three sources of stress. The physical and emotional symptoms associated to stress vary based on type of work. Hence understanding of the specific cause in work related stress and associated symptoms help organizations to come up with appropriate stress management programs to improve organizational effectiveness. Considering the increasing role of IT (Information Technology) in today's industry, this study is intended to identify the causes of work related stress in IT professionals and the common physical and emotional symptoms exhibited by IT professionals with high level of work related stress. The study collected data from 128 IT professionals, to identify a subset of professionals experiencing high levels of work place stress. 53 of 128 professionals reported work related issues as primary factor contributing to stress. Work related issues causing extreme stress, most frequently experienced physical symptoms associated with work related stress and most frequently experienced emotional symptoms associated with work related stress, were identified for the 53 professionals that reported work related issues as primary factor contributing to stress.

Index Terms- Stress, Psychology, Symptoms, IT

I. INTRODUCTION

Cox¹, defines stress as a "perceptual phenomenon arising from a comparison between the demand on the person and his ability to cope." The interaction model of stress implies that varying demands are made on individuals in any situation. These demands may be physical, emotional or environmental in nature. The degree of stress experienced by an individual in any single situation will vary due to personal factors. An individual's reaction to stress can also be physiological (state of arousal)². This necessarily means that stress can manifest as emotional and physical symptoms in an individual. According to Sternberg, disruption in communication among the major biological systems during and after serious stress or the accumulation of multiple, minor, difficult events increase the risk for physical and emotional illness⁵.

Stress management is the ability to reduce or cope with

stressors by controlling frequency, intensity, and duration of the stress reaction to decrease unhealthy conditions³. In the broadest sense, stress management may include any type of stress intervention; however, it may also include a narrow set of individual-level interventions⁴.

Organizations need to clearly identify the causes of work related stress and, the physical and emotional symptoms that employees have based on these causes while designing stress management program. It is very important to conduct study of stress at industry/domain level so that effective stress management programs can be designed that will be beneficial and meets the needs of professionals in the specific industry.

There is several industry specific stress studies conducted in healthcare, academic and defense industry. Some of the popular studies published recently on industry specific stress study are given in reference^{6,7,8}. The purpose of this study is focused on stress of professionals in IT industry. Work related issues causing extreme stress, most frequently experienced physical symptoms associated with work related stress and most frequently experienced emotional symptoms associated with work related stress, of IT professionals were analyzed as part of this study.

II. MATERIALS AND METHODS

The aim of this study was to get data for the following research questions:

- i) What are the work related issues causing extreme stress in IT professionals?
- ii) What are the most frequently experienced physical symptoms associated with work related stress in IT professionals?
- iii) What are the most frequently experienced emotional symptoms associated with work related stress in IT professionals?

The research approach used in the study to obtain data for the research questions is shown in figure 1.

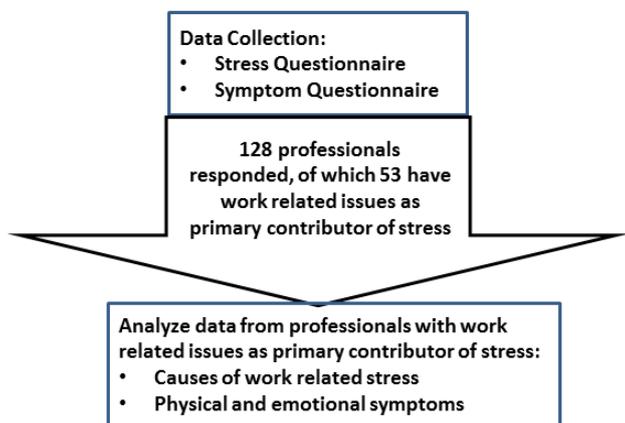


Figure 1. Research approach used in this study

The study was conducted by utilizing questionnaire based self-report to get data from the IT professionals. Self-report questionnaire involved the administration of many questions/items to participants who responded by rating the degree to which each item reflects their experience and can be scored objectively.

The decision to use a questionnaire instead of interviews was because:

- It allowed the researcher to reach a wider set of IT professionals working in different organizations.
- There was time for respondents to consider their opinions before committing to the response.
- Questionnaire made it convenient for the researcher to analyze the data obtained.
- Bias was minimized as no middleman was involved and there was uniformity of question and/or statement presentation.
- The researcher's own opinion(s) could not influence respondents to answer questions in a certain manner.
- Questionnaires are less intrusive than telephonic or face-to-face surveys.

This Stress questionnaire was intended to determine the causes of stress and factor contributing to highest level of stress. To ensure that the Stress questionnaire appears neutral, the factors contributing to stress covered in the questionnaire included: Family Issues, Work Related Issues, Social and Interpersonal Issues, Environmental Issues outside Work, Financial and Legal Issues, Change in Circumstances and Physical Issues. IT professionals that responded to the stress questionnaire were asked to rank the factors contributing to stress corresponding to the level/contribution it has on the stress of the individual. "Rank 1" corresponds to highest contributor to stress.

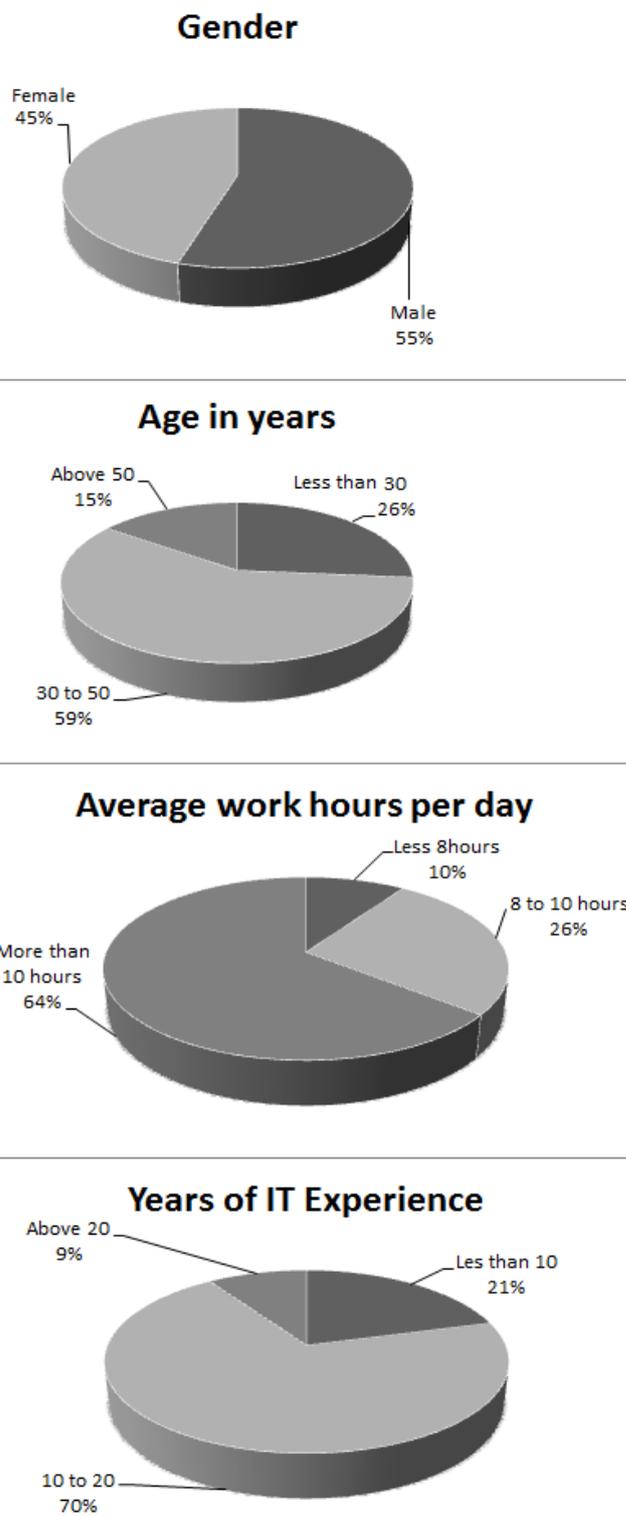


Figure 2. Characteristics of sample under study

The professionals, who reported work related issues as the primary contributor of stress, were requested to respond to an additional symptoms questionnaire on work related stress. Out of the 128 IT professionals that responded to the questionnaire, 53 reported to have work related issues as primary contributor to stress, and gave response to both questionnaires. The distribution of factors based on its contribution to stress on IT professionals that participated in this study is shown in figure

3. The characteristics of the sample that reported work related issues as primary contributor to stress are show in figure 2. They are referred to as sample under study to get better insight on the research questions.

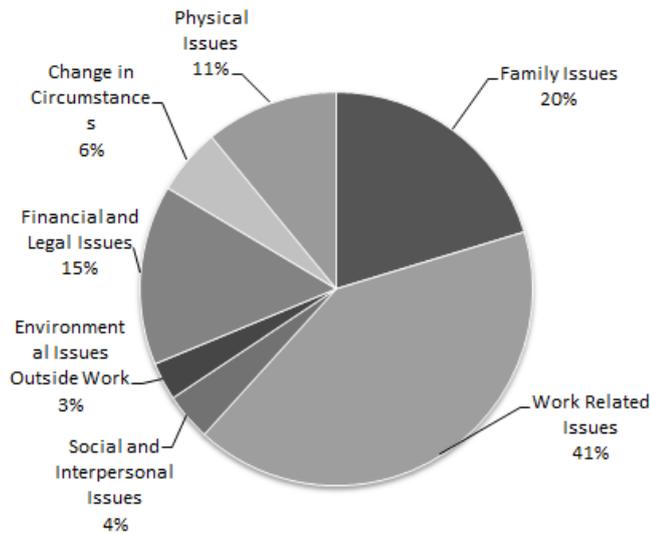


Figure 3. Distribution of primary factor contributing to stress in IT professionals

III. RESULTS

Results of the study provided answers to the research questions this study intended to resolve. The response of the IT professionals helped in showing the main causes of work related stress and the physical and emotional symptoms associated to work related stress. The results of the study are presented in table 1, table 2 and table 3.

Table 1. Work Related Issues Contributing to Stress

Work Related Issues Contributing to Stress in IT Professionals	Number of Professionals Rating Extreme Stress	%
Job Insecurity	12	5.88
Unsafe/Unethical work environment	4	1.96
Started with a new career/ position	7	3.43
Incomplete job description	14	6.86
Too high workload	32	15.69
Work environment issues - limited office space, noise, pollution, privacy etc	13	6.37
Retrenchment	9	4.41
Disciplinary conduct/ serious warnings given by supervisor	3	1.47
Concern on slow tempo of promotion or low remuneration	17	8.33
Having relationship problems	8	3.92

with colleagues		
Problems with authority structure / management	12	5.88
Lack of positive feedback by managers	24	11.76
Boring routine work	8	3.92
Irregular working hours	34	16.67
Difficulty in deciding future career	7	3.43

Table 2. Physical Symptoms Associated with Work Related Stress

Physical Symptoms Associated with Work Related Stress in IT Professionals	Number of Professionals experiencing the symptom most frequently	%
Headaches	34	11.07
Muscle pain	18	5.86
Colds	12	3.91
Disturbed Sleep	17	5.54
Back pain	32	10.42
Neck pain	8	2.61
Tiredness	28	9.12
Breathing difficulties/ Shortness of breath	7	2.28
Feeling dizzy	12	3.91
Eye Strain – Itching, Watery or Dry	17	5.54
An upset stomach or nausea	12	3.91
Chest pain	4	1.30
Diarrhea	8	2.61
Acid indigestion or heartburn	13	4.23
Stomach cramps (Not menstrual)	7	2.28
Constipation	8	2.61
Heart pounding when not exercising	3	0.98
An infection	2	0.65
Fever	12	3.91
Loss of appetite	13	4.23
Trouble Falling asleep	22	7.17
Skin problem – itching, pimple, rash, etc	18	5.86

Table 3. Emotional Symptoms Associated with Work Related Stress

Emotional Symptoms Associated with Work Related Stress in IT Professionals	Number of Professionals experiencing	%

	the symptom most frequently	
Helpless/Can do nothing about a situation	3	1.03
Have lost interest in work	13	4.45
Accept things as they are	7	2.40
Boredom at work	18	6.16
Do not wish to participate in activities	12	4.11
Have no interest in activities around you	8	2.74
Feel uneasy to go to work	13	4.45
Feels no support at work	23	7.88
Want to isolate and work alone	12	4.11
Feel irritated or easily annoyed	28	9.59
Feel aggressive	8	2.74
Feel inferior	7	2.40
Feel guilty	3	1.03
Getting sad	3	1.03
Afraid without any specific reason	18	6.16
Afraid of losing control	21	7.19
Not exactly sure how to act	8	2.74
Trouble concentrating	32	10.96
Continuously needs assistance	8	2.74
Getting into trouble	3	1.03
Too many problems	17	5.82
Feel insecure	27	9.25

IV. DISCUSSION

The research study showed that for the sample under study, the top three work related issues causing extreme stress in IT professionals were:

- a)irregular work hours,
- b) too high workload,
- c)lack of positive feedback from managers.

Job insecurity, incomplete job description and work environment also were causes of stress which can be expected based on current economic conditions and studies on workspace⁹, conducted recently. Lack of positive feedback is a stress cause which the organizations can address by educating the supervisors and offering employee recognition programs at various levels. However high work load and irregular work hours, in most cases is stress cause which most organizations does not want to avoid for achieving productivity and timelines of IT projects. Hence appropriate stress management programs should be introduced to improve coping strategies of the IT professionals, as organization may not want to directly

eliminate irregular work hours and high work load.

For the sample used in this research study, the top three most frequently experienced physical symptoms associated with work related stress were:

- a)headaches,
- b) back pain
- c)tiredness.

Eye strain, disturbed sleep and skin problems were also common symptoms among IT professionals. IT organizations are strongly suggested to introduce alternative medicine programs that involve exercises like yoga which will help professionals relax mentally and physically. It is strongly suggested to at least educate employees on eye exercises and stretch exercises that can directly address the top three symptoms.

For the sample used in this research study, the top three most frequently experienced emotional symptoms associated with work related stress were:

- a)trouble concentrating,
- b) fell irritated or easily annoyed,
- c)feel insecure.

Boredom at work and getting afraid without any specific reason are some of the other emotional symptoms common among IT professionals with high level of work related stress. The results show the need for internal initiatives that will improve coping strategies of IT professionals. Lack of internal initiatives, will result in a hostile work environment that is disturbing not only to the person experiencing stress, but also to other colleagues in the enterprise working with this professional. Multiple research studies have showed the effectiveness of preventative, as opposed to reactive coping strategies^{10,11}. For organizational stress management it is suggested to come up with preventive coping strategies. Preventative coping involves developing resources to lessen the consequences of stressful events¹², which can be achieved using organizational stress management programs.

V. CONCLUSION

The Information Technology (IT) industry is growing at a rapid pace and the work pressure and expectations from IT workers is increasing exponentially. There is a pressing need for emphasis to be placed upon research to address the role of stress and its function and its impact on mental and physiological health of IT professionals. Research in this direction will help IT organizations to come up with effective low-cost strategies and interventions to combat, reduce, or prevent the effects of stress. Reducing some of the sources of stress like workload and irregular work hours, may not be productive for the enterprise. Hence stress is inevitable for IT professionals. However, knowledge of effective stress management strategies will help in empowering IT professionals to become more self-efficacious in the management of their health and well-being.

This study helped in analyzing the work related issues causing extreme stress, most frequently experienced physical symptoms associated with work related stress and most frequently experienced emotional symptoms associated with work related stress in IT professionals. The study included participants from multiple IT organizations and care was taken to isolate samples with work related stress as primary contributor of stress. The study does have limitation, in that other sources of stress may have also contributed to some degrees in the physical and emotional symptoms, for those with extreme work related stress. As future work, the intent is to study the effectiveness of alternative medicine in stress management of IT professionals, and analyze how it would reduce the physical and emotional symptoms from work related stress of IT professionals.

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REFERENCES

- [1] Cox, T. and Griffiths, A., *Work-related stress: a theoretical perspective*, Occupational Health Psychology, Chichester, Wiley-Blackwell, 2010
- [2] Kendall E, Murphy P, O'Neill V, Bursnall S., *Occupational stress: Factors that contribute to its occurrence and effective management. A Report to the Workers Compensation and Rehabilitation Commission*. P1-158, 2000
- [3] Girdano, D.A., Everly, G.S., and Dusek, D.E., *Controlling stress and tension*. Boston: Allyn & Bacon, 1997.
- [4] Murff, S.H., *The impact of stress on academic success in college students*, *The Association of Black Nursing Faculty Journal*, 16, 102-104, 2005.
- [5] Sternberg, E.M., Chrousos, G.P., Wilder, R.L., and Gold, P.W., *The stress response and the regulation of inflammatory disease*. *Annals of International Medicine*, 117(10), 854-866, 1992.
- [6] Murff, S.H., *The impact of stress on academic success in college students*. *The Association of Black Nursing Faculty Journal*, 16, 102-104, 2005.
- [7] Baker, D.M., Capuano, T., Cohen-Katz, J., Deitrick, L., Shapiro, S., and Wiley, S., *The effects of mindfulness-based stress reduction on nurse stress and burnout*. *Holistic Nursing Practice*, 19(2), 78-82, 2005.
- [8] Taugis, J, *Stress management for police Special Forces*, *Journal of Applied Sport Psychology*, 14, 330-343, 2002.
- [9] Szalma, James L., and Peter A. Hancock, *Noise Effects on Human Performance*, *Psychological Bulletin* 137, no. 4: 682-707, 2011.
- [10] Greenglass, E.R, *Proactive coping and quality of life management*. In E. Frydenberg (Ed.), *Beyond coping: Meeting goals, visions, and challenges* (pp. 37-62). London: Oxford University Press, 2002
- [11] Schwarzer, R., and Renner, B. *Social-cognitive predictors of health behavior. Action self-efficacy and coping self-efficacy*. *Health Psychology*, 19, 487-495, 2000.
- [12] Peacock, E.J., Wong, P.T.P., & Reker, G.T. (1993). *Relations between appraisals and coping schemas: support for the congruence model*. *Canadian Journal of Behavioral Science*, 25, 64-80

Time Stamp Based Mining in Multiple Asynchronous Text Sequences

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Abstract—Text sequences are ubiquitous, multiple text sequence are often related to each other by sharing common topics. The interactions among these sequences provide more information to derive more meaningful topics. Discovering valuable knowledge from a text sequence involves extracting topics from the sequence with both semantic and temporal information. The method is relied on a fundamental assumption that different sequences are always synchronous in time. The documents from different sequences on the same topic have different time stamp and there is no guarantee that the articles covering the same topic are indexed by the same time stamps. The key idea is to introduce a generative topic model for utilizing correlation between the semantic and temporal information in the sequences. Topic model is mainly focused on extracting a set of common topics from given sequences using their original time stamps. It performs topic extraction and time synchronization alternatively to optimize a unified objective function. A local optimum is guaranteed with the proposed method.

Index Terms-Asynchronous sequences, temporal text mining, Topic model.

I. INTRODUCTION

Text mining is the analysis of data contained in natural language text. The application of text mining techniques to solve business problems is called text analytics. Text mining is alternately referred to as text data mining, roughly equivalent to text analytics, refers to the process of deriving high-quality information from Text mining is the analysis of data contained in natural language text. The application of text mining techniques to solve business problems is called text analytics.

Text mining is alternately referred to as text data mining, roughly equivalent to text analytics, refers to the process of deriving high-quality information from text. Text analysis involves information retrieval, lexical analysis to word frequency distributions, pattern recognition, tagging/annotation, information extraction, data mining techniques including link and association analysis, visualization, and predictive analytics.

Addressing the problem of topic detection is the main focus of in text mining. The goal of the task is to identify a collection of news articles about a topic. It is viewed as d as natural text streams with publication dates as time stamps. It would be very useful it can discover, extract, and summarize the evolutionary theme patterns automatically. The algorithm contains several interesting applications that can make it easier for people to understand the information contained in large knowledge domains, including exploring topic dynamics and indicating the role that words play in the semantic content of documents.

Application domains, encounter a stream of text, in each text document has some meaningful time stamp. An event covered in news articles generally has an underlying temporal and Evolutionary structure consisting of themes characterizing the beginning, progression, and impact of the event, among others. It is classification of document into topics and actions into activities.

Parameter estimation in these models discovers a low-dimensional set of multinomial word distributions called topics in textual documents. Mixtures of these topics give high likelihood to the training data, and the highest probability words in each topic provide keywords that briefly summarize the themes in the text collection. The topic models have also been applied to images, biological findings and other non-textual multi-dimensional discrete data.

The topics addressed by a paper are also one of the first pieces of information a person tries to extract reading a scientific abstract. Papers are relevant to their interests, search areas are rising or falling in popularity, and the papers are related to one another. A statistical method is provided for automatically extracting a representation of documents that provides a first-order approximation to the kind of knowledge available to domain experts. The method discovers a set of topics expressed by documents, providing quantitative measures that can be used to identify the content of those documents, track changes in content over time, and express the similarity between documents.

A novel problem of text mining referred to as Baseline Text Mining. The task of comparative text mining is to discover any latent common themes across all collections as well as summarize the similarity and divergences of these collections along each common theme. The task of comparative text mining involves discovering the different common themes across all the collections and for each discovered theme, characterize the common and unique term.

The rest of the paper is organized as follows: related work is discussed in Section II; formalize our problem and propose a generative model with a unified objective function in Section III; how to optimize the objective function in Section IV; extensions of our model and algorithm are discussed in Section V; and conclude our work in Section VI.

II. RELATED WORK

The authors introduced present asynchronous distributed learning algorithms for two well known unsupervised learning frameworks is Latent Dirichlet Allocation and Hierarchical Dirichlet Processes the work contain some distinction. It will contain purely asynchronous communication. It is not applicable to the collapsed sampler for LDA. Another method is mining correlated busy topic patterns from coordinated text streams can reveal interesting latent associations or events behind these streams. It is effectively discover quite meaningful topic patterns. Using mutual reinforcement across streams discover correlated busy Topic patterns methods. It is applicable text stream only.

The approach that is to use state space models on the natural parameters of the multinomial distributions that represent the topics. Variational approximations based on Kalman filters and nonparametric wavelet regressions are developed to carry out approximate posterior inference over the latent topics. In addition to giving quantitative, predictive models of a sequential corpus, dynamic topic models provide a qualitative window into the contents of a large document collection. The main problem contains Factorial Hidden Markov models for topic intensity tracking with exponential order statistics for implicit data association. At the problem is data association and intensity tracking of multiple topics over time. The approach detects correct topic intensities even with 30% topic noise.

Another model capture arbiter nested a possibly sparse correlation between topics and then using a directed acyclic graph. The leaves of the DAG represent individual words in the vocabulary, each interior node represents correlation among its children may be words or other interior node. It proposed to correlation among children, may be words or other interior nodes. A correlation of textual documents parameter estimation in these model distributions called topics. Mixtures of this topic give likelihood to the training data and the highest probability words in each topic provide keywords that briefly summarize the themes in the text collection.

The authors introduced a probabilistic model to incorporate content and time information in a unified framework. This model gives new representations of both news articles and news events. This algorithm is easy to understand and implement. A disadvantage is to find better representations of the contents of news articles very difficult.

Symbols	Description
WF	Total number of words in a particular sequence
WS	Number of words in a all sequence
SW	Number of sequence in Database which a particular word is found

TE	Topic Extraction
IF	Inverse frequency
ITE	Inverse topic frequency
SD	Sequence in Database

Table.1 Symbol and Their Meaning

The novel problem of mining spatiotemporal theme patterns from weblogs and propose a novel probabilistic approach to model the subtopic themes and spatiotemporal theme patterns simultaneously. The proposed model discovers spatiotemporal theme patterns by extracting common themes from weblogs. The proposed probabilistic model is general and can be used for spatiotemporal text mining on any domain with time and location information. The probabilistic model is generally applicable not to any text collections with time and location information, but also for other text mining problems.

The model is Markov assumptions or discretization of time each topic is associated with a continuous distribution over timestamps, and for each generated document, the mixture distribution over topics is influenced by both word co-occurrences and the document’s timestamp. The meaning of a particular topic can be relied upon as constant, but the topics occurrence and correlations change significantly over time. More improved topics, better timestamp prediction, and interpretable trends.

Text stream is important to know that the hot burst events detection problem, it is different from TDT. It focuses, detecting a set of burst features for a burst event. Propose a new novel parameter free probabilistic approach, called feature-pivot clustering. Main technique is to fully utilize the time information to determine a set of burst features may occur in different time windows. Detect burst events based on the feature distributions. There is no need to tune or estimate any parameters.

III. PROBLEM STATEMENT

The asynchronies among multiple sequences, i.e., documents from different sequences on the same topic have different time stamps, is actually very common in practice. The main symbols used throughout the paper are listed in Table 1.

For instance, in news feeds, there is no guarantee that news articles covering the same topic are indexed by the same time stamps. There can be hours of delay for news agencies, days for newspapers, and even weeks for periodicals, because some sources try to provide first-hand flashes shortly after the incidents, while others provide more comprehensive reviews afterward.

Another example is research paper archives, the latest research topics are closely followed by newsletters and communications within weeks or months, and then the full versions may appear in conference proceedings, which are usually published annually and at last in journals, which may sometimes take more than a year to appear after submission.

IV. PROPOSED ALGORITHM

Formally address this problem and put forward a novel algorithm based on the generative topic model.

Our algorithm consists of two alternate steps:

- The first step extracts common topics from multiple sequences based on the adjusted time stamps provided by the second step.
- The second step adjusts the time stamps of the documents according to the time distribution of the topics discovered by the first step.

V. DISCUSSIONS AND EXTENSIONS

Perform these two steps alternately and after iterations a monotonic convergence of our objective function can be guaranteed. The effectiveness and advantage of our approach were justified through extensive empirical studies on two real data sets consisting of six research paper repositories and two news article feeds, respectively.

The current time stamps of all sequences are synchronous and the common topics are extracted and TE is calculated for each of them. TE/ITF can be calculated for each word using the four values such as number of words in a document, frequency of a word in a document, the number of total documents, and the number of documents where the word appears. Instead of extracting words from an e-text, two-word phrases were extracted and TEITF is calculated for each of them.

$$TE = WS/WF1 \quad (1)$$

Inverse frequency (IF) is essential. In this percentage denoting the number of times a word appears in a document [10]. It is mathematically expressed as WS/WF , where WS is the number of times a word appears in a document and WF is the total number of words in the same document. Inverse document frequency (IDF) takes into account that many words occur many times in many documents. IDF is mathematically expressed as SD/SW , where SD is the total number of sequence in database and SW is the number of document in which a particular word is found. As SD/SW increases so do the significance of the given word.

$$ITE = SD/SW^{-1} \tag{2}$$

A. Time Synchronization

The timestamps (IF) are adjusted to synchronize the sequences. Once the common topics are extracted, the documents are matched to the topic. Topic related content retrieval from the various unstructured document based upon Time Synchronization

$$IF = TE/ITE \tag{3}$$

$$H(1:1,1:a) = \sum_{m,t=1} \max_{1 \leq s \leq a} \sum_w Q(W,s)C(W,d) \tag{4}$$

In this (3) and (4) equation gives the global optimum to our objective function in [6].

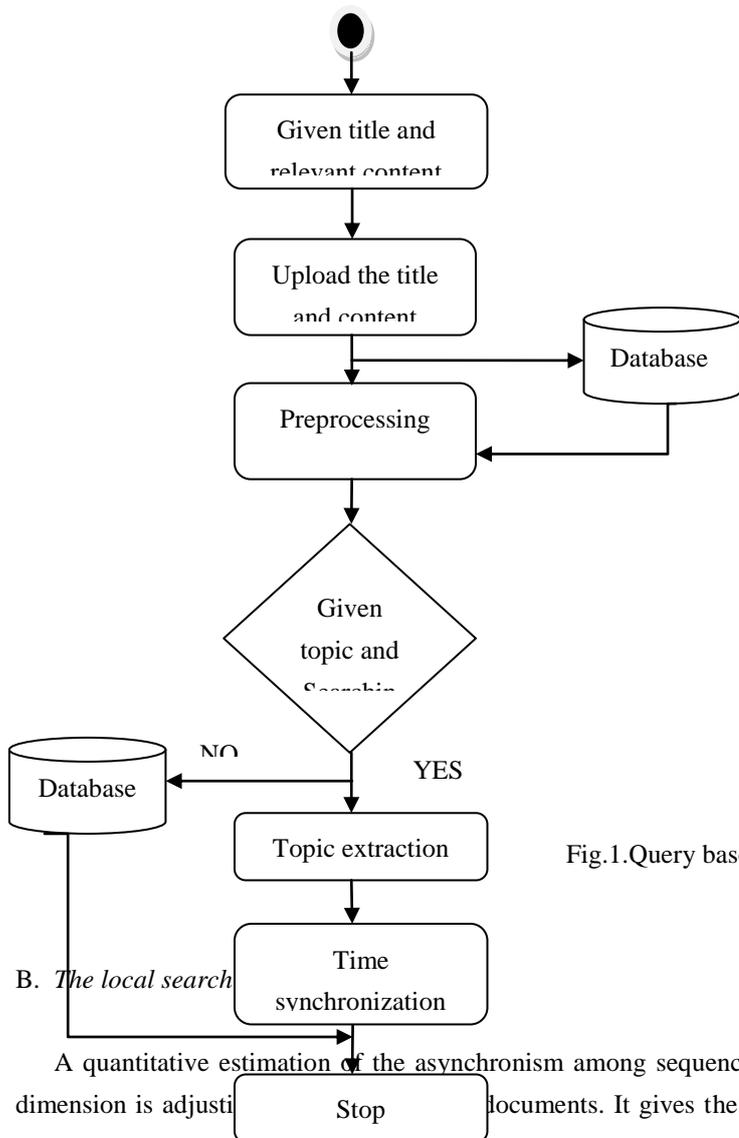
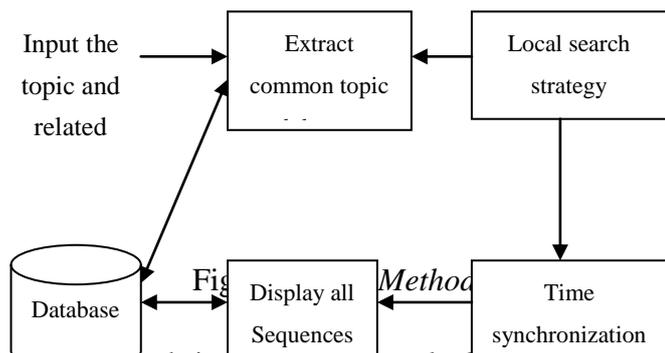


Fig.1.Query based browsing

step without causing substantial performance loss, by setting an upper bound for the difference between the time stamps of documents before and after adjustment in each iteration.

C. The Baseline Method and Implementation

The standard PLSA method as the topic extraction step of our algorithm. Yet in the experiments, we introduced two additional techniques as used in and this modified version of the PLSA algorithm was used as a baseline method for topic extraction.



One technique is to introduce a background topic into our generative model so that background noise can be removed and find more burst and meaningful topics.

D. Algorithm

- STEP 1: Input to the document or topic.
- STEP 2: Give the topic related content.
- STEP 3: Using preprocessing state.
- STEP 4: Get topic related content, all sequence already synchronous and extract common topic using topic extraction.
- STEP 5: Give the searching string and then pick the searching related content.
- STEP 6: Extract common topic content to be displayed.
- STEP 7: Once the common topics are extract, match documents in all sequences' and then display synchronize the Sequences.
- STEP 8: Get document content from unstructured Text sequence.

VI. RESULTS AND DISCUSSION

The proposed work web search result personalization is focused. From the Table.1 it is clear that the user can get the efficient results based on their domain. Queries based Browsing provides increased proficiency as in Fig.1.

Domain		Number of queries	Response efficiency	
Common Login (%)		Query based Login (%)		
Science	50	52	56	
Education	40	68	72	
Research	42	45	62	
Software	38	67	70	
Total	170	232	260	

Table.2 Query based browsing

Based on the user query the related links are displayed. Normally the query is in the form of keywords as in Fig.2.

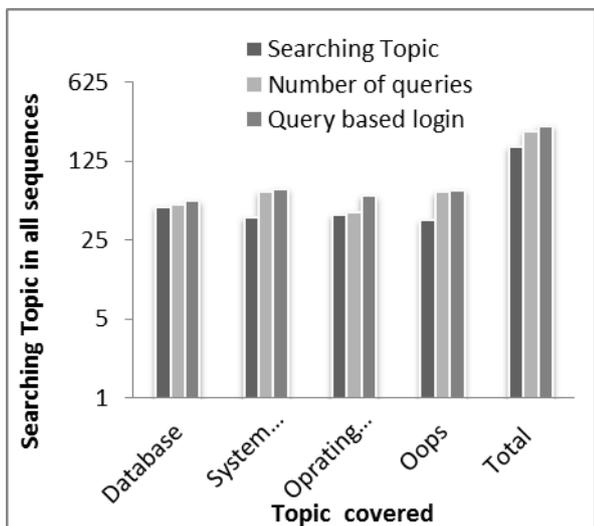


Fig.2 Query based browsing

The keywords which match with the sequence are indexed as in Fig.3. The lexical meaning of the keyword is analyzed through Word Net. Tree Tagger is for annotating text with part of speech and lemma information. Preprocessing or Tokenization is the process of breaking a stream of text up into words phrases, symbols or other meaningful elements called tokens. The list of tokens becomes input for further processing such as parsing.

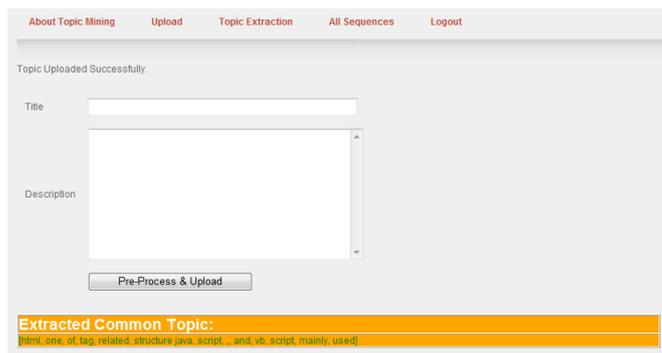


Fig.3 Home page

The related documents are captured and display. The similarity between the topic sequences is calculated. The documents with more similarity measures are clustered.

VII. CONCLUSIONS

A novel method was introduced to deal with and it automatically discovers and fix potential asynchronism among sequences and consequentially extract better common topics.

The proposed method is used by utilizing correlation between the semantic and temporal information in the sequences. It performs topic extraction and time synchronization alternatively to optimize a unified objective function. A local optimum is guaranteed. Preventing duplications in text sequences considering similarities according to temporal analysis is a constrain proceed further.

- 1) The method is able to find meaningful and discriminative topics from asynchronous text sequences;

2) The performance of our method is robust and stable against different parameter settings and random initialization.

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REFERENCES

- [1] J. Allan, R. Papka, and V. Lavrenko, 'On-Line New Event Detection and Tracking', Proc. Ann. Int'l ACM SIGIR Conf. Research and Development in Information Retrieval (SIGIR), pp. 37- 45, 1998.
- [2] A. Asuncion, P. Smyth, and W. Welling, 'Asynchronous Distributed Learning of Topic Models', Proc. Neural Information Processing Systems, pp. 81-88, 2008.
- [3] D. J. Berndt and J. Clifford, 'Using Dynamic Time Warping to Find Patterns in Time Series', Proc. Knowledge Discovery in Databases (KDD) Workshop, pp. 359-370, 1994.
- [4] D. M. Blei and J. D. Lafferty, 'Correlated Topic Models', Proc. Neural Information Processing Systems, 2005.
- [5] D. M. Blei and J. D. Lafferty, 'Dynamic Topic Models', Proc. Int'l Conf. Machine Learning (ICML), pp. 113-120, 2006.
- [6] D. M. Blei, A. Y. Ng., and M. I Jordan., 'Latent Dirichlet Allocation', Proc. Neural Information Processing Systems, pp. 601-608, 2001.
- [7] G. P. C. Fung, J. X. Yu, P. S. Yu, and H. Lu, 'Parameter Free Bursty Events Detection in Text Streams', Proc. Int'l Conf. Very Large Data Bases (VLDB), pp. 181-192, 2005.
- [8] T. Hofmann, 'Probabilistic Latent Semantic Indexing', Proc. Ann. Int'l ACM SIGIR Conf. Research and Development in Information Retrieval (SIGIR), pp. 50-57, 1999.
- [9] A. Krause, J. Leskovec, and C. Guestrin, 'Data Association for Topic Intensity Tracking', Proc. Int'l Conf. Machine Learning (ICML), pp. 497-504 , 2006.
- [10] W. Li and A. McCallum, 'Pachinko Allocation: Dag-Structured Mixture Models of Topic Correlations', Proc. Int'l Conf. Machine Learning (ICML), pp. 577-584, 2006.
- [11] Z. Li, B. Wang, M. Li, and W.Y. MaY, 'A Probabilistic Model for Retrospective News Event Detection', Proc. Ann. Int'l ACM SIGIR Conf. Research and Development in Information Retrieval (SIGIR), pp. 106-113, 2005.
- [12] Mei.Q, Liu.C, Su.H, and Zhai.C (2006), 'A Probabilistic Approach to Spatiotemporal Theme Pattern Mining on Weblogs', Proc. Int'l Conf. World Wide Web (WWW), pp. 533-542.
- [13] X. Wang. and A. McCallum, 'Topics over Time: A Non-Markov Continuous-Time Model of Topical Trends', Proc. ACM SIGKDD Int'l Conf. Knowledge Discovery and Data Mining (KDD), pp. 424- 433, 2006.

- [14] X. Wang, C. X. Zhai, X. Hu and R. Sproat, '*Mining Correlated Bursty Topic Patterns from Coordinated Text Streams*', Proc. ACM SIGKDD Int'l Conf. Knowledge Discovery and Data Mining (KDD), pp. 784-793, 2007.
- [15] C. Zhai, A. Veliveli and B. Yu, '*A Cross-Collection Mixture Model for Comparative Text Mining*', Proc. ACM SIGKDD Int'l Conf. Knowledge Discovery and Data Mining (KDD), pp. 743-748, 2004.

Poisson-Size-biased Lindley Distribution

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Abstract:

In this paper the general concept of Poisson-size-biased Lindley (PSBL) distribution is presented. Its p.m.f. is obtained. Some of its properties and the expressions for raw and central moments, coefficients of skewness and kurtosis are derived. The moment equations and the maximum likelihood estimators of the parameter of this Poisson size-biased Lindley (PSBL) distribution have been obtained for estimation its parameters. A simulation of a parameter is study has been proposed.

Key Words:

Size-biased Poisson-Lindley distribution; moment's equation estimation; maximum likelihood estimators;

I. INTRODUCTION

D. V. Lindley [2], has introduced a one-parameter distribution, known as Lindley distribution, given by probability density function (p.d.f.):

$$f(x; \theta) = \frac{\theta^2}{\theta + 1} (1 + x)e^{-\theta x}; \quad x > 0, \quad \theta > 0, \dots \dots (1.1)$$

M. Sankaran [10] has introduced one parameter Poisson-Lindley distribution (PLD) to model count data with probability mass function (p.m.f.):

$$f_0(x; \theta) = \frac{\theta^2(x + \theta + 2)}{(\theta + 1)^{x+3}}, \quad x = 0, 1, \dots; \quad \theta > 0, \dots (1.2)$$

The distribution arises from the Poisson distribution when its parameter λ follows a Lindley distribution with probability density function (p.d.f.)

$$g_0(\lambda; \theta) = \frac{\theta^2}{\theta + 1} (1 + \lambda)e^{-\theta \lambda}, \quad \lambda > 0, \quad \theta > 0, \dots \dots (1.3)$$

R. Shanker, S. Sharma and R. Shanker [16] proposed a two-parameter Lindley distribution of which the one-parameter Lindley distribution (LD) is a particular case, for modeling waiting and survival time's data. R. Shanker and A. Mishra [11] proposed a two-parameter Quasi Lindley Distribution (QLD) and studies its properties. It is found that in all data-sets the QLD provides closer fits than those by the Lindley distribution.

R. Shanker, S. Sharma and R. Shanker [15] proposed a discrete two parameter Poisson Lindley distribution (PLD), of which the M. Shankaran's [10] Poisson-Lindley distribution is a special case. It is derived by compounding a Poisson distribution with the discrete two-parameter Lindley distribution of R. Shanker, S. Sharma and R. Shanker [13]. They derived first four moments of this distribution and have discussed the estimation of the parameters by the moments. They have found that the two-parameter PLD is better fit and more flexible than the Shankaran's one-parameter PLD to some data sets.

M. E. Ghitany and D. K. Al-Mutairi [9] discussed estimation methods for the discrete Poisson Lindley distribution (1.2) and its applications. They derived a discrete two-parameter Poisson Lindley distribution by compounding a Poisson distribution with a two-parameter Lindley distribution obtained by R. Shanker, S. Sharma and R. Shanker [13].

In many a situation experimenters do not work with truly random sample from the population, in which they are interested, either by design or because of the fact that in many situations it becomes impossible to have random sample from the targeted population. However, since the observations do not have an equal probability of entering the sample, the resulting sampled distribution does not follow the original distribution. Statistical models that incorporate these restrictions are called weighted models. When an investigator records an observation by nature according to certain stochastic model, the recorded observation will not have the original distribution unless every observation is given an equal chance of being recorded. For example, suppose that the original observation x_0 comes from a distribution with p.m.f./p.d.f. $f_0(x_0)$ and that observation x is recorded according to a probability re-weighted by a weight function $w(x) > 0$, then x comes from a distribution with p.m.f./p.d.f.

$$f(x) = \frac{w(x)}{E[w(X_0)]} f_0(x) \dots \dots \dots (1.4).$$

C. R. Rao [3] introduced distributions of this type and called them weighted distributions. The weighted distribution with $w(x) = x$ is called size-biased/length-biased distribution. G. P. Patil and C. R. Rao [4] examined some general models leading to weighted distributions and showed how the weight $w(x) = x$ occurs in a natural way in many sampling problems. A study of size-biased sampling and related form-invariant weighted distributions was made by G. D. Patil and J. K. Ord [5]. A survey of real-life applications of size-biased distributions may be found in G. D. Patil and C. R. Rao [3] and [4].

M. E. Ghitany and D. K. Al-Mutairi [8] proposed Size-biased Poisson-Lindley distribution and suggested its application. They consider the size-biased version of Poisson-Lindley distribution and obtained the p.m.f. of size-biased Poisson-Lindley (SBPL) distribution as

$$f(x; \theta) = \frac{x}{\mu_0} f_0(x; \theta) = \frac{\theta^3}{\theta + 2} \frac{x(x + \theta + 2)}{(\theta + 1)^{x+2}}, \quad x = 1, 2, \dots; \theta > 0, \dots (1.5)$$

Where, $\mu_0 = \frac{\theta+2}{\theta(\theta+1)}$ is the mean of the Poisson-Lindley distribution with p.m.f. (1.2). The SBPL distribution also arises from the size-biased Poisson (SBP) distribution with p.m.f.

$$g(x/\lambda) = e^{-\lambda} \frac{\lambda^{x-1}}{(x-1)!}, \quad x = 1, 2, \dots; \lambda > 0, \dots (1.6)$$

when its parameter λ follows a size-biased Lindley (SBL) model with p.d.f.

$$h(\lambda; \theta) = \frac{\theta^3}{\theta + 2} \lambda(1 + \lambda)e^{-\theta\lambda}, \quad \lambda > 0, \theta > 0, \dots (1.7)$$

Combining the equations (1.6) and (1.7) then the result will be:

$$f(x; \theta) = \int_0^\infty g(x/\lambda) \cdot h(\lambda; \theta) d\lambda$$

$$= \frac{\theta^3}{\theta + 2} \left\{ \frac{x(x + \theta + 2)}{(\theta + 1)^{x+2}} \right\}, \quad x = 1, 2, \dots; \dots (1.8)$$

This is same as equation (1.5). Thus it is clear that the size-biased version of Poisson Lindley distribution is same as that obtained by compounding size-biased Poisson and size-biased Lindley distributions. The mean (μ), variance (σ^2), coefficient of skewness ($\sqrt{\beta_1}$) and coefficient of kurtosis (β_2) for the SBPL distribution proposed by M. E. Ghitany and D. K. Al-Mutairi [9] are as:

$$\text{Mean}(\mu_1) = \mu'_1 = \frac{\theta^2 + 4\theta + 6}{\theta(\theta + 2)},$$

$$\text{Variance}(\mu_2) = \frac{2(\theta^3 + 6\theta^2 + 12\theta + 6)}{\theta^2(\theta + 1)^2},$$

$$\sqrt{\beta_1} = \frac{\theta^5 + 10\theta^4 + 42\theta^3 + 84\theta^2 + 72\theta + 24}{\sqrt{2}(\theta^3 + 6\theta^2 + 12\theta + 6)^{3/2}},$$

$$\beta_2 = \frac{\theta^7 + 22\theta^6 + 184\theta^5 + 780\theta^4 + 1800\theta^3 + 2256\theta^2 + 1440\theta + 360}{2(\theta^3 + 6\theta^2 + 12\theta + 6)^2}$$

We propose another size-biased Poisson-Lindley (SBPL) distribution which is obtained by compounding the size-biased Poisson distribution with Lindley distribution without considering its size-biased form. (This paper is accepted by IJMRS for the process of publication in Dec., 2013 Volume)[12]. The size-biased Poisson distribution has the p.m.f.

$$f(x/\lambda) = \frac{e^{-\lambda} \lambda^{x-1}}{(x-1)!}; \quad x = 1, 2, 3, \dots \dots \dots; \quad \lambda > 0, \dots \dots \dots (1.9)$$

Now if its parameter λ follows the Lindley distribution with p.m.f. (1.1) then the p.m.f. of the size-biased Poisson-Lindley (SBPL) distribution is obtained as:

$$\begin{aligned} f(x; \theta) &= \int_0^\infty f(x/\lambda) \cdot g_0(\lambda; \theta) d\lambda \\ &= \frac{\theta^2}{(1 + \theta)^{x+2}} \cdot (x + \theta + 1), \quad x = 1, 2, 3, \dots \dots \dots (1.10), \end{aligned}$$

We obtained the first four raw moments and their corresponding central moments of this size-biased Poisson-Lindley (SBPL) distribution (1.10) are as:

Raw Moments:

$$\begin{aligned} \mu'_1 &= \frac{\theta^2 + 2\theta + 2}{\theta(\theta + 1)} \\ \mu'_2 &= \frac{\theta^3 + 4\theta^2 + 8\theta + 6}{\theta^2(\theta + 1)} \\ \mu'_3 &= \frac{\theta^4 + 8\theta^3 + 26\theta^2 + 42\theta + 24}{\theta^3(\theta + 1)} \end{aligned}$$

$$\mu'_4 = \frac{\theta^5 + 16\theta^4 + 80\theta^3 + 210\theta^2 + 264\theta + 120}{\theta^4(\theta + 1)}$$

And Central Moments:

$$\mu_1 = \frac{\theta^2 + 2\theta + 2}{\theta(\theta + 1)}$$

$$\mu_2 = \frac{\theta^3 + 4\theta^2 + 6\theta + 2}{\theta^2(\theta + 1)^2}$$

$$\mu_3 = \frac{\theta^5 + 7\theta^4 + 22\theta^3 + 32\theta^2 + 18\theta + 4}{\theta^3(\theta + 1)^3}$$

$$\mu_4 = \frac{\theta^7 + 15\theta^6 + 87\theta^5 + 258\theta^4 + 406\theta^3 + 338\theta^2 + 144\theta + 24}{\theta^4(\theta + 1)^4}$$

Thus the mean, variance, skewness, kurtosis and their coefficients are proposed are as:

$$\text{Mean} = \frac{\theta^2 + 2\theta + 2}{\theta(\theta + 1)},$$

$$\text{Vairance} = \frac{\theta^3 + 4\theta^2 + 6\theta + 2}{\theta^2(\theta + 1)^2},$$

$$\beta_1 = \frac{\mu_3^2}{\mu_2^3} = \frac{(\theta^5 + 7\theta^4 + 22\theta^3 + 32\theta^2 + 18\theta + 4)^2}{(\theta^3 + 4\theta^2 + 6\theta + 2)^3},$$

$$\beta_2 = \frac{\mu_4}{\mu_2^2} = \frac{\theta^7 + 15\theta^6 + 87\theta^5 + 258\theta^4 + 406\theta^3 + 338\theta^2 + 144\theta + 24}{(\theta^3 + 4\theta^2 + 6\theta + 2)^2},$$

$$\gamma_1 = \sqrt{\beta_1} = \frac{\theta^5 + 7\theta^4 + 22\theta^3 + 32\theta^2 + 18\theta + 4}{(\theta^3 + 4\theta^2 + 6\theta + 2)^{3/2}},$$

And

$$\gamma_2 = \beta_2 - 3 = \frac{\theta^7 + 12\theta^6 + 63\theta^5 + 174\theta^4 + 250\theta^3 + 182\theta^2 + 72\theta + 12}{(\theta^3 + 4\theta^2 + 6\theta + 2)^2}$$

II. PROPOSED PSBL DISTRIBUTION

In this paper we propose Poisson size-biased Lindley (PSBL) distribution which is obtained by compounding the Poisson distribution without considering its size-biased form with size-biased Lindley distribution. The Poisson distribution has the p.m.f.

$$g(x/\lambda) = \frac{e^{-\lambda} \cdot \lambda^x}{x!}; \quad x = 0,1,2, \dots; \quad \lambda > 0, \dots \dots \dots (2.1)$$

Now if its parameter λ follows the size-biased Lindley (SBL) model with p.d.f. (1.7) then the p.m.f. of the Poisson size-biased Lindley (PSBL) distribution is obtained as:

$$\begin{aligned} f(x; \theta) &= \int_0^\infty f(x/\lambda) \cdot h(\lambda; \theta) d\lambda = \\ &= \int_0^\infty \frac{e^{-\lambda} \lambda^x}{x!} \cdot \frac{\theta^3}{(\theta+2)} \cdot \lambda(1+\lambda) \cdot e^{-\theta\lambda} d\lambda \\ &= \frac{\theta^3}{\theta+2} \cdot \frac{1}{x!} \left[\int_0^\infty e^{-(\theta+1)\lambda} \cdot \lambda^{x+1} d\lambda + \int_0^\infty e^{-(\theta+1)\lambda} \cdot \lambda^{x+2} d\lambda \right] \\ &= \frac{\theta^3}{\theta+2} \cdot \frac{1}{x!} \left[\frac{1}{(\theta+1)^{x+2}} \cdot x! (x+1) + \frac{1}{(\theta+1)^{x+3}} \cdot x! (x+1)(x+2) \right] \\ &= \frac{\theta^3}{(1+\theta)^{x+3}} \cdot \frac{1}{\theta+2} \cdot (x+1) \cdot (x+\theta+3), \quad x = 0,1,2, \dots \dots \dots (2.2), \end{aligned}$$

Here we get, $\sum_{x=1}^\infty f(x; \theta) = 1$.

The first four raw moments and their corresponding central moments of this Poisson size-biased Lindley (PSBL) distribution (2.2) comes out to be:

Raw Moments:

$$\begin{aligned} \mu'_1 = E(X) &= \frac{2\theta^3 + 10\theta^2 + 14\theta + 6}{\theta(\theta+2)(\theta+1)^2} \\ \mu'_2 = E(X^2) &= \frac{2\theta^4 + 16\theta^3 + 50\theta^2 + 60\theta + 24}{\theta^2(\theta+2)(\theta+1)^2} \\ \mu'_3 = E(X^3) &= \frac{2\theta^5 + 28\theta^4 + 146\theta^3 + 336\theta^2 + 336\theta + 120}{\theta^3(\theta+2)(\theta+1)^2} \\ \mu'_4 = E(X^4) &= \frac{2\theta^6 + 52\theta^5 + 410\theta^4 + 1512\theta^3 + 2712\theta^2 + 2280\theta + 720}{\theta^4(\theta+2)(\theta+1)^2} \end{aligned}$$

And Central Moments:

$$\begin{aligned} \mu_1 = \mu'_1 &= \frac{2\theta^3 + 10\theta^2 + 14\theta + 6}{\theta(\theta+2)(\theta+1)^2} \\ \mu_2 &= \frac{2\theta^7 + 20\theta^6 + 84\theta^5 + 188\theta^4 + 242\theta^3 + 180\theta^2 + 72\theta + 12}{\{\theta(\theta+2)(\theta+1)^2\}^2} \end{aligned}$$

$$\mu_3 = \frac{2\theta^{11} + 32\theta^{10} + 234\theta^9 + 1012\theta^8 + 2842\theta^7 + 5424\theta^6 + 7190\theta^5 + 6644\theta^4 + 4212\theta^3 + 1752\theta^2 + 432\theta + 48}{\{\theta(\theta + 2)(\theta + 1)\}^3}$$

$$\mu_4 = \frac{2\theta^{15} + 60\theta^{14} + 776\theta^{13} + 5848\theta^{12} + 28988\theta^{11} + 100792\theta^{10} + 255416\theta^9 + 482752\theta^8 + 689090\theta^7 + 745548\theta^6 + 608240\theta^5 + 368376\theta^4 + 160656\theta^3 + 47712\theta^2 + 8640\theta + 720}{\{\theta(\theta + 2)(\theta + 1)\}^4}$$

Thus the mean, variance, skewness, kurtosis and their coefficients are obtained as:

$$\text{Mean}(\mu_1) = \mu'_1 = \frac{2\theta^3 + 10\theta^2 + 14\theta + 6}{\theta(\theta + 2)(\theta + 1)^2},$$

$$\text{Variance}(\mu_2) = \frac{2\theta^7 + 20\theta^6 + 84\theta^5 + 188\theta^4 + 242\theta^3 + 180\theta^2 + 72\theta + 12}{\{\theta(\theta + 2)(\theta + 1)\}^2},$$

$$\beta_1 = \frac{(2\theta^{11} + 32\theta^{10} + 234\theta^9 + 1012\theta^8 + 2842\theta^7 + 5424\theta^6 + 7190\theta^5 + 6644\theta^4 + 4212\theta^3 + 1752\theta^2 + 432\theta + 48)^2}{(2\theta^7 + 20\theta^6 + 84\theta^5 + 188\theta^4 + 242\theta^3 + 180\theta^2 + 72\theta + 12)^3},$$

$$\beta_2 = \frac{2\theta^{15} + 60\theta^{14} + 776\theta^{13} + 5848\theta^{12} + 28988\theta^{11} + 100792\theta^{10} + 255416\theta^9 + 482752\theta^8 + 689090\theta^7 + 745548\theta^6 + 608240\theta^5 + 368376\theta^4 + 160656\theta^3 + 47712\theta^2 + 8640\theta + 720}{(2\theta^7 + 20\theta^6 + 84\theta^5 + 188\theta^4 + 242\theta^3 + 180\theta^2 + 72\theta + 12)^2},$$

$$\gamma_1 = \frac{2\theta^{11} + 32\theta^{10} + 234\theta^9 + 1012\theta^8 + 2842\theta^7 + 5424\theta^6 + 7190\theta^5 + 6644\theta^4 + 4212\theta^3 + 1752\theta^2 + 432\theta + 48}{(2\theta^7 + 20\theta^6 + 84\theta^5 + 188\theta^4 + 242\theta^3 + 180\theta^2 + 72\theta + 12)^{3/2}},$$

And

$$\gamma_2 = \frac{2\theta^{15} + 48\theta^{14} + 860\theta^{13} + 12500\theta^{12} + 48728\theta^{11} + 176956\theta^{10} + 566162\theta^9 + 2160028\theta^8 + 882278\theta^7 + 763716\theta^6 + 492536\theta^5 + 262695\theta^4 + 107032\theta^3 + 36480\theta^2 + 3456\theta + 288}{(2\theta^7 + 20\theta^6 + 84\theta^5 + 188\theta^4 + 242\theta^3 + 180\theta^2 + 72\theta + 12)^2}$$

We now give some basic properties of the SBPL model.

(i) Since

$$\mu - \sigma^2 = -\frac{2\theta^6 + 20\theta^5 + 72\theta^4 + 128\theta^3 + 122\theta^2 + 60\theta + 12}{\{\theta(\theta + 2)(\theta + 1)\}^2},$$

It follows that $\mu < (=) > \sigma^2$ for $\theta < (=) > \theta^*$, where $\theta^* \approx 1.671162$. That is the SBPL distribution is over-dispersed (equi-dispersed) (under-diapered) for $\theta < (=) > \theta^*$.

(ii) Since

$$\frac{f(x + 1; \theta)}{f(x; \theta)} = \left(\frac{1}{\theta + 1}\right) \cdot \left(1 + \frac{1}{x + 1}\right) \cdot \left(1 + \frac{1}{x + \theta + 3}\right)$$

Is a decreasing function in x, $f(x; \theta)$ is log-concave. Therefore the PSBL distribution is unimodal, has an increasing failure rate (IFR) (and hence, increasing failure rate average (IFRA), new better than used (NBU), new better than used in expectation

(NBUE) and decreasing mean residual life (DMRL) in Barlow and Proschan (1981) for more details about the definition of these aging concepts are given.

III. METHOD OF MOMENTS

Given a random sample $x_1, x_2, x_3, \dots, x_n$, of size n from the SBPL distribution with p.m.f.(2.2), the MOM estimate, $\hat{\theta}$ of θ is given by

$$E(X) = \frac{2\theta^3 + 10\theta^2 + 14\theta + 6}{\theta(\theta + 2)(\theta + 1)^2} = \bar{x}$$

$$\text{Or, } 2\theta^3 + 10\theta^2 + 14\theta + 6 = \theta(\theta + 2)(\theta + 1)^2 \times \bar{x}$$

$$\text{Or, } 2\theta^3 + 10\theta^2 + 14\theta + 6 = (\theta^4 + 4\theta^3 + 5\theta^2 + 2\theta) \cdot \bar{x}$$

$$\text{Or, } \theta^4 + (2\bar{x} - 1)2\theta^3 + (\bar{x} - 2)5\theta^2 + (\bar{x} - 7)2\theta - 6 = 0$$

Note that $\bar{x} = 1$ if and only if $x_i = 1$ for all $i = 1, 2, \dots, n$. A data set where all observations are ones is not worth analyzing. This situation, of course, will not lead to any estimate of θ . However, such situation may arise in a simulation experiment when n is small. For this reason, we will assume throughout this paper that $\bar{x} > 1$.

IV. MAXIMUM LIKELIHOOD ESTIMATION

Given a random sample x_1, x_2, \dots, x_n , of size n from the SBPL distribution with p.m.f. (2.2) is,

$$f(x; \theta) = \frac{\theta^3}{(1+\theta)^{x+3}} \cdot \frac{1}{\theta+2} \cdot (x+1) \cdot (x+\theta+3)$$

The likelihood function will be:

$$L(x_i; \theta) = \prod_{i=1}^n f(x_i; \theta)$$

$$= \left(\frac{\theta^3}{(\theta+1)^3} \cdot \frac{1}{\theta+2} \right)^n \cdot \prod_{i=1}^n \frac{1}{(\theta+1)^{x_i}} \cdot (x_i+1)(x_i+\theta+3)$$

$$\log L = 3n \log \theta - 3n \log(\theta + 1) - n \log(\theta + 2)$$

$$+ \sum_{i=1}^n \log(x_i + 1) + \sum_{i=1}^n \log(x_i + \theta + 3)$$

$$\therefore \frac{\partial \log L}{\partial \theta} = \frac{3n}{\theta} - \frac{3n}{\theta + 1} - \frac{n}{\theta + 2} + \sum_{i=1}^n \frac{1}{x_i + 1} - \sum_{i=1}^n \frac{1}{x_i + \theta + 3}$$

And

$$\therefore \frac{\partial^2 \log L}{\partial \theta^2} = -\frac{3n}{\theta^2} + \frac{3n}{(\theta + 1)^2} + \frac{n}{(\theta + 2)^2} - \sum_{i=1}^n \frac{1}{(x_i + 1)^2} - \sum_{i=1}^n \frac{1}{(x_i + \theta + 3)^2}$$

Thus the ML estimate $\hat{\theta}$ of θ is the solution of the non-linear equation:

$$\frac{3n}{\theta} - \frac{3n}{\theta + 1} - \frac{n}{\theta + 2} + \sum_{i=1}^n \frac{1}{x_i + 1} - \sum_{i=1}^n \frac{1}{x_i + \theta + 3} = 0 \dots \dots \dots (4.1)$$

The solution may be obtained by appropriate numerical methods.

V. SIMULATION STUDY

A simulation may be done using an algorithm to generate random samples from this Poisson-size biased Lindley distribution, a simulation study may be carried out $N = 10,000$ times for each pair (θ, n) where $\theta = 0.5, 1, 2, 8$ and $n = 20 (20) 100$. The study calculates the following measures:

(i) Average bias of the simulated estimates:

$$\frac{1}{N} \sum_{i=1}^N (\theta_i^* - \theta)$$

Where θ_i^* is the MOM estimate $\tilde{\theta}_i$ or the ML estimate $\hat{\theta}_i$.

(ii) Average mean-square error (MSE) of the simulated estimates:

$$\frac{1}{N} \sum_{i=1}^N (\theta_i^* - \theta)^2.$$

(iii) Coverage probability = percentage of confidence intervals containing θ .

REFERENCES

[1] C. R. Rao, On discrete distributions arising out of ascertainment, In: Classical and Contagious discrete distribution; G.P. Patil (ed.), Pergamon press and Statistical Publishing Society, Calcutta, 1965, 302-332.
 [2] D. V. Lindley, Fiducial Distribution and Bayes Theorem. Journal of Royal Statistical Society, 1958, Ser. B, 20, 102- 107.
 [3] G. D. Patil and C. R. Rao, Weighted distributions: a survey of their applications, in: P.R. Krishnaiah (Ed.), Applications of Statistics Amsterdam, North-Holand, 1975, 383-405.
 [4] G. P. Patil and C. R. Rao, Weighted distributions and size-biased sampling with applications to wildlife populations and human families, Biometrics, 34, 1978, 179-189.
 [5] G. P. Patil, and J. K. Ord, on size-biased sampling and related form-invariant weighted distributions, 1975, Sankhya, 38, 48-61.
 [6] J. E. Gentle, Random Number generation and Monte Carlo Methods, New York: Springer-Verlag, 2003, Second edition.

- [7] M. E. Ghitany, B. Atieh and S. Nadarajah, Lindley distribution and its applications, *Mathematics and computers in simulation*, 2008, Vol. 78, No. 4, pp. 49-506.
- [8] M. E. Ghitany and D. K. Al-Mutairi, Size-biased Poisson-Lindley Distribution and its Application, 2008, Vol. LXVI, n. 3, pp. 299-311.
- [9] M. E. Ghitany and D. K. Al-Mutairi, Estimation Methods for the discrete Poisson-Lindley distribution. *Journal of Statistical Computation and Simulation*, 2009, 79(1), 1-9.
- [10] M. Shankaran, The discrete Poisson-Lindley distribution. *Biometric* 26, 1970, 145-149.
- [11] R. Shanker and A. Mishra, A Quasi Lindley Distribution: *African Journals of Mathematics and Computer Science Research*, 2013, Vol. 6(4), pp. 64-71.
- [12] R. S. Srivastava and T. R. Adhikari, A Size-biased Poisson-Lindley Distribution, (Accepted for publication in *International Journal of Multidisciplinary*, Dec, 2013).
- [13] R. Shanker, S. Sharma and R. Shanker, A two-parameter Lindley Distribution for modeling waiting and survival times data. (Accepted for publication in *Applied Mathematics*), 2012¹.
- [14] R. E. Barlow and F. Proschan, *Statistical Theory of Reliability and Life Testing*, Silver Spring, MD: To Begin with, 1981.
- [15] R. Shanker, S. Sharma and R. Shanker, A discrete two-parameter Poisson Lindley Distribution: *JESA*, 2012² Vol. XXI, pp. 15-22.
- [16] R. Shanker, S. Sharma and R. Shanker, A two-parameter Lindley Distribution for Modeling Waiting and Survival Times Data; doi: 10.4236/am. 2013, 42056 Publishd Online Februry 2013 (<http://www.scirp.org/journal/am>) *Applied Mathematics*, 2013, 4 363-368.
- [17] R. V. Hogg, J. W. Mckean and A. T. Craig, *Introduction to Mathematical Statistics*, New Jersey: Pearson Prentice Hall, 2005, Sixth edition.

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A Study on Laundry Workers Attitude towards Health Care Industry in Trichy City

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Abstract- The services sector has become global in Indian context. This paper describes the characteristics of services and compares it with the characteristics of the products. It also brings out the importance of services in case of manufactured products. The challenges for the service industry have been discussed and the critical success factors have also been elaborated. This study also covers international trade regulations and their impact on the services sector. The problems facing India's health care system which have a greater impact on the poor. The inequal geographic distribution of doctors and hospitals makes it difficult for low-income families to access quality medical facilities. Eighty percent of doctors, 75 percent of dispensaries, and 60 percent of hospitals are situated in urban areas – making quality health care virtually inaccessible to people who live in remote areas. This study is mainly concerned with laundry workers, their nature of work, their washing material needs, their health issues and the protection in laundry work. The hospital administration is taking care of laundry workers. The area of the study is confined to Trichy city and the primary and secondary data are used in this study. The data were analysed using appropriate statistical tools such as percentages, chi-square test and ranking technique, Likert scaling techniques, correlation and analysis of variance.

Index Terms: Health care industry, Laundry services, process, physical facilities, Occupational problems

INTRODUCTION

The service sector, which has registered a nine per cent annual growth since the mid-1990s, accounts for 54 % of Indian's GDP and is currently the fastest growing sector of the economy. The services sector, which witnessed a double –digit annual growth, includes transportation, telecom, healthcare, financial services such as banking and insurance, business services such as advertising, legal services and the like. The

growth of the service industry has been uniform, with sectors such as accountancy, facility management, hospitality, entertainment, and personal services also showing impressive growth. The service marketing environment has been elaborated on and the service mix elements – product, people, physical evidence, and process. Service product, gives an understanding of the product in the context of services.

Services can be classified in several ways; various authors have tried to classify services on the basis of different features/aspects such as market segment, tangibility factor, skill type and the like.

1. Tangibility component 2. Skill-type involved 3. Business goals 4. Regulatory dimension 5. Intensity of labours employed 6. Consumer contacts 7. Place and timing 8. Customization 9. Demand and supply 10. Relationship with customers

The country's population is aging faster than expected. In 1980, the country's median age was just 20 years – it will be 31 by 2026. Between 2000 and 2050, the number of people between 60 and 80 years of age will increase by 326 percent. What's more, lifestyles are increasingly sedentary, and people's diets have become significantly less healthy. Due to these changes, the incidence of lifestyle and age-related diseases like diabetes is growing rapidly and the health care system as currently structured is ill-equipped to respond.

WORKING CONDITIONS

Cleaning services include a broad range of activities and are performed in different work environments such as homes, offices, industries, schools, shops, aircrafts and hospitals. The risks that cleaners undertake depend on the tasks they perform but also on the premises they work in. Workers need the following skills such as a good observation skills and attention to detail, to enjoy practical work, normal

colour vision, a reasonable level of fitness and good time management skills.

Laundry worker are specialist in commercial laundries or in the laundry department of a hotel, hospital or other organisation that produce large volumes of washing. These facilities are often warm and humid and some of the cleaning chemicals used can have strong fumes, though work areas are usually well ventilated. Laundry workers spend long periods on their feet, and are regularly required to lift heavy loads. Some laundry workers may drive vans or trucks to collect washing from customers and deliver the cleaned items when finished. The hours of work may vary, depending on the particular laundry. In some cases shift work - including nights and weekends – depending upon the need.

CHEMICAL HAZARDS

Cleaners' are exposed to chemicals depends on the type of products used as well as on the characteristics of the working environment in which they are used and the conditions of use (such as frequency, quantity, application mode and cleaner's breathing rate).

BIOLOGICAL HAZARDS

Cleaning staff can be also exposed to different types of biological agents such as micro-organisms (bacteria, viruses and moulds) and their products, such as fungal secretions and bacterial end toxins present in dust as well as in aerosols created during the cleaning process, including when vacuuming.

PHYSICAL HAZARDS

Physical hazards encountered in cleaning work encompass among others falls from ladders, elevated platforms and wet or slippery floors, falling objects, sharp objects, moving or rotating machinery parts, not only from the work equipment used but also from the environment where the cleaning work is performed.

STAGES OF OPERATION

Laundry process goes through six stages. The first three stages are called "soiled side" operations, such as i) soiled retrieval, ii) Soil sorting and iii) washing since it occur before the linen is actually washed. The last three are called "clean side" operations such as iv) processing, v) packaging and vi) distribution since they involve the handling of clean linen

STATEMENT OF THE PROBLEM

The laundry service providers are facing plenty of business problems in washing clothes, getting work order, collection of material, occupational illness, no proper training and, general problems in washing clothes; cost of operation is high, communication, cross contamination, wet linen storage, dust, cart space, replacement linens, maintenance, rework, overstuffing, tunnel jams and the like. The three biggest problems that plague India's health care sector today which is to be addressed in response to patients' changing needs are quality, access and affordability. These problems are executed by: i) A shortage of manpower across India ii) Poor infrastructure iii) Poor health resulting in a higher share of private expenditures.

The most common accidents in industrial laundries involve chemical exposure, sharp objects present in soiled linen, slips falls in wet floors, infections due to pathogens in contaminated linen, and body parts being misshaped in machinery. With the heavy workload and tough working environment employees easily get short-tempered. This leads to problems such as violence and workplace bullying. Hence laundry managers must be competent disciplinarians, ready to deal with employees who have attitude problems and additionally some production problem such as Communication, Cross-contamination, Wet linen storage, Dust, Cart Space, Replacement linens, Maintenance, Rework, Overstuffing and Tunnel jams in offering laundry services. Thus this is conducted for examine the method of washing, washing material used, side effects, treatment, process, life style and the laundry workers attitude.

REVIEW OF LITERATURE

The researcher mainly concentrated on the laundry service practices and policies of service providers, consumer satisfaction towards services, level of usage, quality of service, and variety of service provided by the laundry service providers. There are a very small number of studies on the general behaviour of laundry service provides and research was done in some specific areas only but it has not covered all the areas. But there is no specific study relating to the consequences faced by the laundry worker attitude towards their services, behaviour. Hence the researcher in this section has taken up some important research article relating to attitude

of laundry workers which appeared in the reputed journals for review.

Dr. R. Kavitha¹⁰ has conducted a study on “Health care industry in India” and it analyzed that the indispensable to prevent the laundry people from being affected by any disease and to give treatment to laundry workers. The first and foremost task of hospitals is to getting quality services from laundry workers and also to improve the quality of services where the situation is found very critical. Moreover this study deals with healthcare position in India and the steps are taken by government to improve the laundry workers.

OBJECTIVES OF THE STUDY

- ✚ To know about the laundry services offered in the health care industry.
- ✚ To study the laundry service provider’s perception and their behaviour in offering laundry services.
- ✚ To study the cause and effect in discharging laundry service.

METHODOLOGY

The area of the study is confined to Trichy city which is located in the southern part of India. In Trichy so many industries, educational institutions, hospitals are available in large numbers and all the level of people are also living in this city. The primary and secondary data are used in this study. The secondary data were collected from the health care industry, manuals, magazines and the like. The survey was conducted to collect primary data for this study from August 2013 to September 2013. The researcher has interviewed a total number of 60 respondents performing laundry services in hospitals. These respondents were drawn randomly across the city of Trichy based on convenient sampling method. As the responses received 10 respondents were inadequate and contradictory to the required information, their responses were rejected and finally responses from 50 sample respondents were considered for present analysis.

HYPOTHESES

The hypotheses tested in this study are

i) There is no association between the socio economic variables like age, gender, education and the occupational illness.

ii) There is no association between the working place and walk accidents in laundry services.

For analyzing the attitude of laundry workers, chi square test, ranking technique and percentile analysis have been used in this study. The above hypothesis framed is tested using chi square test. The Likert scaling technique has been used to measure the attitude of laundry workers. The fish bone analysis was also undertaken to know the cause and effects of the laundry services.

DATA ANALYSIS

In the health care industry various types of services are offered to the society. The researcher made an attempt to analyse the attitude and behaviour of laundry services in health care sector. For the purpose of analysis and interpretation, the laundry workers are classified on the basis of Gender viz. Male and Female.

ANALYSIS OF SOCIO – ECONOMIC CHARACTERISTICS OF SAMPLE RESPONDENTS

In this section the sample respondent’s socio – economic characteristics like age, educational qualifications, monthly income and family members are taken from the primary data. Percentage analysis has been used for analyzing the personal characteristics relating to the sample respondents are presented in the below table no.1.

Table No. 1. SOCIO ECONOMIC CHARACTERISTICS OF RESPONDENTS

¹⁰ International journal of scientific and research publications,
Vol. 2, August 2012, pp. 1-4.

Source: Primary Data

It is observed from the Table No. 1 that out of the sample respondent's majority of male and female workers falls in the category of 21 years to 45 years. 39.47 percent of male workers and 33.33 percent of female workers comes under 45 years to 55 years age category. Majority of respondents have completed only their school education i.e. 78.95 percent in male category and 75 percent in female category. Other respondents are found illiterate.

Above table indicates that the 75 percent of female and 52.63 male respondents earn only less than Rs. 10000 per month. 36.84 percent of the male respondents and 25 percent of the female respondents earn Rs. 10000 to Rs. 15000 per month. The table 3.2 expresses that 76.31 percent of male and 58.33 percent of female category have only 3 to 5 members in their family.

MODE OF WORK

In present business sector all the works are executed under PPP system i.e. Public Private Participation. In the health care sector, works are executed under the mode of direct labour work and also on contract basis. The researcher analysed this factor and presented in the below table no 2.

Table No. 2 MODE OF WORK

Particulars	Male		Female	
	Res	%	Res	%
Direct Laundry work	13	34.21	4	33.33
Contract basis	4	10.52	0	0
Both	21	55.26	8	66.66
Total	38	100	12	100

Source: Primary Data

Table no. 2 depicts that majority of the sample respondents do their work under direct and contract schemes 34.21 from male category respondents and 33.33 from female category respondents do their work directly basis.

SOURCE OF GETTING WORK ORDER

Laundry workers are handling various strategies to get work order from the hospitals such as the workers are contact directly to consent people, getting through reference, through neighbours and some contract basis from that people.

Table No. 3 SOURCE OF GETTING WORK ORDER

AGE				
Particulars	Male		Female	
	Res	%	Res	%
21years to 45years	17	44.74	6	50
45years to 55years	15	39.47	4	33.33
More 55 years	6	15.79	2	16.67
EDUCATIONAL QUALIFICATIONS				
Illiterate	8	21.05	3	25
School	30	78.95	9	75
Collegiate	0	0	0	0
MONTHLY INCOME				
Less than Rs. 10000	20	52.63	9	75
10000 to 15000	14	36.84	3	25
Above 15000	4	10.53	0	0
FAMILY MEMBERS				
Less than 3 members	5	13.15	2	16.66
3 to 5 members	29	76.31	7	58.33
More than 5 members	4	10.52	3	25
Total	38	100	12	100

Particulars	Male		Female	
	Res	Rank	Res	Rank
Direct	35	I	12	I
Reference	2	III	4	II
Neighbours	0		0	
Contract Basis	5	II	0	
Total	42		16	

Source: Primary Data

It is evident from Table no. 3 that the majority of laundry workers are getting their orders from the hospital directly. Hence the first rank has been allotted to this source. Sources such as 'contract' and 'reference' secure the second place.

ANALYSIS OF VARIANCE

Between groups(Work order& No .of workers)	5.309	2	2.655	2.894	.000
Linear term Un weighted	3.981	1	3.981	4.341	.000
Weighted	5.304	1	5.304	5.782	.020
Deviation	.006	1	.006	.006	.937
Within groups	43.11	47	.917		

Source: Primary Data.

$$\text{For } V_1 = 1(2-1); V_2 = 98 (100-2) F = 3.92$$

The calculated value 2.894 of F is less than the table value. The Hypothesis is accepted. Hence there is no significant difference in the sample means.

ANOVA or Analysis of Variance is used to compare the means of more than two populations. It uncovers the main and interaction effects of classification or independent variables on one or more dependent variables. ANOVA analysis uses the *F*-statistic, which tests if the means of the groups, formed by one independent variable or a combination of independent variables, are significantly different. The *F*-statistic calculates the ratio between the variance due to difference between groups and the error variance.

$$F = \text{Variance due to difference between groups/Error variance}$$

One-Way ANOVA is the generalization of the t-test for independent samples to situations with more than two groups. It is also known as single classification ANOVA or one-factor ANOVA. It is used to test the difference in a single dependent variable among two or more groups formed by a single independent or classification variable. It can be found under the Compare Means item in the Analyze menu by the name One-Way ANOVA.

The variables are labeled work orders and no of workers respectively. When there are both, between-groups as well as within-groups factors present in a design, it is referred to as mixed design. This analysis is carried out using SPSS and presented in table no 4.

Table No. 4 ANALYSIS OF VARIANCE

Work order	Sum of square	df	Mean Square	F	Sig
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WASHING PLACE

This work is done in the specific place only. The workers have various places to undertake their washing works such as river bed, washing outlets, at their home and at hospital. It has been analysed by the researcher and presented the result in table no 5.

Table No. 5. WASHING PLACE

Particulars	Male		Female	
	Res	Rank	Res	Rank
River-bed	28	II	9	I
Washing outlet	32	I	9	I
At home	3	III	3	II
At hospital	2	IV	2	III
Total	65		23	

It is learnt from the above table no 5 that the majority of male and female respondents preferred to wash at 'washing outlet' and 'river bed'. Hence, first and second rank is provided to these options. The third and fourth rank has been allotted to the 'home' and 'hospital'.

PROBLEMS FACED BY THE LAUNDRY WORKERS

Health care industry is providing this opportunity to the consent people and at the same time laundry workers are facing various problems like water scarcity, time constraint, natural calamities, inadequate space, hazardous chemicals, inadequate labours and regular monitor by management. The researcher analysed above said problems which faced by the respondents and the results are presented in table no 6.

Table No. 6. PROBLEMS FACED BY THE LAUNDRY WORKERS

Particulars	Male		Female	
	Res	Rank	Res	Rank
Water Scarcity	33	I	11	I
Time constraint	14	IV	2	V
Natural Calamities	31	II	11	I
Inadequate Space	14	IV	4	IV
Hazardous chemicals	3	VI	2	V
Inadequate labours	22	III	7	III
Regular monitory by management	0	0	0	
Total	117		37	

Source: Primary Data

It is evident from table no 6 that the majority of workers from male and female category. Suffer from water scarcity and are affected some natural calamities. Hence the first rank and second has been allotted to these problems respectively. Third rank goes to the problem inadequate labours in the field. The remaining problems have low scoring and are faced by the laundry workers occasionally.

KINDS OF OCCUPATIONAL ILLNESS

Due to the work nature, environment, and the chemicals used laundry workers are having occupational illness such as respiratory problems, Backache complaints, Skin problems, Allergies, Transmitted disease, Infections, Upper limp disorder. The researcher made an attempt to analyse the illness and results are presented in the table no 7.

Table No. 7. KINDS OF OCCUPATIONAL ILLNESS

Particulars	Male		Female	
	Res	Rank	Res	Rank
Respiratory problems	4	V	3	V
Backache complaints	29	I	9	II
Skin problems	25	III	11	I
Allergies	16	IV	7	IV
Transmitted disease	0	0	0	0
Infections	1	VI	1	VI
Upper limp disorder	29	I	8	III
Total	104		39	

Table no 7 evident that the majority of the respondents of male category affected ‘backache’ and ‘upper limp disorder’ problems and female category are affected by ‘skin problems’. Hence the first and second rank has been allotted to these illnesses. Following this, the male and female workers are affected ‘allergies’ secures fourth place. Fifth place goes to respiratory problems and infections among the entire category.

KINDS OF ACCIDENTS

Laundry workers are facing so many accidents while working in river bed, home, hospital and washing outlet. The laundry workers met accident such as small scratch, Fracture, Sudden bleeding, Giddiness, Insect bites, Chemical infections, Slips in wet floor and the like. The researcher analysed the accidents faced by the respondents and the results are given the below table no. 8.

Table No. 8 KINDS OF ACCIDENTS

Particulars	Male		Female	
	Res	%	Res	%
Small scratch	8	14.29	2	14.29
Fracture	13	23.21	2	14.29
Sudden flood	3	5.36	0	0.00
Giddiness	15	26.79	5	35.71
Insect bites	0	0.00	0	0.00
Chemical infections	1	1.79	0	0.00
Slips from wet floor	16	28.57	5	35.71
Infections to pathogens from contaminated clothes	0	0.00	0	0.00
Total	56	100	14	100

It is inferred from table no 8 Among 56 responses for men and female category, 16 persons met accident like slips from wet floor and giddiness from the sun lighting. 13 respondents among male and 2 respondents among female have met accident and got fracture. Other options have minimized responses such as small scratch, sudden flood, and chemical infections. Nobody is affected because of handling contaminated clothes and insect bites.

ASSOCIATION BETWEEN THE WORK PLACE OF LAUNDRY SERVICE AND ACCIDENT IN WORK SPOT

The association between the work place of laundry service and accident in work spot has been analyzed with the help of chi-square test based on the basis of null hypothesis (Ho), i.e. there is no association between the place of laundry service and accident happen in work spot and alternative hypothesis (H₁), i.e. there is an association between the place of laundry service and accident happen in work spot. The researcher have used SPSS to cross tabulate and then test the similarity of two distribution using chi square statistics. The result of the analysis is shown in the below Table. 9

TABLE NO. 9. CHI-SQUARE ANALYSIS FOR WORK PLACE OF LAUNDRY SERVICE AND ACCIDENT HAPPEN IN WORK SPOT

Particulars	River	Washing	At	At
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	bed	out-let	Home	Hospital
Small scratch	0.234	.034	1.705	1.087
Fracture	0.401	1.865	.577	.052
Sudden flood	1.121	.701	1.375	.278
Giddiness	.624	1.445	.284	.408
Chemical infections	.359	.224	.139	.089
Slips from wet floor	.910	.338	.179	.516

Source: Primary Data

(Five percent level of significance)

It is observed from the above table 9 that the calculated chi-square value is greater than five percent critical value for the nature of accidents 'small scratch', 'fracture', sudden flood, giddiness, chemical infections, slips from wet floor', in the work spots such as river bed, washing outlet, at home, at hospital. Hence the null hypotheses for these accidents happen on the work spot are accepted. Hence it can be concluded that there is no association between the work place of laundry service and accident happen in work spot.

ASSOCIATION BETWEEN SOCIO-ECONOMIC FACTORS AND OCCUPATIONAL ILLNESS

The association between the socio economic factors such as age, gender, education and occupational illness has been analyzed with the help of chi-square test based on the basis of null hypothesis (Ho), i.e. there is no association between socio economic factors such as age, gender, education and occupational illness and alternative hypothesis (H₁), i.e. there is an association between socio economic factors such as age, gender, education and occupational illness.

TABLE NO.10. CHI-SQUARE ANALYSIS FOR SOCIO ECONOMIC FACTORS SUCH AS AGE, GENDER, EDUCATION AND OCCUPATIONAL ILLNESS.

Particulars	Age	Gender	Education
Respiratory problems	2.85	.166	.195
Backache complaints	.008	1.219	.019
Skin problems	3.594	.453	1.553
Allergies	.435	3.631	1.887
Transmitted disease	.359	1.299	.224
Infections	.089	1.161	.701
Upper limp disorder	1.418	1.722	.307

Source: Primary Data

(Five percent level of significance)

The table 10 shows that the calculated value of chi-square is less than the table value at 5% level of significance. Hence the null hypothesis is accepted and it is concluded that there is no significance difference in the tendency of occupational illness to socio economic factors such as age, gender and educational qualification.

OFFERED PRIVILEGES

The researcher analysed about the privileges given by the hospital to their laundry workers such as free medical checkup, free medic line, discounts in treatment, children welfare, educational assistance and employment opportunities for family members and its results are presented in table 11.

Table No. 11. PRIVILEGES OFFERED BY THE HOSPITAL

Particulars	Male	Female
	Res	Res
Free medical checkup	16	5
Free medic line	13	2
Discounts in treatment	27	8
Children welfare	1	1
Educational assistance	1	0
Total	58	16

Source: Primary Data

It is clear from the above table 11 shows that the privileges listed by the researcher and its responses. Among the sample respondents, 27 made respondents and 8 female respondents have opined that they are given discounts in hospitals. Following this a major portion of the respondents from male and female category avail free medical checkup from the hospitals. Other privileges also availed by few respondents.

TRAINING AVAILABILITY

Training is an important tool to improve the workers quality, skill set, and using machineries in laundry field, update knowledge and knowing the recent techniques available in the field. Level of satisfaction and dissatisfaction of the training methods to their workers and it also differ from one to another person. Hence a question was raised to the respondents regarding the training methods. The opinion of the laundry workers towards this question is presented in table 12

Table No.12 TRAINING AVAILABILITY

Particulars	Male		Female	
	Res	Score	Res	Score
Strongly Agree	0	0	0	0
Agree	0	0	0	0
Neutral	13	39	7	21
disagree	14	28	4	8
Strongly disagree	11	11	1	1
Total	38	78/190* 100 = 41	12	30/60* 100 = 50

Table 12 highlights the opinion regarding the level of satisfaction of the respondents towards availability of training to the laundry workers. Majority of respondents disagreed regarding training. There is no proper training offered by anyone from the laundry association. The dissatisfaction scores given by the sample of respondents are male category 41 percent and female category 50 percent.

LOW OPERATION COST

Due to the market condition, cost of living, living style, competition, prices, scarcity of labour, fluctuation of cost of material are all the determinant factor of actions. So the researcher asked question to know the opinion about the operation cost among the laundry workers and presented in table no3.30.

Table No. 3.30 LESS OPERATION COST

Details	Male		Female	
	Res	Score	Res	Score
Strongly Agree	0	0	0	0
Agree	0	0	0	0
Neutral	0	0	0	0
disagree	0	0	0	0
Strongly disagree	38	38	12	12
Total	38	38/190*100 = 20	12	12/60*100 = 20

Table 3.30 highlights the opinion regarding the level of satisfaction of the respondents toward the cost of operation. All the respondents are strongly disagreed towards the cost of activity. The satisfaction scores given by the sample respondents are 20 percent in both the categories.

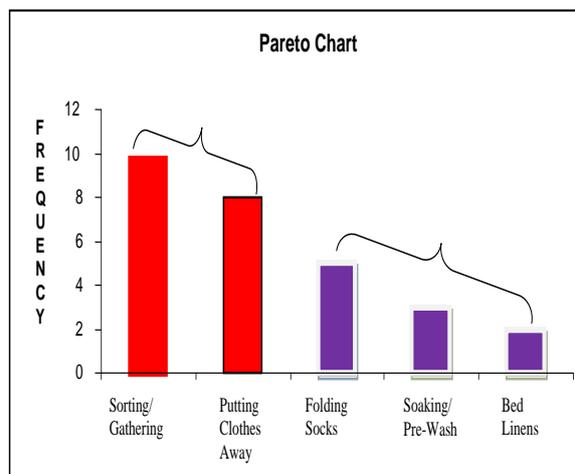
CAUSE AND EFFECT ANALYSIS ABOUT LAUNDRY WORK

In this step, it is brainstormed that the possible causes are employment of high time for discharging laundry work. The researcher had chosen statistical tools for interpreting the causes, namely a fishbone diagram and a Pareto chart. The researcher had collected response from family members and asked the questions, "Which activity would you consider adds the most time to your laundry process?" Based on this data, a Pareto chart and fishbone diagram and presented below.

The researcher has analysed with the additional causes during the laundry process through a fishbone diagram. The researcher was able to sought out these caused by analyzing the process inputs, process, and outputs. Among the causes easily sought out some processes like sorting and putting clothes away are concentrated in the Pareto chart as viewed.

Hence, the researcher suggest to focus attention on these factors like folding, soaking and bed liens in order to reduce the total amount and time spent performing the entire laundry process. The researcher analyzed the possible causes and determined from the Pareto chart that the vital few consisted of extra time for sorting and gathering clothes as well as the time spent folding and putting the clothes away.

Chart No 1. Pareto Chart



The below diagram depicts the cause and effect of variation in time spent on laundry. The various causes are entertainment, distractions laziness and illness etc...

Diagram No. 1. FISHBONE DIAGRAM



RESEARCH FINDINGS

1. Among the sample respondents Male category of the respondents are 76% and very few are from female category.
2. 96.7 percent of respondents render laundry service as it a hereditary business.
3. Majority of the respondents have responded that the material, washing, ironing and delivery the materials from the various hospitals in a particular timings only.
4. 81.57% male respondents and 58.3% of the female respondents have more than 10 years of experience in this field.
5. The laundry service providers completing their work orders with the half of hired labours, their neighbours, relations and with their life partners.
6. 81.57 % male respondents and 83.33 % of female respondents are opined that they are not willing to involve their heirs in this work.
7. The respondents have opined that they do not give any additional complements to hospitals for getting wok order.
8. The hospitals do not receive any gifts (monetary and non-monetary) from the laundry workers for procuring work order.
9. In this study majority of the respondents are completing their works with the assistance of three members.
10. The respondents are completing the work depends up on the availability of water, time taken, raw material availability and delivery time. They are doing above said works based on their convenience and timings and the respondents are working between 8am to 6 pm.
11. All the respondents are using washing soda and washing powder only for washing.
12. The workers are facing so many problems such as water scarcity, natural calamities and inadequate space.
13. Hospitals are paying bills to their laundry workers at the time of delivery.

14. 63.63% of the laundry service providers are giving wages to their labourers on daily basis and few percentage of respondents are settling on weekly basis.
15. In this study, it is found that most of the laundry workers are giving fixing wages to their labourer's on piece rate basis.
16. 50% of female respondents and 44.47% of male respondents are using the bacterial soap for protecting their health after the completion of work process.
17. Majority of the respondents have suffered from occupational illness in their work.
18. The laundry workers seek assistance from the local bodies such as, water tank facilities and washing materials at low cost. Some of the respondents have availed special assistance from the hospital like housing facilities and safety washing outlet.
19. Nobody is have availed any insurance policies to compensate their financial loss and for their medical treatment due to that their poor financial position and lack of awareness.
20. All the respondents opined that they are recognized by the society.
21. Majority of respondents have strongly agreed the statement "accessing order is easy". The satisfaction scores given by the sample of respondents are male category 41 percent and female category 50 percent.
22. Few respondents are strongly disagreed their hindrances and cost of action from the male and female category.
23. The respondents have strongly disagreed regarding the availability of manpower resources.

CONCLUSION

Third parties services play a prominent role in health care industry. Third party services such as transportation, warehousing, cross docking, inventors, packaging, cleaning, and washing freight forwarding etc have gained. They are normally contracted by a health administrators in India also where high rate of demographic pressure, illiteracy, environmental pollution. This laundry service types include washing and drying garments such as T-shirts, shorts, pants, and even materials such as blankets and curtains. Most of the laundry service providers also offer laundry services such as pressing, packaging and delivery. Hence the present research work will be highly useful to the policy makers in taking vital decision and will help the laundry service to improve their work life. This piece of research work will gain reputation for the researcher if it is amply rewarded.

REFERENCES:

1. Aake, David, A., Kumar.V., and Day George. S. **Marketing Research**. Sixth edition, John Wiley and Sons, New York, 1998.
2. Bateson, John, E. **Services Marketing Text and Readings**. 3rd edition, Dryden, Hinsdale IL, 1995.
3. Kuntz, David, L. **Services Marketing**, John Wiley, New Delhi, 2002.
4. Philip Kotler. **Marketing Management**. Prentice Hall of India, New Delhi, 2001.
5. Venugopal, Vasanthi. **Services Marketing**. Himalaya Publishers, New Delhi, 2001.
6. Dr. R. Kavitha "International journal of scientific and research publication" Vol. 2, August 2012.
7. Borg M. A. and A. Portelli. 1999. "Hospital Laundry Workers – An At-risk Group" Occupational Medicine 49, no. 7 (Sept): 448-50.
8. Diekema, Daniel J. and Bradley N. Doebbeling. 1995. "Employee Health and Infection Control," **Infection Control And Hospital Epidemiology** 16 (May): 292-301.
9. Lipscomb, Jane and Linda Rosen stock. 1997. "Healthcare Workers: Protecting Those Who Protect Our Health." Editorial. **Infection Control and Hospital Epidemiology** 18, no. 6: 397-399.
10. Barrie D, Hoffman PN, Wilson JA, Kramer JM. Contamination of hospital linen by *Bacillus cereus*. **Epidemiol Infect.** 1994;113:297–306.
11. Shanks NJ, AL-Kalai D. Occupational risk of needle stick injuries among health care personnel, **Hospital Infection** 1995; 29(3):221-6.
12. Baru, R. 1999. **Private Health Care in India: Social Characteristics and Trends**. New Delhi: Sage Publications.
13. CII-Mc Kinsey Report. 2004. **Healthcare in India: The Road Ahead**. New Delhi: Indian Health Care Federation.
14. Shreenivas T. **Management of Hospitals, Patient Satisfaction 'A Survey'**. 1st Edition. Vol. 6. A. P. H Publishing Company; New Delhi: 2003. pp. 399–460.
15. **Diploma in Hospital and Health Management Course . Management of Supportive and Utility Service**. Ninth Edition. Academy of Hospital Administration; New Delhi: 1998. pp. 109–121.
16. Sakharkar BM. **Role of Hospital in Health Care, Principles of Hospital Administration and Planning**, 1st Edition, Jaypee Brother. New Delhi. 1998;1:1–19.

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A Numerically efficient power optimization scheme for coded OFDM systems in achieving minimum frame error rate

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Abstract- Coded OFDM is a transmission technique that is used in many practical communication systems. In a coded OFDM system, source data are coded, interleaved and multiplexed for transmission over many frequency sub-channels. In a conventional coded OFDM system, the transmission power of each subcarrier is the same regardless of the channel condition. However, some subcarrier can suffer deep fading with multi-paths and the power allocated to the faded subcarrier is likely to be wasted. In this paper, we compute the FER and BER bounds of a coded OFDM system given as convex functions for a given channel coder, inter-leaver and channel response. The power optimization is shown to be a convex optimization problem that can be solved numerically with great efficiency. With the proposed power optimization scheme, near-optimum power allocation for a given coded OFDM system and channel response to minimize FER or BER under a constant transmission power constraint is obtained.

Index Terms- FER, BER, OFDM, Convex Optimization, Near-Optimum power allocation

I. INTRODUCTION

In recent years, the demand for high data rate transmission has increased in wireless communications. High data rate transmission may require a very complex equalizer which is not desirable in wireless communications. Orthogonal Frequency Division Multiplexing (OFDM) is a transmission scheme for which a receiver can be implemented that is easily implemented without an equalizer. Therefore, the OFDM technique has attracted attention for many wireless applications. OFDM is a transmission technique that divides the data into several frequency sub-channels whose bandwidth is less than the total data rate. The uncoded performance of an OFDM system can be different in different frequency selective channels. To solve this problem, some solutions that are used include discrete multi-tone (DMT) and coded OFDM. In the case of DMT, the bits and power are allocated to each sub-channel with a water-filling optimization. However, a DMT system does not provide frequency diversity, since each sub-channel is coded independently. In this paper, equation for the bit error rate (BER) and frame error rate(FER) bounds of a coded OFDM systems. The upper bounds can be expressed as sums of exponential functions or sums of Q-functions that are convex functions. Therefore, the power allocation to minimize the target BER or FER for a total transmission power constraint is shown to be a convex function. Optimization problem by solving the present convex power optimization problem, we can improve the performance of a coded OFDM system compared with that of conventional constant power allocation. This paper shows the performance improvements with the proposed power allocation. The paper is structured as follows. Section II describes the system model used in this paper. The proposed power optimization is shown to be convex optimization in Section III.

II SYSTEM MODEL

In this section, the system model of the proposed coded OFDM system used in the proposed power allocation scheme. The system model is based on bit-interleaved coded modulation [2] [3]. However, it is also possible to use trellis-coded modulation [4] with some modification of the model for the power allocation of the coded OFDM system. Figure 1 shows the block diagram of the proposed coded OFDM system. Information bits are coded with the channel encoder. After channel encoding, the number of coded bits is larger than that of the uncoded information bits. The coded bits are interleaved at the inter-leaver to achieve frequency diversity.

The interleaved bits are demultiplexed into several sub-channels. The number of interleaved bits for each sub-channel is $\log_2 M$, where M is the constellation size of the modulation. The demultiplexed bits are mapped to a constellation point for the given modulation scheme. For bit-interleaved coded modulation, a Gray mapping is usually used. After mapping, the transmitter sends the modulated symbols to the channel.

The channel is wireless channel is assumed to be $|H_i|^2$ and quasi-static within the sub-channel for the transmission period of a frame. After experiencing the Channel, AWGN noise is added to the signal at the receiver. At the receiver, the received signal is demodulated. Usually a DFT is used to convert the time-domain signal to a frequency-domain signal. After the DFT, the received signal .The soft metric is de-interleaved at the de-interleaver and sent to the decoder. The receiver also estimates the gain and phase components of the channel response for coherent detection. Channel gain plays an important role and power allocated depends upon channel gain

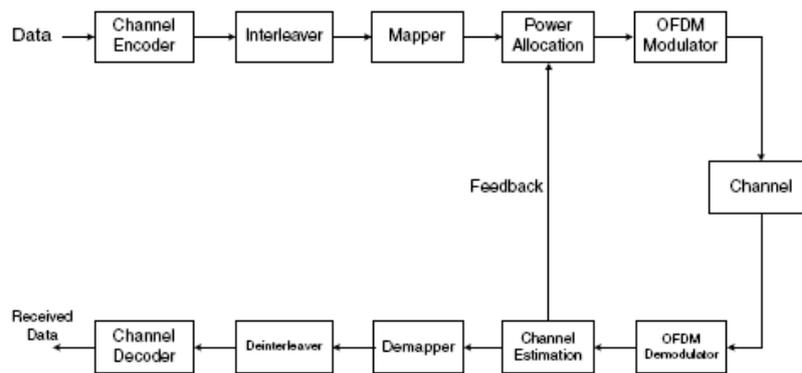


Fig 1. Block diagram of the a coded OFDM system

In the proposed power allocation scheme, a feedback link from the receiver to the transmitter is assumed. The receiver sends the channel response information to the transmitter and the transmitter computes the power level of each sub-channel. The transmission power of each sub-channel is adjusted based on the computed power levels.

III POWER OPTIMIZATION

A. Performance Bounds:

With the system model presented described in the last section, the performance of a coded OFDM system can be represented by upper bounds. For simple analysis, assume that the channel code is linear and the modulation is BPSK or QPSK. With these linear conditions, can fix a codeword c_0 as the transmitted codeword. For a general non-linear case, an average over C_0 may be required. There is no closed form for the BER or FER of coded systems except for some trivial cases that include uncoded systems and orthogonal coding. Upper bounds are the conventional method for the performance analysis of coded systems. The upper bounds of coded systems are obtained with the union bound technique. Using the union bound technique, the upper bounds of BER and FER are given by

$$P_{FER} \leq \sum_i Z_i \tag{1}$$

Where Z_i is the pair-wise error probability (PEP) that a codeword

$$P_{FER} \leq \frac{1}{N_b} \sum_i Z_i \cdot b_i \tag{2}$$

Where N_b the total number of information is bits in a frame and b_i is the Hamming distance of the source data.

The pair-wise error probability Z_i is given by the following equation

$$Z_i = Q \left(\sqrt{\frac{2D_i^2}{N_0}} \right) \tag{3}$$

Where D_i is the distance between the all-zero codeword and the i-th codeword at the receiver.

$$D_i^2 = \sum_k |H_k|^2 \cdot P_k \cdot E_{i,k}^2 \tag{4}$$

Where P_k is the allocated power at the k-th sub-channel and $E_{i,k}^2$ is the sum of the squared Euclidian distance of coded symbols located at the k-th carrier of the i-th codeword, when unit power is allocated to each sub channel. From (1), (2) and (3), BER and FER of a coded OFDM system. The present system is upper bounded by sums of Q functions or sums of exponential functions. The FER and BER bounds are given as

$$P_{FER} \leq \sum_i Q \left(\sqrt{\frac{2D_i^2}{N_0}} \right) \leq \sum_i \frac{1}{2} \exp \left(\frac{-D_i^2}{N_0} \right) \tag{5}$$

$$P_{BER} \leq \sum_i \frac{b_i}{N_b} Q \left(\sqrt{\frac{2D_i^2}{N_0}} \right) \leq \sum_i \frac{b_i}{2N_b} \exp \left(\frac{-D_i^2}{N_0} \right) \tag{6}$$

The BER and FER upper bounds in (6) or (7) are expressed as sums of exponential functions or Q-function. These upper bounds can be shown to be convex functions. The target of the proposed power allocation is to minimize the FER bound in (5) or the BER bound in of a coded OFDM system under this constraint

$$\sum_k P_k \leq P_T \tag{7}$$

$$P_k \geq 0 \text{ For } k=1, \dots, N_c \tag{8}$$

Where P_k is the transmission power of the k-th sub-channel, P_T is the total transmission power and N_c is the number of Sub-channels in a coded OFDM system. The upper bounds on FER and BER for QAM modulation are convex functions, since FER and BER are linear sums of conditional FER's and BER's which are convex functions [6]. Therefore, the FER or BER bound of a coded system can be given as a sum of Q functions or a sum of exponential functions which are convex functions. The constraints for the power optimization of (7) and (8) are also linear inequalities. Therefore, power optimization to minimize the FER or BER bound under the constant power constraint is a convex optimization problem. Generally, there is no analytical solution for a convex optimization problem. However, there are many numerical methods which can solve the problem efficiently [5]. Most of the numerical methods are based on iteration. The number of iterations to obtain an optimized solution depends on the cost function and choice of a numerical method. The upper bounds to be log-convex functions [5]. For most systems, it requires less number of iterations to solve the problem using the cost functions. It has so many advantages. Since the proposed power optimization uses upper bounds as the cost functions, it cannot be said that the proposed power optimization is optimal. However, the upper bound approach is the best method to analyze the performance of the coded system, since it is impossible to obtain a closed form formula for the performance of a coded system except some trivial cases. Furthermore, the upper bound is very close to the actual performance for the most E_b/N_0 range of interest. Therefore, it can be said that proposed power optimization provides a near optimum power allocation for the given channel encoder, modulation scheme and inter-leaver.

IV RESULTS

A. Simulation Environments

In this section, simulation environments are presented for the coded OFDM system used for performance evaluation. For the performance simulation, a simple coded OFDM system with 16 sub-channels is used. The basic coding and modulation scheme for the coded OFDM system is bit-interleaved coded modulation. For channel coding, a convolutional code with rate $r_c = 1/2$ and constraint length $k = 9$ is used. A simple block inter-leaver and estimation and an ideal Viterbi decoder are assumed. It is also assumed that there is no error in the feedback information from the receiver to the transmitter. For simple comparison, the average channel gain is normalized so that

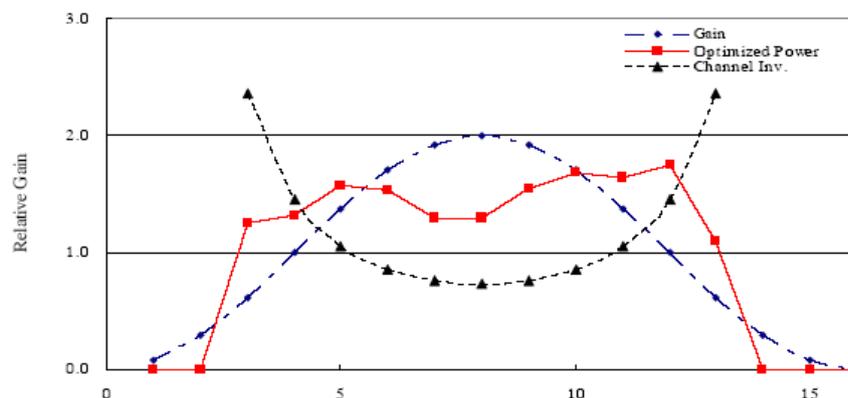
$$\frac{1}{N_c} \sum_{i=1}^{N_c} |H_i|^2 = 1 \tag{9}$$

Where N_c is the number of sub-channels of the OFDM system. The most computationally demanding part for the proposed power optimization is computing the cost function. The cost function is the FER or BER upper bound of the coded OFDM system. In this letter, upper bounds are computed using the Nev significant error events of the convolutional code. The Nev significant error events are computed and all possible time shifts of the error events are considered in computing the coefficients of the upper bounds. The complexity to compute the upper bound is that of decoding 10 - 1000 frames, depending on the number of terms and

input variables used for the bounds. $N_{ev} = 1000$ is used to compute the upper bound of the example system. Ten iterations are used for the optimization with the interior point method [4].

B. Performance Results

The performance results are obtained for the coded OFDM system described in IV-A with the previous conventional constant power and the proposed power allocations is the power allocations and the channel gain for a channel response $h_1(t)$. The channel gain has a peak at the center of the sub-channels and nulls at the both ends of the sub-channels. The solid line shows the power allocation with the proposed power optimization method. The dotted line shows the power allocation obtained from channel Inversion with some low gain channels dropped. The power allocated to a sub-channel is the proportional to the inverse of the channel gain in the case of channel inversion technique The channel inversion would require infinite power for the null bands. Therefore, the performance of channel inversion improves if some sub-channels with lower gains are not used. The figure shows the best performance power allocation for channel inversion with bad channel dropped. Fig. 2(b) shows the performance results for the coded OFDM system with the channel response $h_1(t)$. The conventional coded OFDM with constant power allocation shows the worst performance. Using the channel inversion technique with bad channels dropped improves the performance of the coded OFDM system by 0.5 - 0.6 dB. However, with the proposed power optimization, the performance gain is about 1.2 dB compared with the conventional constant power allocation. An OFDM system with 7 sub-channels and a data frame composed of four information bits. For the channel coding, Consider a simple (7,4) Hamming code which has a minimum Hamming distance 3. The Hamming code is designed to correct one bit error in the codeword with hard decision decoding. Another widely used transmission scheme is coded OFDM. In a coded OFDM system, data are encoded by a channel coder, interleaved and divided into several frequency sub-channels. Due to the channel coding and interleaving, frequency diversity can be archived. This coded OFDM is used in practical communication systems including Wireless LAN. However, the power allocated to the nulls of the frequency response is likely to be wasted in a coded OFDM system. Therefore, if the power is allocated to the best sub-channels, the performance of a coded OFDM can be improved .The FER and BER of a coded OFDM system are bounded by sums of exponential functions or by sums of Q-functions. In this paper, these bounds are shown to be convex functions. Therefore, power allocation to minimize the target BER or FER is shown to be a convex optimization problem with a total transmission power constraint. With the power allocation obtained from the optimization, the performance of a coded OFDM system is improved. The proposed scheme provides a near-optimum power allocation for a given channel coding, inter-leaver and modulation The performance of the proposed allocation schemes is simulated with a simple OFDM system in static and dynamic channel environments. From the simulation and analytical results, we show that the proposed allocation schemes provide performance gain over conventional coded OFDM systems. In static channel environments, DMT shows the best performance. The performance of coded OFDM with constant power allocation is worse than that of DMT. The proposed power allocation improves the performance of coded OFDM systems. For the channel models of this dissertation, the proposed schemes can achieve 1-2 dB performance gain over the conventional coded OFDM systems.



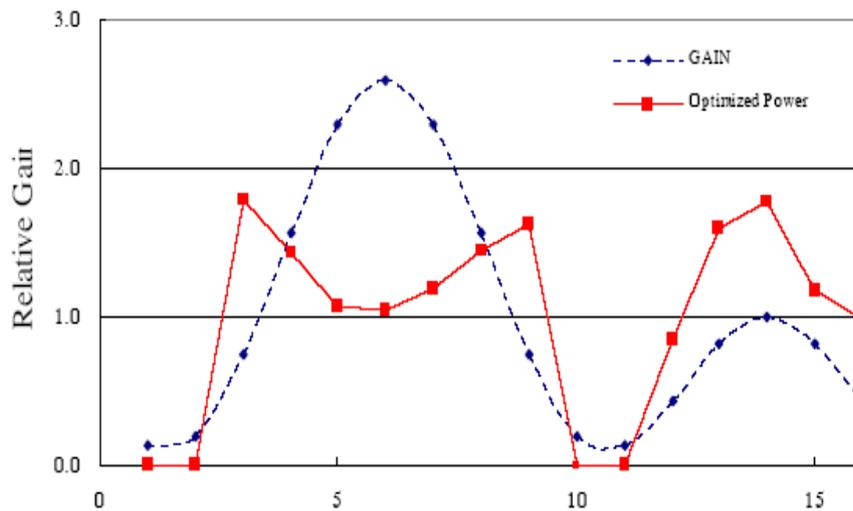


Fig 2 Performance of channel response $h_1(t)$

The power allocations and the channel gain for another channel response $h_2(t)$. The channel gain in the frequency domain shows two peaks near sub-channel six and fourteen. The power allocation from the proposed optimization is shown as a solid line. The power allocation near sub-channel six is similar to channel inversion. However, for the power allocation near sub-channel fourteen, the higher The channel gain, the higher the allocated power level. The performance results for the coded OFDM system with the channel response and the power allocations given in above figure. With the power allocation obtained from the proposed optimization, the performance gain is about 1.2 dB.

V CONCLUSION

In conventional coded OFDM systems, the power of each Sub-channel is the same regardless of the channel and response. With a feedback link from the receiver to the transmitter, the transmitter can optimize the power of each sub-channel to minimize the FER or BER under constant total transmission power constraint. In this paper, it is shown that the present power optimization problem can be solved with convex optimization. Simulation results shows that the proposed power optimization can improve the performance of coded OFDM systems.

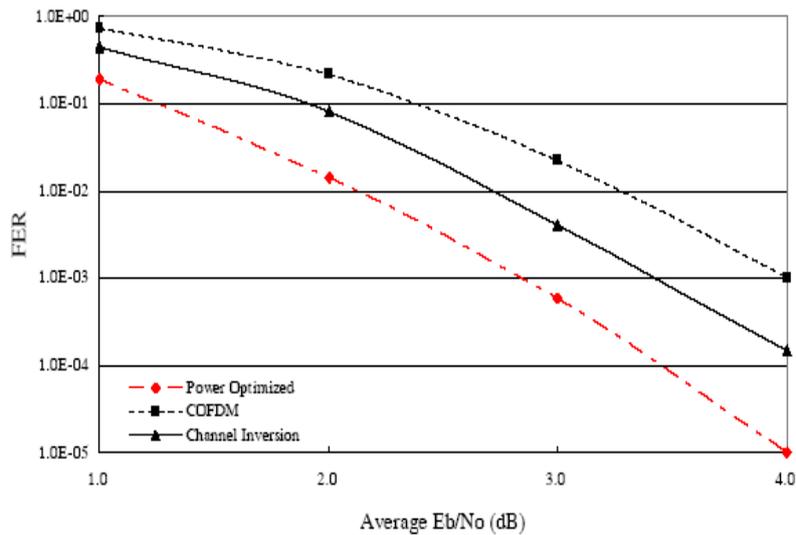
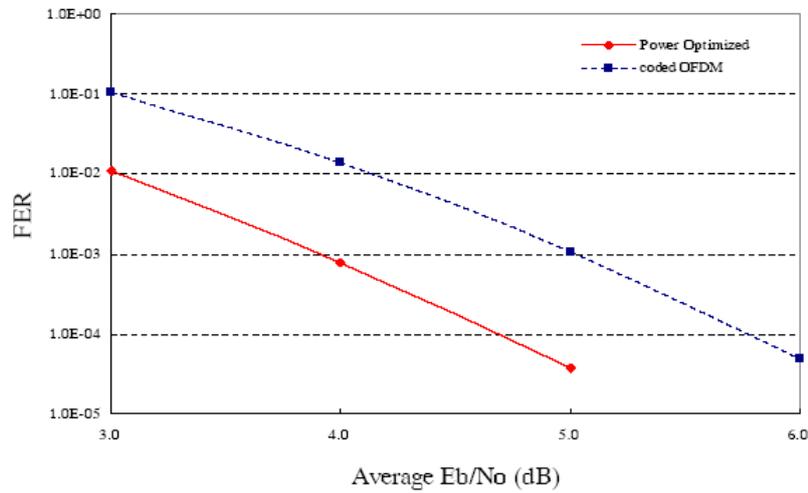


Fig 3 Performance of channel response $h_2(t)$

REFERENCES

- [1] H. Moon, "Efficient power allocation for coded OFDM systems," Ph.D. dissertation, Stanford University. 2004.
- [2] B. Le Floch, M. Alard, and C. Berrou, "Coded orthogonal frequency multiplex," Proc. IEEE, vol. 83, no. 6, pp. 982-996, June 1995.
- [3] T. Keller and L. Hanzo, "Sub-band adaptive pre-equalized OFDM transmission," in Proc. IEEE VTC, Amsterdam, Netherlands, Sept. 1999, pp. 334-338.
- [4] C. S. Park and K. B. Lee, "Transmit power allocation for BER performance improvement in multicarrier systems," IEEE Trans. Commun., vol. 52, no. 10, pp. 1658-1663, Oct. 2004.
- [5] H.-J. Su and E. Geraniotis, "Power allocation and control for multicarrier systems with soft decoding," IEEE J. Select. Areas Commun., vol. 17, no. 10, pp.

1759-1769, Oct. 1999.

- [6] W. Bocquet, K. Hayashi, and H. Sakai, "Frequency domain power adaptation scheme for coded OFDM transmissions," in Proc. 13th European Wireless Conf., Paris, France, Apr. 2007.
- [7] G. Caire, G. Taricco, and E. Biglieri, "Bit-interleaved coded modulation," IEEE Trans. Inform. Theory, vol. 44, no. 3, pp. 927-946, May 1998.
- [8] J. M. Wozencraft and I. M. Jacobs, Principles of Communication Engineering. New York: John Wiley & Sons, Inc., 1967.
- [9] S. Boyd and L. Vandenberghe, Convex Optimization. Cambridge University Press, 2004.

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Balance and Decline of Trade in Early Andhra: (With special reference to Roman contacts)

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Abstract- The history of early Indian trade also shows a distinct preference for the study of long-distance trade—both over land and overseas—the study of exports and imports, especially their possible identifications on a modern map. The other common feature in this historiography is to present urban centers almost invariably as thriving commercial centers and to hold commercial exchanges as the principal causative factor towards urbanization. Without belittling the importance of this conventional narrative approach to the history of trade; it must be emphasized that an understanding of trade and urban centers can hardly be delinked from the agrarian sector. Significantly enough, the expansion “agro-cities” has been used to characterize early Indian urban centers. The trade between Andhra and Roman Empire, Andhra was the much beneficiary compare with Rome. Because of this trade Buddhism, urban centers were flourished in that period.

Index Terms- Exports, Imports, Port towns, Monsoons, Sea winds, Balance of trade

I. INTRODUCTION

Andhradesa as one of the regional hubs of the vast network of international commerce must have experienced a great amount of material prosperity, herself having accomplished production of merchandise so as to actively participate in it. As such, the Roman connection is increasingly seen as a powerful factor in the urbanization of ports of Peninsular India in the early historic period (S.J. Keay, 1996-97). In spite of the subject having been studied by so many eminent scholars and distinguished archaeologists, whose works will be briefly reviewed in the following section as to have set the model for the present study, the subject promises opportunities for studies afresh.

Andhra Pradesh is one such state in the Indian Union, with its own individuality in matters of language, civilization and culture, worthy of historical study with useful purpose, and hence the study has been taken up, keeping in mind the need for a balanced study in accordance with the principles of historiography, explained above. However, the fact that no part of the country is so much individual as to flourish absolutely independent of others, and no region could remain aloof from others to the extent of without influencing, or getting influenced by others, is never to be ignored. Hence, the present study is not strictly limited to the region of Andhra Pradesh as a water-tight compartment and adequate importance has been accorded to corresponding developments in the regions around, of the same time.

A few words may be said here with regard to the influence of the ocean upon the life of the Andhra people close association with the sea made the inhabitants of the coastal regions fearless and adventurous sailors. The idea conquering the sea always haunted them and the result was the discovery of a number of places hitherto unknown to them. Going there both as colonists and traders they also widened the geographical horizon of Indian civilization. Levi (pre-Aryan and pre-Dravidian) has pointed out that the sea-routes to the East from the ports of South India had come in to common use many centuries before the Christian era. Trade relations with the West also opened well before said era. This maritime trade was regulated by the wind currents, better known as monsoonal wind currents, which are specially important and are perhaps unique in their effects. (Vincent-commerce of ancient India) The monsoon whose regular action was known to Indian sailors from very early times, was discovered for the west some time about the middle of the first century A.D. and since then it dominated the navigation of the Arabian sea and the Bay of the Bengal till the invention of steamship of the 19th century. The monsoonal wind current, likewise, governed sailing over the Bay of Bengal. For a period of well over five months, the direction and route of sailing were determined by these winds and navigators of the Indian Ocean who had closely studied the action of these phenomena were able to make full use of them.

Objectives of the paper

- 1) To identify the trade evidences of Early Andhra.
- 2) To identify the sea winds of early times.
- 3) To identify the ports and Harbours of Early Andhra
- 4) to identify the Exports and Imports of Early Andhra
- 5) How Andhra was benefited with Roman contacts

Trade relations between India and Roman Empire

Political upheavals in the country did not affect the trade between India and other countries. It was carried on as before on international routes and there was great improvement in the sea trade and as we shall see later on, On account of his profitable trade India was the recipient of large amount of Roman gold. When the political changes were taking place in Northern India, the Satavahana dynasty was increasing its strength in the Deccan. In the period of Simuka and his younger brother Krishna, the Satavahana empire was extended up to Nasik, and in this way as they profess in their later inscriptions, they had in reality become the rulers of the Deccan. The Satavahana king Vasishta Putra Pulumavi (circa 137-155 A.D.) was the son-in-law of Rudradaman. Even then by defeating his son-in-law Rudradaman annexed some parts of his empire. Another great king of Satavahana dynasty was Sri Yajna Satakarni. Who according

Rapson issued the ship type coins found in the cholamandala between Madras and Cuddalore. (E.J.Rapson 1908) professor V.V.Mirashi (1941) on the strength of a complete coin of this type has, however, proved that these coins were issued by SriYajnaSatakarni. On the reverse of this coin appears a double mated ship below which a fish and a conch shell symbolize the sea. The ship raked at both ends is equipped with mats, ropes and sails. There is no doubt that this ship symbolizes the Indian overseas trade which was in full swing in the Satavahana period. But as professor Mirashi's coin was found in the Guntur district of Andhra Pradesh it informs us that ship type coins were in currency in that region as well. The ship type and Roman coins from the Cholamandala inform us that there was a very intimate commercial relation between India and Roman Empire.

One inscription, mention has been made of the Mahachaitya at Kantakasala. There is no doubt that this Kantakasala of Ptolemy which he places just after the mouth of the Krishna of the same. Discovery of the inscriptions from a village named Ghantasala in the Krishna district on the Eastern coast datable to circa 300 A.D. makes the identification of Kantakasala easy. The first inscription mentions the great sea captain Sivaka which supports the view that in the early centuries of the Christian era. Ghantasala was an important port. In the second inscription the ancient name of Ghantasala is given as Kantakasala (Ancient India 1949) these references leave no doubt that in the early centuries of Christian era Kantakasala was a big port situated on river bank of the Krishna River which carried on trade with the ports of Srilanka and other countries.

The first two centuries after Christ; we have indicated that close relations reached between Roman subjects and Indian races. And have watched the activities of Syrians and Egyptian, Greeks backed private capital. We have indicated the collapse of this direct trade a sign of the economic and political disintegration of the Western empire and reversion of control in to the hands of Persians, Arabians.

It may be noted that Roman influence on the India had generally made its marks on South India, particularly the places and areas that were accessible by sea. Therefore if the invaders influenced it was in the North India and the peaceful influence took place largely in South India.

From the very start the Roman Empire was unable to counter-balance the inflow of Indian products, with the result that the Roman sent out coined money which never returned to them not even in the form of Indian money. Roman Emperors down to Nero (31BC-68AD) have left very large numbers of gold coins and silver coins which have been found in the Tamil states and of these a phenomenally large number has stamps of Augustus (31BC) ,Tiberius (14-37AD) those of Augustus occur in all three Tamil kingdoms some time in large numbers and of those at least some must have come in reign.

Agustus (27BC-14AD) ,Tiberius (14-37AD),Tarjan (37-41AD), Claudius (41-54AD), Nero (54-68AD), Trojan (98-117AD), Hadrian (117-138AD),Antiochus Pius (138-161AD), Halloogabalus (218-222AD),Constantine (223- 255AD),Aurelian (270-275AD),Plian (361 363AD).

Important Roman Emperors including those who received Indian embassies. The Indian trade, in spite of sums paid for obtaining and carrying the goods, brought a good profit, for Pliny says that Indian wares cost a hundred times more in Roman

markets, the Chinese records also give the profit as tenfold or a hundred-fold. Many people have brought this traffic was economically harmful to the Roman Empire in the long run. The Roman products failed to balance the Indian imports, and exportation of money, discouraged even from Italy in first century B.C. was freely allowed to altogether foreign lands under Augustus and his successors. We must consider the use of wealth by the Romans and estimate whether the exportation of money, silver and gold was detrimental of the Empire. It is a fact that as early as 62A.D. the ruinous system of depreciation had begun; silver alloy from 5% to 20% added before the death of Nero increased to 30% under Trojan 50%; and more under Severus, until finally after 218 A.D. the denarius ceased to be a silver coin and there was a return to the system of payment in kind. The aureus too was depreciated but gold which played a different part in the international economics from silver did not become so scarce.

Before the Roman Empire began, was rather than commerce distributed wealth gained by slave-labour, and though war Republican Rome became rich by the plunder of the East with its hoarded wealth and possession of the mines of Spain and other regions. Roman capitalist's speculators and Money-lenders came to regard money as the only riches and valuable only in exchange; hence the new wealth was spent not upon productive enterprises. There was no economic reserve-that was fault we must not accuse the Romans of blindly meeting their economic collapse as thought it were caused only or primarily because of their Indian trade.

Chowstow rightly points out that history has shown examples of preponderance of import over export without disastrous consequences, though he appears to think that the serious part of Roman-Indian trade was flow of gold to the East; this certainly was continuous as finds of coins in India show, but the drain of silver, though apparently checked in time, was more serious.

The ultimate conclusion of Chowstow is that no harm appears noticeable as a direct result of this passive Trade of Rome and that if the flow of coin to the East was undesirable; on the other hand, the trade with the East stimulated barter and tended to develop industries. The drain perhaps did no more than hasten a little financial collapse which would have come to Rome sooner or later in any case. In our survey of the Indian commerce of the Roman Empire during two centuries we have in reality watched that splendor of a great power as reflected in one branch of its commerce; we have seen that Empire feeling its way towards a direct commerce with the Far East we have seen the complete attainment of that aim during.

II. MONSOON AND SEA WINDS

The discovery of monsoon by Hippalus of Alexandria in the late Ptolemaic or early Augustan period brought a revolution in the Indo-Roman trade relation. Both Pliny and the author of the Periplus describe how, as a result of this discovery, the Graeco-Roman merchants were able to abandon Coastal voyage along the perilous and inhospitable Arabian Coast and could steer from the ports near the mouth of Red Sea a tolerably straight course across the approaches to the Persian Gulf, 'quite away from the land' to the Indus and Baryhara Merchants for Damirica, however, sailed directly a little south of east across the Arabian

Sea, throwing the ships head considerably off the wind and in favourable circumstances reached Muzuris in 40 days pliny (Natural History, 1951) Travellers sail back from India in the beginning of the Egyptian month Tybins-our December- or at all events before the 6th day Egyptian month Mechir, that 8 before the ideas of January. In this way they can go out return the same year. They sail from India with a South-East wind, and on entering the Red Sea Catch the South-West or South (Mc. Crindle, 1961).

Moreover, the technical difference between Sewn boats and nailed boats was not great. If the Arabs and Indians found their conventional boats unsuitable for heavy seas they could have changed their method of construction. The use of proper types of sails is also essential for smooth navigation. And it seems that like their Mediterranean counter-parts the ancient vessels playing on the Arabian Sea had square sails which were used in this region even up to the last century (G.L. Adhya, 1966-121p). Boats with such sails could go before the wind though they could not beat into the wind, and this made them quite suitable for voyages with the south-west monsoon (JAOS, LXXX, p.139).

When the Mediterraneans began sailing with the fast-blowing south-west wind to reach India quicker, they certainly look some risk, but it was not an exceptional feat as has been suggested (op.cit, p. 136). The south-west monsoon which blows over the Arabian Sea for six months starting from May is really dangerous along the coast, especially from June to August (Govt. Pub. 1931). According to the Periplus (39, 49, 56) and Pliny (VI.104) Mediterranean sailors for India left Egypt in mid-July and it took them about a couple of months to arrive there (JAOS, LXXX, p. 139). In September, when they reached the Indian ports, the peak period of stormy weather is almost over along the coast, therefore, we may hold that the sailors of Arabia and India utilized the South-West monsoon without much risk before the Greeks and the Romans arrived on this region.

In the western world the south-west monsoon came to be known as Hippalus after the name of the sea-pilot, who, according to the periplus (57) made the maiden voyage to India right across the Arabian Sea "by observing the location of the ports and condition of the seas". Pliny (VI.100, 104) also called this monsoon Hippalus but he seen to suggest that the name was significant name of a headland in north-eastern Africa (VI, 172) and the geographer Ptolemy (IV. 7.12) gives the same name to a sea. The use of the south-west trade wind by the Mediterranean sailors to reach India through the high seas did not occur all at once but by stages, as suggested by Pliny (VI, 96-107). The statement in the periplus that a sailor called Hippalus discovered how to use the south-west monsoon on the outward voyage to India may or may not have any historical basis, (Tarn, W.W. 1951, p.369), but the significance point here is that by the time of the periplus and Pliny the Mediterranean Sailors had begun utilizing the monsoon. We should try to determine the probable time when the westerners started doing this, in other words, the date of the discovery of Hippalus, as it has some important bearing on the history of the Indian trade.

The return journey was no problems; departure in December-January meant that it took place during the begin north-east monsoon. And since this lasted from November to April. One could show off even earlier or later (Casson, 1980, p.33-34).

It is now necessary to look for Indian Sources for the knowledge on types of winds, particularly the monsoons. According to Jainliterature (Avasyaka churni). The successful termination of a sea voyage depended much on favourable wind. Pilots were expected to have an expert knowledge of sea. The sea wind is divided into sixteen categories, namely:

1. Prachina vata (easterly wind)
2. Udichina vata (northerly wind)
3. Dakshinatya vata (southerly wind)
4. Uttarapaurastya (northerly wind moving against forward movement)
5. Sattvasuka (wind blowing in all directions)
6. Dakshina-purva-tungara (a stormy win roaring in south-eastward direction)
7. Aparadakshina-bijapa (the wind blowing from south-west)
8. Aparadakshina-bijapa (westerly wind)
9. Aparottara-garjabha (north-westerly storm)
10. Uttara Sattvasuka
11. Dakshina Sattvasuka
12. Purvatungara
13. Dakshina bijapa
14. Paschima bijapa
15. Paschima garjabha
16. Uttariya garjabha

In the categories of the sea winds described above sattvasuka, tungara and bijapa are nautical terms and it is difficult to describe them, but there is hardly any doubt that they are related to favourable and unfavourable sea-winds. This is supported further on. After describing the sixteen kinds of winds, the commentator observes that in the absence of cyclones in the sea and in the favourable garjabha wind, the ship which has no leaks, piloted by a clever pilot reaches the desired ports safely. The cyclone which is called Kalikavata caused many ship wrecks (Moti Chandra, 1972).

III. EXPORTS – IMPORTS OF EARLY ANDHRA

Exports

Exports from early Andhra to Rome. Masalia Modern Machilipatnam famous for it's a great quantity of Muslims (Periplus, p. 47). Other exports from this region are grain, salt, spices, pepper, bangles, cooking vessels, coarse cloth (H.P.Ray, 1986, p.113). Ivory, wool, woolen products, hide, fur, silk, lac, pearl, onyx-shell, conch shell, tortoise shell, ghi and musti (Warmington, 1974, pp. 157.F).

IMPORTS:

Wine, Italian preferred also Laodicean and Arabian, Copper, Tin and lead; Coral and topaz; thin clothing and inferior sorts of all kinds, bright-coloured girdles a cubit wide, storax, sweet clover, flint glass, realgar, antimony, gold and silver coin, on which there is a profit when exchanged for the money of the country; (Periplus, p.42).

A question that needs to be answered is; what was the nature of the imports? Did these fall under the category of essential or Luxury items? For this evidence we would again have to rely on the periplus. Above commodities wine, dates, glass, tin, lead,

copper or antimony, realgar coral, gold and silver coins. Further proof of this comes from Archaeological excavations.

Certain varieties of blue glass beads, e.g. long cylinder, circular, collared and conveu barrel- shaped lenticular with colours have adopting value between AD 100 to 350 and have been found at Satavahana site in A.P – Kondapur (Dikshit 1955, p.90).

Ivory at Kondapur (Desh Pande 1961, p.55) and Dharani Kota (Mukharjee 1970, p.1418). The cult was that of the nude goddess locally known as Lajja-Gowri and Indicated by the occurrence of terracotta or stone plaques depicting the often headless goddess with a lotus in place of the hea. These plaques have been found from the first century A.D. at sites in Kondapur, Yeleswaram and Nagarjunakonda. The stone plaque from Nagarjunakonda depicts the torso of the goddess in the shape of a “Ghata” and bears an inscription of the third century A.D. which records that the plaque was offered by a queen whose husband and sons were alive (Desai, 1981).

Terracotta bullae have been reported from Kondapur and Dharanikota in A.P. (Deo and Gupte, 1974, p.76). The bullae seem to have been used as ornaments as metallic imitations of Roman coins are also known from NagarjunakKonda (Wheeler 1955, p. 181-2).

The pillar of a ruined place at Nagarjunakonda represents a male figure nude down to the waist and holding a drinking horn (rhyton) in his left hand. Standing on the ground near his left foot is a wine Jar covered with an inverted drinking cup. The figure seems to be meant for a crude representation of Dionysius. The very active sea-borne trade between the Roman empire and Andhra in Early Christian era, may account for the presence of this figure which was obviously copied from some classical examples (MASI, 1938, No. 54, p.11). The discovery, from the territory of the Andhras, of actual specimens of Roman coins and their imitations, made locally as ornaments and mostly pierced or looped for suspension is further evidence of such contact (Wheeler, 1955). Lastly, we may refer to the Alluru inscription which includes in a list of gifts made by a certain Mahatalavara, Vadalabhi Karo Karodiyo Ya (na) Kadivikayo, i.e., lamps of the shape of the mouth of Vadala fish, manufactured by the Yavanas (D.C.Sircar 1939, p.330). Coins jewels, pottery were also analysed in this study in 3rd Chapter.

IV. BALANCE OF TRADE

The Indo-Roman Trade has been discussed in detail by scholars mostly depending on the western sources. Many of the important conclusions in these studies are based on the assumption that the western sailors learnt the use of the south-west monsoon (Hippalus). Sometime in the middle of the first century A.D. and from that time the commercial connection between India and the Roman Empire became closer.

We have stated above the reasons why we believe that the discovery of the Hippalus was much earlier. Unfortunately the Roman coins found in India are not always very helpful in determining the respective dates of different phases of Indo-Roman transactions. However, only after the establishment of peace and order in the Mediterranean region by Augustus did full scale trade between India and the west become possible. With the development of her economic condition Rome’s demand for

oriental goods, consisting mostly or luxuries gradually increased to the point of extravagance. From the lamentations of some classical writers such as, Pliny in his natural history (xii.xli) states that “by the lowest reckoning India, China and the Arabian Peninsula take from our empire 100 million sesterces a year. This has been taken to indicate a gradual drainage of the empire is gold resources which threw the Roman Monetary system in to a crisis. The figure quoted by Pliny has been questioned on a account of several factors. The use of imported spices was widespread in the Roman Empire; they found their way to relatively minor places and were extensively used in drugs perfumes, cooking and religious services, as antidotes for poisons and as ingredients in ointments (Miller 1969:2). Even if Pliny’s price list is accepted, it is unlikely that the original some paid to the producer’s was high. Prices in Rome may have been exorbitant because of the high important duties, cost of transportation and the risks involved. The much better documented medieval spice trade suggests that tremendous price fluctuation could occur because of destruction of a convoy, warfare, piracy, failure of a convoy to arrive in time to catch the last ship of the season, etc and there is no reason to suppose that prices remained is stable in antiquity and were not affected by these variables (Rasche, 1978, p.670).

The figures quoted by Pliny have been attributed considerable credibility on account of his position as “Financial Advisor” to Vespasian and it is often assumed that they refer to the export of coins to China and India. Both these views are, however, erroneous. A friend of Vespasian, Pliny died as commander of the fleet at Misenum- an important post but military rather than financial. Another serious objection is that both Roman bureaucratic practice and the surviving from Egypt itself indicate that it would have been impossible for Pliny to obtain any accurate figures for the annual quantity of the balance-of-payments deficit in Rome’s trade with the East (Rasche, 1978, p.636).

Though tax records were more carefully kept in Egypt than in other provinces and a good deal of evidence is available about transit tolls, accounting practices and customs regulations, yet now here it is indicated that any one kept a record of the coinage (ibid).

Rome found a market for her manufactured goods, Roman economy did not derive much benefit from trading with them (Adhya.G.L. 1966).

Her oriental trade, as is revealed by its adverse balance (Warmington 1928) was undoubtedly a great liability, but the Roman emperors were keen on maintaining regular and smooth traffic with India and other Eastern countries. Some of them took positive measures to keep the route to India unobstructed. Thus Tarjan’s improvement of the canal connection between the Nile and the Red sea and his maintenance of a Roman fleet in the latter area, and the peaceful polices followed by Hadrian even at the cost of surrendering certain political rights in Western Asia, are all connected with the purpose of maintaining an uninterrupted trade with the East. As a result of these and similar measures, Rome’s Commerce with China and India was quite intense from the time of Tarjan almost up to the Death of Marcus Aurelius (Ibid, p. 96).

But was there any larger motive behind these imperial policies, or were they adopted merely to maintain an open

passage for importing Indian precious stones and spices so that the Roman citizens could continue their luxurious living? We know from western authors that imperial Rome nurtured the wish to occupy Arabia, Babylon, Bactria, India and China (Stadius, *Silvae*, IV.1, p. 40-42). That a rich country like India which lured foreign invaders from very early times would also rouse the ambition of powerful Roman emperors is no wonder. We know of Tarjan's strong desire to repeat the achievement of Alexander in India and to do it with more lasting success (Dio's Roman History, LX VIII, p. 29).

But circumstances beyond their control never allowed the entry into India of the 70,000 Roman troops with which, according to a classical estimate, a commander like Pompey or Caesar could easily have occupied the land (Plu tarch, Pompey, LXX, 1917).

We have seen above that up till the reign of Marcus Aurelius (AD 161-180) trade between Rome and oriental countries was at a high level. But from the last decade of the second century, Rome became involved in long drawn-out political trouble, in which the army got the upper hand. This unstable situation lasted throughout the third century and brought in its wake serious social and economic crisis (Rostov Zeff 1957). Naturally the oriental traders lost a considerable part of their lucrative market in the west. The massacre of the Alexandrians by Caracalla probably dealt a great blow to the direct sea trade between the India and the empire (Warmington 1928, p.136). Possibly this trade passed into the hands of the Arabs, especially those of them who had settled in Axum (Hitti 1956, p. 56-57). But as Palmyra remained flourishing almost until end of the third century it seems that the oriental trade with the west through the Persian Gulf and by the land route survived to some extent (Warmington 1928, p.137).

V. PORTS AND MARTS OF EARLY ANDHRA

The inscriptions of Amaravati, Nagarjunakonda and the nearby Buddhist Centres mention several centres of Industry Trade carried on by nigamas. Some of them are Vaddamanu (T.V.G. Sastri B.I.A) which was originally a Jaina Ksetra, Kavurura, Narasala, and (James Burgers Ganjikula (T.N. Rama Chandra Jou. Andha His. Soc) very little is known about nigamas of these places. The following are the most important centres of Industry and trade including maritime trade.

Antiquity:

The earliest mention of forts or fortified towns in Andhra occurs in the accounts of Megasthenes followed by Pliny. The later stated that they. The Andrae (Andhras) had possessed thirty walled towns, numerous villages and an army of 100,000 infantry 2,000 cavalry, and 1,000 elephants (Mc. Crindle, Megasthenes, Arrian p.140). From this we learn that the Andhras i.e., Satavahanas, the earliest rulers of the Andhra country, were already a political and military force to reckon with. Originally, being the local chieftains in mid Godavari valley, they slowly expanded their power and authority and rose to imperial position in the Deccan when Kanha or Krishna the second member of the Puranic genealogy, declared independence. Their empire at its zenith comprised the whole of the Deccan and hence they were

known as Dakshina Pathapatis Inscription of Balasri (Burges J.N.SI. Nasik have No; 18, p. 108-09).

Several attempts have been made by the scholars to locate and identify the 30 walled towns mentioned by pliny. But it must be noted that they were spread over the entire Deccan and not confined to the limits of the present day Andhra Pradesh alone. Apart from their capital cities i.e., Amaravati in Guntur district, Andhra Pradesh and Paithan in Aurangabad District, Maharashtra, numerous other sites of the same period have come to light, as a result of extensive archaeological explorations. To mention a few are Tagara in Kolhapur District, Junnar and other sites in the valley of river Ghod in Pune District, Nevasa on the river pravara, Bahal on Girnar, also in Maharashtra.

Khandesh and Maheshwar in central India (Sankalia H.D.) In Andhra Pradesh also a few sites of the same period have been discovered by the state department of Archaeology and museums and some literary evidences. Notable among them; are Dhanyakataka or Dharanikota, Bhattiprolu, Vijayapuri, Ghantasala, Kodduru, Kalingapatnam, Dantapura.

Dhanyakataka:

As already noted Dhanyakataka was the place of embarkment for merchants bound for foreigners. Dhanyakataka had a very rich hinter-land producing large quantities of grain, cotton and forest products hence it developed in to a centre of Industry and trade. The word 'Dhanyakataka means a heard of grain. It was a converging point of different Indeed trade routes and it proved a convenient hoarding point on the river Krishna. Early Inscriptions of the place mention Nigama which means a merchant guild (C. Sivarama Murthy p.43). Most of Donations for the construction and maintenance of the stupa and Vihara were made by artisans, merchants and their women folk. A huge hoard of punch-marked coins has been discovered in the stupa site. (P.L. Gupta p.43, 1963).

Though it is away from the sea, big ships could travel up to Dhanyakataka and even beyond recently. A navigable canal dated 4th Cen.B.C. connecting the town with the river has been unearthed (H. Sarcar p.11, 1971), All these, reflect the importance of Dhanyakataka as a trade centre and A.K. Coomaraswamy (A.K. Coomaraswamy, 1971, p.156) and Reginald le may (reginald Le may p.122) were of the view that traders and Buddhist missionaries sailed off from Dhanyakataka.

Bhattiprolu:

Bhattiprolu was another great centre of trade and industry in this region. This is generally identified with Prithunda Nagara of the Hathigumpha inscription (170 BC) (DC. Sircar, p. 206 of Kharavela and Pytindra of Ptolemy (130 AD) (Mc. Crindle p. 67)

Prithunda Nagara appears to be a very Ancient town. The above inscription describes it as (Purva Raja Nirmita) that is built by Ancient kings. Ptolemy mentions it as a centre of textile Industry a great mart in the region of maisalia. Even to-day Bhattiprolu is known for its textiles. The relic coskets (E.I. vol II p 329) discovered in the stupa of Bhattiprolu clearly reveals that it was built on the genuine relic of the Buddha by Raja Kuberaka with the help of local nigama. The town is just four kms west of the right banks of the Krishna and about 15 kms from the coast. Even very big ships could sail up to the point. At Bhattiprolu we thus find the three institutions.

Political Raja, Commercial Nigama and religious Gosti. The existence of these institutions certainly indicates that the sputa-site was close to a township having in its population several trading communities conducting their business.

VIJAYAPURI:

Vijayapuri at the foot of Sriparvata, the most extensive Buddhist site in Andhra was also a great centre of trade and Industry. The inscriptions of the place mention several craft guilds (DC. Sircar Vol. 35, p.5). The later excavations in the Nagarjunakonda valley brought to light an excellent wharf (B.V. Krishna Rao, p.323). This only indicates that ships moved up and down the Krishna upto Vijayapuri.

GHANTASALA:

Ghantasala is identified with Kantakossyla of Ptolemy (J.W.M.C. Crindle p.66-68)

Or Kantakassyla (James Burgers 1887, p.85-93) of the Inscriptions. It might have been named after Kantaka the favourite horse of prince Siddhartha, the future Buddha.

Ghantasala also had very rich hinter land producing rice and Textiles which helped it to develop in to an international mart. Though it is six miles away from the coast it is connected with the sea by a big dain called upputeru. The tidal waves helped the ships to move into and out of the port. An inscription of about 270 A.D. Mentions a mahanavika (EP. Andhrice Vol.II p.12) leader of a fleet. The discovery of a large number of Roman gold coins (H. Sarcar Op Cit. p. 14-16) is a proof of the Profitable trade which the port carries on. There is a temple of Jaladhisvara in Ghantasala. (S.I. Vol. V. p.52-53). Jaladhisvara means Lord of the sea. It is probable that the sailory worshipped the god before embarking upon distant voyages.

Kodduru:

Ptolemy mentions kodduru as a prominent port (Mc. Crindle op. cit. 668) it is mentioned even in an inscription from Amaravati. (James Bugess op. cit p.93). There are many kodus around modern Machilipatnam. However koduru in divi Taluq divisima kodurus agrees with the description of Ptolemy. It is considered as the chief port of embarkation in Andhradesa for the land of gold.

The importance of the place continued upto about the 17th C.A.D. as indicated by the name of a neighbouring village Vallandapalem (C.P. Brown 1952, p.172) Vallandu is the Telugu name for Hollender or the Dutch. The Dutch or hollenders who came to India during the 17th C.A.D. had many settlements on the east coast and vallandu pattana is one of them. Koduru and its neighbourhood thus served as an important centre of foreign trade from Ancient to modern times.

Kalingapattanam :

Out side the Maisolia region several ports flourished on the Andhra coast, especially in the North. One of such is Kalingapattanam (Cummingham, 1924, p.592). It is in the Srikakulam district, twenty four kms away from the district headquarters of the same name. Some scholars identify it with the capital of Ancient Kalinga. Recently a huge Buddhist stupa has been exposed at this place. The famous Buddhist centre of salihundam is about eight miles to the west of Kalingapattanam.

It is likely that merchants and Buddhist monks who went to Malay peninsula sailed from Kalingapattanam.

Dantapura :

Dantapura in Kalinga figures prominently in Buddhist literature (S. Paranavitana 1959, p. 18-27). The tradition is that it came to be known as Dantapura (Danta-tooth) of the ship which carried the tooth relic of Buddha to Ceylon halted at the port. Sylvain Levi identified it with Palura (pallu=teeth in Telugu) (Sylvain Levi part 1. p. 66-69 Indo-Chine). Ptolemy refers to the opheterian immediately to the south of Palura where the vessels found for the Malay Peninsula or Dantapura was due to its importance as the point of departure for the Far East.

Yavanas in the early Andhra Country nothing was heard it is however certain that Graeco-Roman influences played a great part in the fashioning of the Amaravati tope, and as will be shown below the inscription from Alluru. (IA.Vol. XL) is another piece of evidence for Greek influence. Of the Sakas something was heard. An Amaravati inscription of the second century A.D. mentions a Saka-guri not as akagiri as read by Chanda, or pi (si?) giri as read by F.W. Thomas) (E.I. Vol. XV) another mentions a Ratika Nekhavama' and Nekhavana curiously reminds us of the person's name Nahapana (Ibid)

More Sakas would seem to have entered early Andhra in the wake of the marriage of Virupurushadata with the daughter of a Western Ksatrapa. A Nagarjunakonda epigraph (E.I. Vol.XX) mentioned a saka 'Joy' and his Buddhist sister Budhi. Among the Sculptures excavated by Mr. Longhurst at Nagarjunakonda there are two showing a warrior in Scythian dress.

Scholars Opinions:

Stein argues that from a social point of view 'Yavanas' whoever they might have been were absorbed by Indian society and it is unlikely that Greek colonies existed around the beginning of the Christian era (Stein 1934). Kosambi has, however, opposed this view and suggested that Deogadh on the opposite curve of hills from Karle be identified as Dhenukataka and that a Greek settlement may have been situated at the site (Kosambi-1955). He has also read one donar's name as Milinda the Physician instead of Mitidasa and suggests that he may also have been a Yavana (ibid) Sircar (Sircar 1942) has pointed out that Dhenukataka should not be confused with Dhanyakataka, the ancient name of Amaravati.

The view, repeatedly expressed by many scholars, that trade ceased in the third century AD and was slightly revived during or soon after the reign of Constantine 1 (fourth century AD), (K.V. Raman. 1992) is erroneous. It may be noted that coins of almost all Roman rulers right from Augustus to Justinus 1 (AD 518-27) has been unearthed in India in varying numbers and there is no reason to believe that trade activities ceased in the third century AD. Instead, the process of Delcine beginning in the late 1st century AD, continued slowly but steadily till the sixth-eight centuries AD.

When contacts finally ceased. It is difficult to determine the precise date of the end of trade activities.

VI. CONCLUSION

Andhradesa entered the System of money economy during the Pre-Mauryan period that is 4th century B.C. This is attested by the large quantities of silver punch-marked coins that were discovered at a number of places. Archaeological sources clearly revealed that the Amaravati Mahachaitya has an established trade communication from the north through Vidarbha in the pre-Mauryan period. The existence of punch marked coins at Amaravati, Singavaram, Gudivada and some places in Telangana, which are proved to be pre-Mauryan witnessed some trade activities. Early inscriptions and some of the names of the villages also attest the existence of industrial activities for commercial purpose. These factors clearly indicate that Andhradesa had trade contacts with the North even before the early historical period. The rise of Satavahanas coinciding with a proliferation of settlements in Modern Andhra Pradesh can in part be attributed to an expansion of internal, long distance trade as well as increased overseas demand supported by the development of an agricultural base. The reasons for this expansion may be ascribed to both geographical and historical factors.

That the Indo-Roman contacts were not confined to mere commercial ties. They extended to the exchange of diplomatic embassies and cultural interaction. The focus here, however, has been on an intensive study of Roman contacts with Andhra Pradesh and their significance in trade, especially maritime trade.

REFERENCES

- [1] S.J. Keay, *Italia MCC. Actos De Las Tornados Del 2200 Aniversario De Fundacion De Italica A Baballos Keay, 1996-97. 'Early Roman Italica and the Romanisation of Western Baetica, in and P. Leon, (Seville, 1996-97).*
- [2] S. Levi, and others, *pre-Aryan and pre-Dravidian in India, translated P.C. Bouché Calcutta, 1929, pp. 125 F.*
- [3] W.D.O Vincent, *The commerce and navigation of the Ancients in the Indian Ocean 2 Vols. London, 1807, P.41*
- [4] Pliny, *Natural History, Loeb Classical Series, 10, Vol.3, London; VI, 23.*
- [5] *Ancient India as described in classical literature, translated and annotated by*
- [6] J.W. Mc.Crindle, *West Minster, 1901, pp. 111, 112.*
- [7] *Journal of the America Oriental Society, LXXX, p. 136. To p. 139.*
- [8] *Winds, Weather and currents on the coasts of India and the laws of storms, Calcutta, 1931, p P3-10, Govt. of India Pub.*
- [9] *Jurnal of the American Oriental Society, LXXX, p.139, No.24.*
- [10] W.W. Torn. *The Greeks in Bactria, India, Cambridge, 1951, p. 369.*
- [11] L. Casson. 1980, *Rome's trade with the east; the sea voyage to Africa and India; Transaction of the American Philological Association, p. 33-34.*
- [12] Motichandra, *Trade and Trade routes in Ancient India. Abhinav pub., New Delhi, 1977, p. 165*
- [13] *Periplus. The periplus of the erythrian sea travel and trade in the Indian Ocean by A merchant of the first century. Longmans Green and Co., Newyork, 1912, p.47, Translated by Wilfred H.Schoff printed in India, Munshiram Manoharlal Pub.New Delhi.*
- [14] H.P.Ray, 1986, *Monastery and Guild Commerce under the Satavahanas, Oxford Pub. New Delhi, p. 113.*
- [15] E.H. Warmington 1974 (First Pub. 192J). *The commerce between the Roman Empire and India, 2nd ed. New Delhi.*
- [16] *Periplus, p. 42, op.cit.*
- [17] Dikshit 1955, *some beads from Kondapur, Hyderabad, A.S.I series, 16.*
- [18] Desh Pande, 1961. *Some observations on the ivory figure from Ter, Lalit Kala, X p. 55-5*
- [19] Mukherjee 1970. *An ivory seal matrix of the Satavahana period, Journal of Asiatic society, XII, p. 141.*
- [20] Desai 1981, b. "Mother Goddess" in Ghosh, A.ed. "Encyclopaedia of Indian Archaeology" ICHR, Project.
- [21] S.B.Deo and R.S.Gupte. 1974, *Excavation at Bhokardan, Nagpur, Aurangabad.*
- [22] Wheeler 1955, *Rome beyond the imperial frontiers, London.*
- [23] *Memoris of Archaeological survey of India, 1938, No. 54, p.11.*
- [24] Wheeler 1955, *O.P.Cit.*
- [25] D.C. Sircar 1939, *successors of the Satavahanas in the lower Deccan, Calcutta, 1939, p.330*
- [26] Pliny- *Natural History Tr.H. Rockhem and others, London Cambridge Mass, 1942-61 (leob)*
- [27] James Innes Miller, *spice trade of Roman Empire: 1969 Oxford Press, New Delhi.*
- [28] M.G..Rasche, 1978 "New studies in Roman commerce with East, Aufstie and Niedergang der Romischer welt, Berlin.
- [29] G.L.Adhya.. 1966. *Early Indian Economics, Asia Pub. House, Bombay, p. 137.*
- [30] Warmington 1928. *The commerce between the Roman Empire and India Cambridge, p. 272*
- [31] *Staius – Silvae, Tr. J.H. Mozley, London, Newyork, 1928 (Loeb).*
- [32] *Dio's Roman History, Tr.E.Cary London, New York, 1904-27 (Loeb).*
- [33] *Plutarch- Lives (Vol.v) Tr.B. Perrin, London, Newyork, 1917, (Loeb).*
- [34] M. Rostov zeff., 1957, *Social and Economic History of Roman Empire (2 vols). Revised Ed. Oxford 1957, p.*
- [35] Warmington, 1928, *op.cit, p. 136.*
- [36] P.K. Hitti. *History of the Arabs, London-1956, pp. 56-57.*
- [37] Warmington, *op.cit, p. 137.*
- [38] *IA, Vol. XL.*
- [39] *E.I Vol,XV , Epigraphia Indica.*
- [40] *E.I, VOL, XX*
- [41] Stein- *Yavanas in Early Indian Inscription, Indian Culture, 1, 1934, p. 343-57.*
- [42] *Kosambi, Dhenukataka Journal of Asiatic society of Bombay 1955, Vol. XXX, p.50-71.*
- [43] D.C. Sircar -1942. *Select inscriptions, Culcutta p .239, Early Roman Coins in India , JNSI, Vol, XLVI.*
- [44] T.V.G. Sastri. *The Vaddamanu excavations, Birla Institute of Archaeology, pp. 1-10 op cit*
- [45] James Burgess, *Buddhist stupa of Amaravati and Jaggayyapet p.78, 55 & 93. Op. cit*
- [46] T.N. Rama Chandra. *Journal of Andhra Historical Research Society Vol. XVIII, p.27.*
- [47] M.C. Crindle, *Ancient India as Described by Megasthenes and Arrian p. 140. Op. Cit.*
- [48] James Burgess, *Nasik cave Inscription of Goutami Balasri, Budhist cave Temples and their inscriptions, No. 18, pp. 108-109.*
- [49] H.D. Sankalia *Aspects of Indian Archaeology Article : Archaeology and Tradition pp. 274-275.*
- [50] C. Siva Rama Murthy, *Amaravati Sculptures in the Madras Govt. Museums p.43.*
- [51] P.L. Gupta, *Coins, p.43, N.B.T., New Delhi 1963.*
- [52] H. Sarcap p.11 *corpus of the Inscriptions of Java (upto 928 AD) K.L.M. Calcutta 1971.*
- [53] A.K. Coomaraswamy, *History of Indian and Indonesia art, p.156 munshiramManohar Lal Pub. New Delhi, 1971*
- [54] *Reginald Le May p.122, The Culture of the South East Asia.*
- [55] D.C. Sircar, *Select Inscriptions, Vol. 1 p. 206 p.73.*
- [56] *Mc. Crindle Op. Cit, p.67.*
- [57] *E.I. Vol. II, p.329.*
- [58] T.V.G. Sastri. *The Vaddamanu excavations, Birla Institute of Archaeology, pp. 1-10 Op. Cit.*

- [59] James Burgess, Buddhist stupa of Amaravati and Jaggayyapet p.78, 55 & 93. Op. Cit.
- [60] T.N. Rama Chandra. Journal of Andhra Historical Research Society Vol. XVIII,p.27.
- [61] M.C. Crindle, Ancient India as Described by Megasthenes and Arrian p. 140. Op.Cit.
- [62] J.A.S. Burgess, Nasik cave Inscription of Goutami Balasri, Buddhist cave Temples and their inscriptions, No. 18, pp. 108-109.
- [63] H.D. Sankalia. Aspects of Indian Archaeology Article : Archaeology and Tradition pp. 274-275.
- [64] C. Siva Rama Murthy, Amaravati Sculptures in the Madras Govt. Museums p.43.
- [65] P.L. Gupta, Coins, p.43, N.B.T., New Delhi 1963.
- [66] H. Sarcar p.11 corpus of the Inscriptions of Java (upto 928 AD) K.L.M. Calcutta 1971.
- [67] A.K. Coomaraswamy, History of Indian and Indonesia art, p.156 Nonshiram Manohar Lal Pub. New Delhi,1971
- [68] Reginald Le May p.122, The Culture of the South East Asia.
- [69] D.C. Sircar, Select Inscriptions, Vol. 1 p. 206 p.73.
- [70] Mc. Crindle Op. Cit, p.67.
- [71] E.I. Vol. II, p.329.
- [72] K.V. Raman;"Roman coins from Tamilnadu" SSIC, vol. 11, 1992, pp.19-34

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OPTIMISED DIRECT TORQUE CONTROL OF INDUCTION MOTOR FOR ELECTRIC VEHICLE PROPULSION

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Abstract—This paper presents Electric Vehicle (EV) propulsion using a three phase squirrel cage induction motor. The motor control at different operating conditions is carried out by a direct torque control technique with an energy optimization strategy. The operating flux of the motor is chosen optimally using model based control strategy. Simulation tests have been carried out using MATLAB SIMULINK to check the consistency and performance of the proposed scheme.

Keywords—induction motor; EV propulsion; DTC; loss minimization; optimisation.

Introduction

Electric Vehicles (EVs) [1] are a solution for the environmental problems caused by vehicles with internal combustion engines. The advantages of EVs include energy efficiency, virtually lack of pollution, and the availability of electric energy through electric distribution systems. Among disadvantages, they have low energy density and long charging time for the present batteries. Hence, optimal energy management is very important in EVs. The other major factors include optimum design of the motor, selection of a proper drive, and optimal control strategy.

The electric propulsion system of EV consists of the motor drive, transmission device, and wheels. The motor drive, comprising of the electric motor, power converter, and electronic controller, is the core of the EV propulsion system.

Desired features of the propulsion system (motor) for an EV

are high ratio of “torque/inertia” and “power/weight,” high maximum torque capability, high speed, low level of audible noise, low maintenance, small size, low weight, reasonable cost, high efficiency over low-and high-speed ranges, energy recovery on braking, and non sensitivity to acceleration forces. Squirrel-cage induction motors have most of the above-mentioned features.

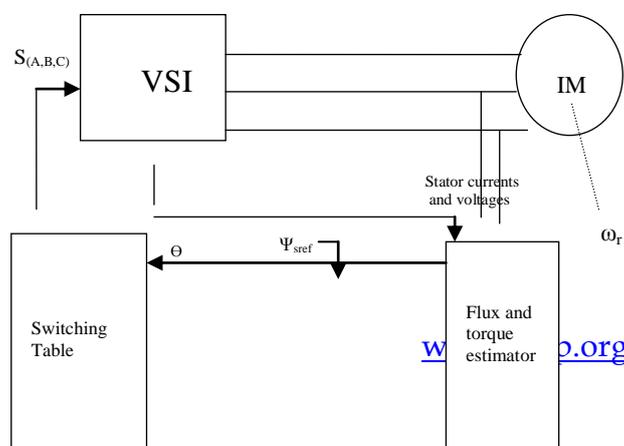
Among the various control techniques available Direct Torque Control (DTC) appears to be very convenient for EV propulsion. The input currents are measured; flux, torque are estimated. The

reference speed which is directly applied by the pedal of the vehicle is the input of the motor controller. [2][3]

Furthermore, DTC typical advantages are not sufficient. EVs induction motor drive has also to possess a high efficiency in order to extend the running distance per battery charge. Therefore, DTC should be associated to a loss-minimization strategy so as to maximize the drive efficiency. In this paper DTC control scheme along with a loss minimization strategy is implemented.[7]

Direct Torque Control

In DTC the electromagnetic torque and stator flux linkage of the machine are controlled directly by the selection of optimum inverter switching modes. The use of a switching table for voltage vector selection provides quick response and it has a simple control structure. The flux and torque errors are restricted within respective flux and torque hysteresis bands with the optimum selection being made. The DTC control scheme utilizes hysteresis controllers for torque and flux to select the switching voltage vector. These hysteresis controllers maintain the flux and torque within an allowed upper and lower limit. [4] The generic Direct Torque Control scheme for an inverter fed induction motor drive is as shown in Fig. 1. The DTC scheme comprises of flux and torque estimator, hysteresis controllers for torque and flux and a switching table.



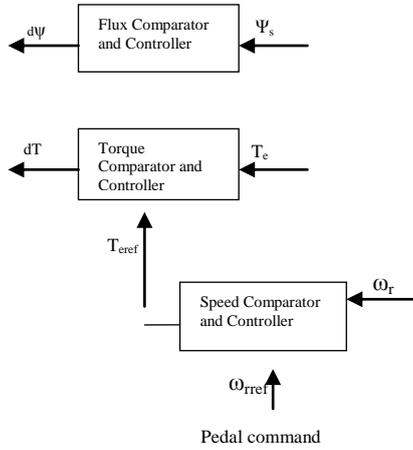


Fig.1.Basic DTC Scheme

Stator Flux and Torque Control

The induction motor stator flux Ψ_s can be estimated as follows

$$\dot{\Psi}_s = (V_s - R_s I_s) dt + \Psi_{s0} \tag{1}$$

where V_s is the stator voltage, I_s the stator current, R_s the stator resistance, Ψ_{s0} the initial flux vector. Selection of appropriate voltage vector in the inverter is based on stator equation by (2)

$$\Delta \Psi_s = \Psi_s - \Psi_{s0} = \int_0^{\Delta t} (V_s - R_s I_s) dt = V_s \Delta t \tag{2}$$

Hence, variation of stator flux space vector can be achieved by the application of stator voltage V_s for a time interval of Δt .

$$\Psi_s^2 = \Psi_{ds}^2 + \Psi_{qs}^2$$

The electromagnetic torque is estimated using (4)

$$T_e = \frac{3}{2} \frac{p}{2} (\Psi_{ds} i_{qs} - \Psi_{qs} i_{ds})$$

Where p indicates the pole pair, Ψ_{ds} and Ψ_{qs} are the stator flux in stationary dq frame, i_{ds} and i_{qs} , d and q axis stator currents respectively.

Voltage Source Inverter and Switching Table

The torque control of the inverter fed machine is performed by hysteresis control of magnitude of stator flux and torque which selects one of the six active and two zero inverter voltage vectors $V_s(i)$, as shown in Fig.2. This selection is made in order to maintain the torque and flux error inside the specified hysteresis band. The errors are indicated by dT and $d\psi$ respectively.

$$\begin{aligned} dT &= T_{ref} - T_e \\ d\psi &= \Psi_{ref} - \Psi_s \end{aligned} \tag{6}$$

The flux loop controller is a two-level comparator and the torque comparator is a three-

level comparator. The digitized outputs of the torque controller are defined as

$$\begin{aligned} H_T &= 1 & dT > +HB_T \\ H_T &= 0 & -HB_T < dT < HB_T \\ H_T &= -1 & dT < -HB_T \end{aligned} \tag{7}$$

and those of flux controller are

$$\begin{aligned} H_\psi &= 1 & d\psi > +HB_\psi \\ H_\psi &= 0 & d\psi < -HB_\psi \end{aligned} \tag{8}$$

The total hysteresis band width of the flux loop controller is $2HB_\psi$ and of the torque controller is $2HB_T$. The actual stator flux is constrained within this band and it tracks the command flux in zigzag path, Fig.3. The feedback flux and torque are calculated from the machine terminal voltages and currents. The sector number in which the flux vector currently lies is computed by the signal computation block. There are six active voltage vectors each spanning 60 degrees. The voltage vector table receives H_ψ , H_T and sector S_i and generates appropriate control for the inverter from a look-up table as in TABLE I.

TABLE I
 SWITCHING TABLE FOR DTC TECHNIQUE

$d\psi$	dT	S(1)	S(2)	S(3)	S(4)	S(5)	S(6)
1	1	V ₂	V ₃	V ₄	V ₅	V ₆	V ₁
	0	V ₇	V ₀	V ₇	V ₀	V ₇	V ₀
	-1	V ₆	V ₁	V ₂	V ₃	V ₄	V ₅
0	1	V ₃	V ₄	V ₅	V ₆	V ₁	V ₂
	0	V ₀	V ₇	V ₀	V ₇	V ₀	V ₇
	-1	V ₅	V ₆	V ₁	V ₂	V ₃	V ₄

The stator input voltages are evaluated in order to determine the stator voltage vector. Having the control strategy (switching pattern), the stator voltage vector can be directly calculated as follows (9)

$$v_s = \sqrt{\frac{2}{3}} V (S_a + S_b e^{j2\pi/3} + S_c e^{-j2\pi/3}) \tag{9}$$

where V is the supply voltage of the inverter (EV battery), and S_a , S_b , S_c are numbers 0 or 1 that are the output of the switching table.

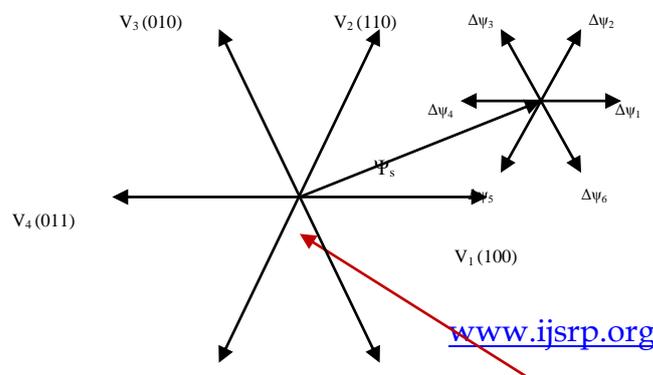




Fig.2. Inverter Voltage Vectors and corresponding stator flux variation in time Δt

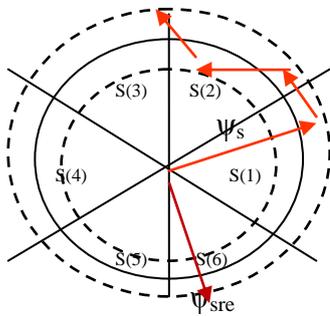


Fig.3. Trajectory of Stator Flux Vectors

Induction Motor Losses Model

Choosing the flux level in the induction motor remains an open problem from the perspective of maximizing motor efficiency. Many operation schemes have been proposed by researchers concerning the optimal choice of excitation current or flux level for a given operating point. One among these technique is the loss-model-based approach which consists of computing losses by using the machine model and selecting a flux level that minimizes these losses. It is observed that the motor loss in steady state consists of the following components:

$$P_s = R_s (i_{sd}^2 + i_{sq}^2) \tag{10}$$

$$P_r = R_r \left(i_{sq} - \frac{\omega_s L_m}{R_f} i_{sd} \right)^2 \tag{11}$$

$$P_{fe} = (\omega_s L_m)^2 \frac{i_{sd}^2}{R_f}$$

Where P_s is the stator copper loss, P_r the rotor copper loss, P_{fe} the core loss and ω_s is the stator angular velocity.

The minimum loss is found by differentiating the total losses with respect to the current ratio and the motor losses are found to be minimal when the loss depending on the current direct with the rotor

flux is equal to the loss depending on the current in quadrature to the rotor. [5][6] The proposed loss minimization DTC scheme for EV propulsion is shown by Fig.4.

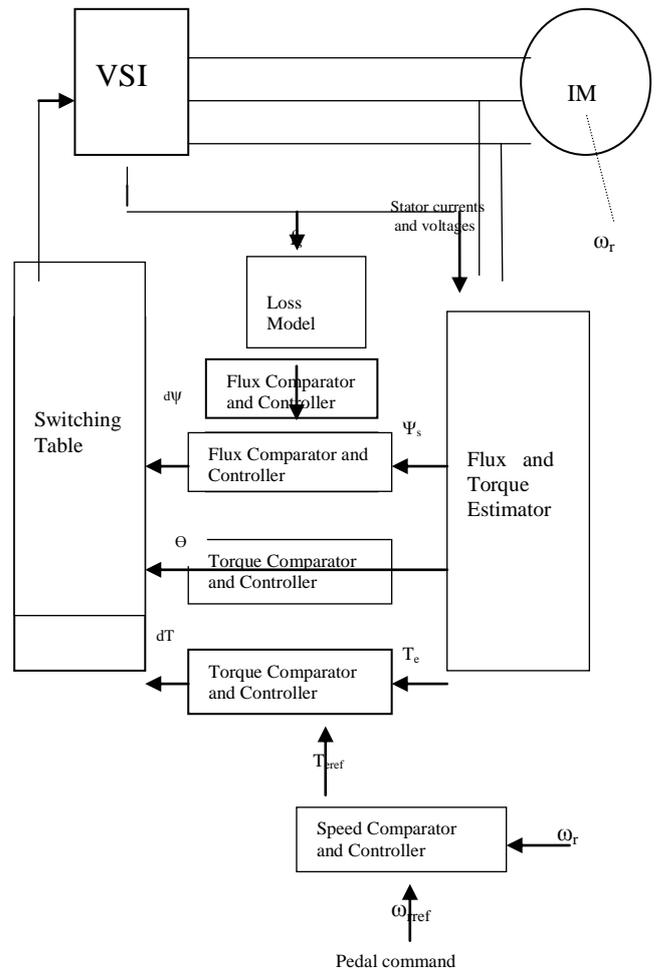


Fig.4. DTC scheme with model based control

Results and Discussions

The optimized DTC control scheme has been simulated in MATLAB along with Simulink toolbox. The simulation is carried out for following conditions.

- A. Transient Response of Vehicle Motor During Starting, Acceleration and Deceleration (Regenerative Braking)

Fig. 5. shows that the motor drawn inrush current during starting (zero to 150 rpm) of the motor. This current can be reduced by first establishing the flux with zero speed command for the first few cycles and then giving the speed command to the drive. The motor is accelerated from (150 rpm to 500 rpm at 1.1 second) with in

current/ torque limit and one can observe the variation of the frequency of the currents as the drive accelerates. Then the motor is decelerated to 150 rpm at 2.5 second to show the drive behavior during regenerative braking (reversal of phase current). When the motor is slowed down, that means negative torque is applied to the electric vehicle, it behaves as a generator that produces electrical power to recharge the battery. Motor currents are at maximum during acceleration and deceleration. Fig.6 shows the torque, current variations when the vehicle is accelerated above it base speed (field weakening).

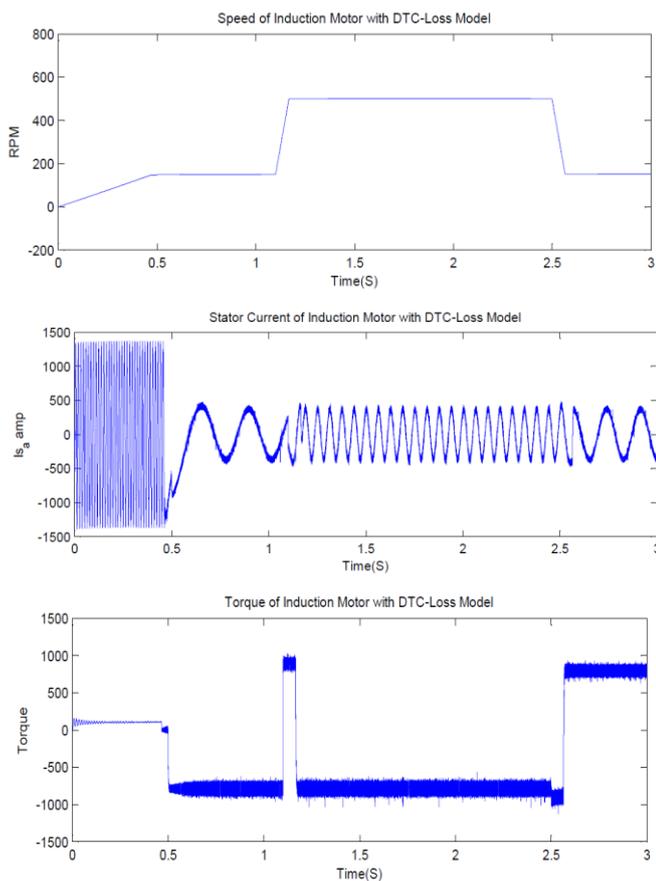


Fig.5. Transient response of the vehicle motor during starting, acceleration and deceleration

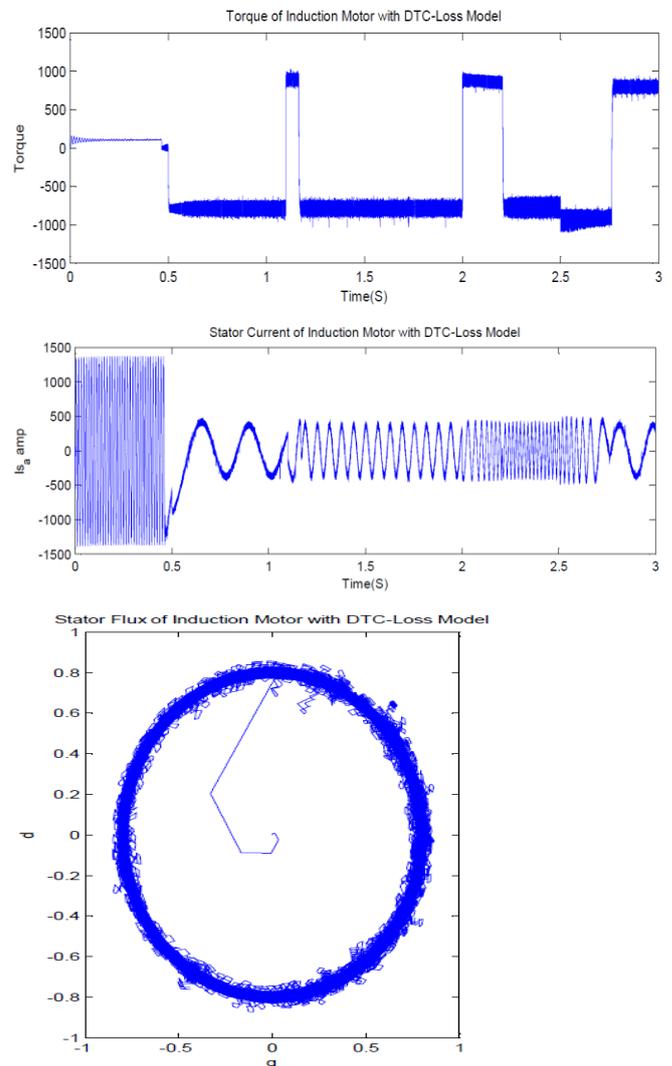
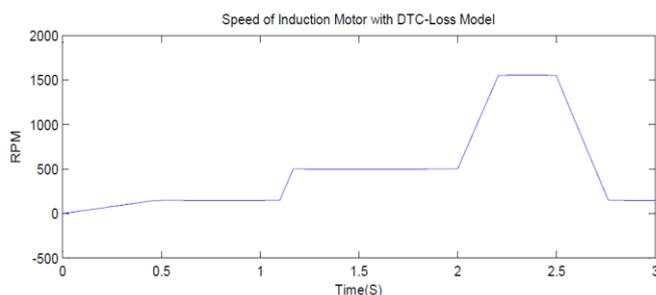


Fig.5. Transient response of the vehicle motor during starting, acceleration (above rated speed) and deceleration

Conclusions

The DTC technique has been employed for the speed control of an induction motor, above and below the rated speed. The input of the control system is the speed reference provided by the pedal of the EV. The required measurements are currents of two phases of the motor. The value of the battery voltage and instantaneous values of the control signals can be used in the place of the measured voltages. Hysteresis controllers were used to control torque and flux independently. Use of the optimum flux during the steady-state operation of the motor can reduce the amplitude of the current and flux and improve the efficiency. The proposed speed scheme is capable of providing acceleration, braking and above rated speed (Flux weakening) feature of the electric vehicle drive.

Appendix

Induction Machine Parameters

2 HP, 50 Hz, 4 pole

$R_s=14.85\text{m}\Omega$, $R_r=9.295\text{m}\Omega$, $L_s=L_r=0.3027\text{mH}$,

$L_m=10.46\text{mH}$, $J=3.1\text{kgm}^2$.

References

- [1] C.C. Chan, "The state of the art of electric and hybrid vehicles," *Proceedings of the IEEE*, vol. 90, n°2, pp. 247-275, February 2002.
- [2] G.S. Buja et al., "Direct torque control of PWM inverter-fed ac motors—A survey," *IEEE Trans. Industrial Electronics*, vol. 51, n°4, pp 744-757, August 2004.
- [3] C. Lascu et al., "A sensorless hybrid DTC drive for high-volume low-cost applications," *IEEE Trans. Industrial Electronics*, vol. 51, n°5, pp 1048-1055, October 2004.
- [4] J. Faiz et al., "Sensorless direct torque control of induction motors used in electric vehicle," *IEEE Trans. Energy Conversion*, vol. 18, n°1, pp. 1-10, March 2003
- [5] S. Lim et al., "Loss-minimising control scheme for induction motor," *IEE Proc.-Electr. Power Appl.*, vol. 151, n°4, pp. 385-397, July 2004.
- [6] F. Abrahamsen et al., "Efficiency-optimized control of medium-size induction motor drives," *IEEE Trans. Industry Applications*, vol. 37, n°6, pp 1761-1767, November-December 2001
- [7] Bhim Singh et al., "Speed Sensorless Electric Vehicle Propulsion System Using DTC IM Drive," *Proceedings of India Int Conf Power Elec*, 2006

Power Generation through Gravity and Kinetic Energy

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Abstract- Power generation is done through various methods, some of which uses Renewable energy sources and some use Non Renewable Energy Resources. But all this methods can be used to produce the Electrical energy only for some extent. The energy generated from Renewable sources is also not continuous throughout the day for 24hrs. Therefore a source through which energy can be harvested continuously for 24hrs is to be found. Gravity is the force that is present on the earth at every instant of time, hence with suitable mechanism it can be used as a source to generate Electrical energy. An arrangement is made in such a way that the Kinetic Energy of a body due to the gravitational force is converted into electrical energy.

Index Terms- Electromagnetic induction, Gravitational force, hydraulic power, kinetic energy.

I. INTRODUCTION

This paper presents a new Innovative method of power generation using the Gravitational force of our Earth which is present all the time and can be utilized at any place on the Earth. Energy demand is increasing day by day with rapid growth in industrial as well as house hold utilization. But the energy resources are gradually decreasing at a higher rate. With this scenario the energy resources would come to an end within a few years and hence there will be scarcity of fuel (coal, wood, water, etc..) for power generation. The other sources like solar, wind, biomass, etc., are available only for a particular duration of time during the day and the night. Therefore it is the time to look for other resources, or to find a new method to generate power in order to fulfill our Energy demands and requirements.

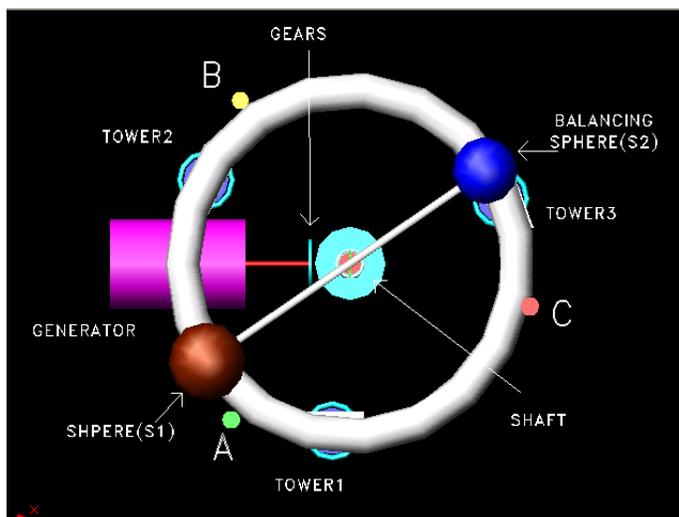


Fig 1: BLOCK DIAGRAM TOP VIEW

But in practice these designs could not be brought into physical body as their functioning did not work as thought theoretically.

Some researchers have been made earlier in this field but they could not be applied successfully due to some limitations. The mechanism employed for harvesting energy from gravity was lacking specifications in various aspects. Some designs were made with the mechanism arranged in an order such that the kinetic energy of solid bodies could be converted into electrical energy.

Principle: This machine is based on the simple principle i.e., when an object is placed on a higher level ground then due to the gravitational force it experiences a pull towards the lower level and gains kinetic energy. This kinetic energy can be utilized in a précised manner in which it can be transformed into electrical energy.

Working: Two spheres of different weights connected together with a shaft are balanced on another shaft placed vertical to the plane. These two spheres rest on a circular ring type platform which is supported by three hydraulic towers. Initially the two spheres rest at certain angle on the horizontal plane.

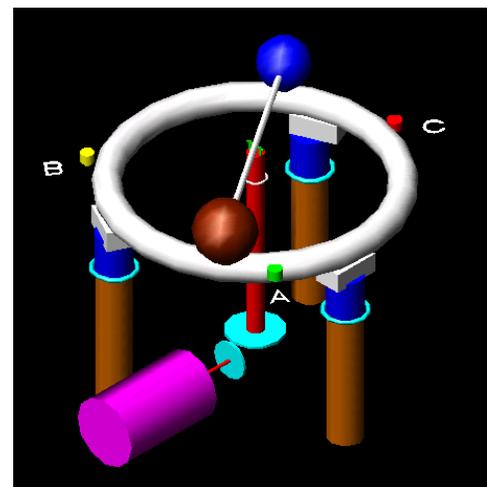


Fig 2: BLOCK DIAGRAM SW VIEW

In this, the power generation is based on the kinetic energy of Sphere S_1 but not that of the other sphere S_2 . The reason for this will be explained in the next chapter.

Let us suppose, the sphere S_1 is at the point A as shown in the fig 2. Then the base of the circular platform at Tower-1 will be raised up hydraulically till the specified height, therefore as the platform is raised up, the sphere above it also rise upwards and therefore due to the gravitational pull of our Earth the sphere tends to move forward in downward motion and hence builds up

kinetic energy. Then the sphere S_1 reaches the point B and therefore the base of the platform at Tower-2 raises up and simultaneously the base at Tower-1 go downwards and hence the sphere S_1 moves further towards the point C. Then again Base of the platform at Tower-3 raises up and simultaneously the base at Tower-2 go downwards, therefore the sphere S_1 moves further in forward clockwise direction and reaches the point A. Then once again the base at Tower-1 rises up and the same process repeats throughout the process. Therefore as the sphere moves, the vertical shaft connected to it also rotates. The vertical shaft is connected to a generator through gears. Hence the Armature of the Generator starts rotating and Electrical power is generated.

There is a big problem with the weight of the Sphere S_1 , the larger the sphere, the heavier it will be and therefore the hydraulic system used to raise the platform base as well as the Sphere S_1 should be of higher capacity. In this case the energy required to raise the tower up will be more than the energy generated and therefore it would be of no use.

This problem is solved by connecting another sphere to the other end of the horizontal shaft. The two spheres S_1 and S_2 are balanced on the vertical shaft such that only 5% to 10% of the weight of sphere S_1 falls on the circular platform. Therefore now when the tower raises up, it has carry additional weight of only 5% to 10% of the sphere S_1 . Hence the power consumed in raising the tower up will be less and therefore this mechanism works with much more efficiency.

II. LIFTING SYSTEM ELECTRICAL CONNECTIONS:

We can use two methods for lifting up the towers.

1. Hydraulically
2. Electrically

1. Hydraulically: Hydraulic lifting arrangement can be done on the top of the three Towers as shown in the Fig 2. With the help of a control unit the raising and lowering of the towers can be controlled till the specified height. The tower must be raised within a short period of time and as soon as the sphere S_1 reaches the next point it must lower down only till half of its raised height. Then when the sphere S_1 reaches 2nd point, this tower must completely lower down till its base point. With this process the sphere S_1 can make continuous rotations and hence power can be generated continuously.

Hydraulic Specification: When the sphere S_1 reaches the points A,B,C placed after the three towers, the following actions are done.

At point **A:**

1. Tower-1 lifts up completely.
2. Tower-2 lowers down completely.
3. Tower-3 lowers half its raising height.

At point **B:**

1. Tower-2 lifts up completely.
2. Tower-3 lowers down completely.
3. Tower-1 lowers half its raising height.

At point **C:**

1. Tower-3 lifts up completely.
2. Tower-1 lowers down completely.

3. Tower-2 lowers half its raising height.

2. Electrically: The electrical connections for the lifting system are as shown in the Fig 3.

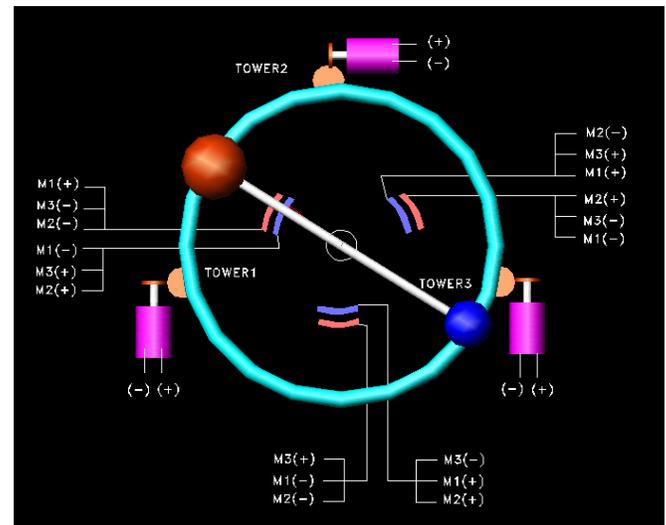


Fig 3: HYDRAULIC SYSTEM ELECTRICAL CONNECTIONS

The mechanism used in lifting and lowering the base part of the tower is as shown in the fig 4.

A rectangular shaft with saw tooth edges on one side is connected to the gear box of the motor as shown in fig 4. Therefore as the motor revolves forward and backwards, the tower shaft moves up and down, thereby lifting up and the base of the platform.

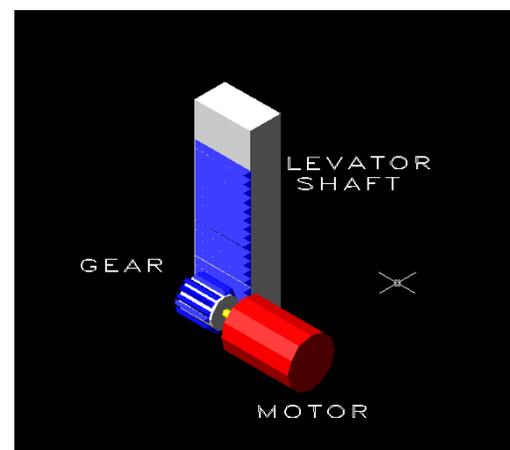


Fig 4: ELECTRICAL ELEVATION MECHANISM

The lifting and lowering of the towers must be done in a précised manner. For this operation the motors must rotate clockwise and anti clockwise only for the defined period of time. This means the supply given to these motors should be controlled. This is done with the help of a switching mechanism through which the electrical supply is given to the motors on for a particular duration of time.

For this operation DC motors are used. By changing the polarity of the supply terminals, the direction of rotation of the motor is changed and hence performs the lifting and lower operation of towers.

The electrical supply connections are shown in fig 5. Electrical supply to the motors is fed through the brushes connected to the horizontal shaft in between the spheres. The two brushes connected to the shaft make contact with the metal strips laid along the circular path and serve as supply terminals. Whenever these two brushes make contact with the metal strips, the corresponding motors get activated through the line connection made on the metal strips and therefore perform the desirable task of lifting and lowering of the platform base.

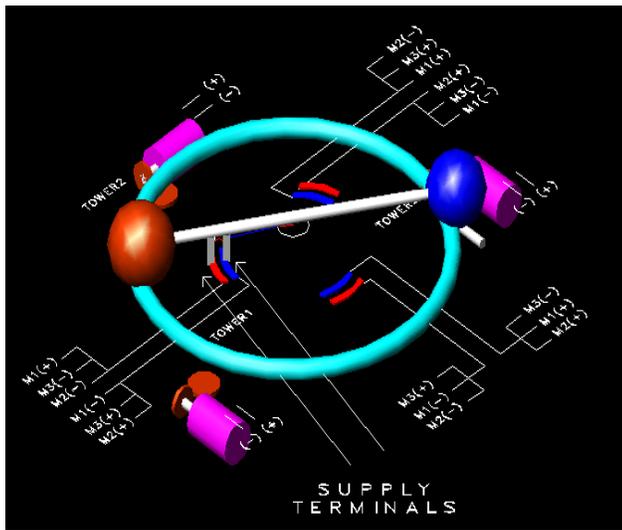


Fig 5: ELECTRICAL CONNECTIONS SW VIEW

When the sphere S_1 reaches the points A,B,C placed after the three towers, the following switching operation of the motors is performed.

At point **A:**

1. Motor-1 is in forward direction and lifts up Tower-1.
2. Motor-2 is in reverse direction and lowers Tower-2.
3. Motor-3 is also in reverse direction and lowers Tower-3.

At point **B:**

1. Motor-2 is in forward direction and Tower-2 lifts up.
2. Motor-3 is in reverse direction and lowers Tower-3.
3. Motor-1 is also in reverse direction and lowers Tower-1.

At point **C:**

1. Motor-3 is in forward direction and lifts up Tower-3.
2. Motor-1 is in reverse direction and lowers Tower-1.
3. Motor-2 is also in reverse direction and lowers Tower-2.

III. CONCLUSION

Therefore compared with the other power generation methods like solar, hydel, wind etc., this method of power generation through kinetic energy produced by the gravitational force is very efficient. As the power generated by this method is available throughout the day. This power unit can be installed at any place nearer to the populated areas as it doesn't require any

fuel or supply resources like water, coal, wind etc., for power generation.

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REFERENCES

- [1] B.L.THERAJA, Electrical Technology, Volume-II, AC & DC Machines, Ed.S.Chand, 2009, pp 887-1030.
- [2] Bunsal, Hydraulics, Radiant publications, 2010.

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Foetal weight estimation methods – Clinical, Sonographic and MRI imaging

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Abstract- Background: Knowledge of the weight of the foetus in utero is important for the obstetricians to decide the time and mode of delivery. It can be estimated clinically, biochemically or by radiological imaging. None of the diagnostic tools are direct. Interestingly clinically estimated foetal weight is being found more precise than radiological estimation

Aim: This study was designed to find the error percentage in ultrasound and clinical methods. We also studied the research papers on the role of ultrasound and MRI in the diverse strata of birth weights.

Results: The average error in all the weight groups except in >3500 grams group was least with Dare's Formula, closely followed by Hadlock's Ultrasound Method. Average error in the >3500 grams group was least with Johnson's formula. For birth weight below 3500 grams clinical estimation by Dare's Formula gave the least average absolute error while in birth weights above 3500 grams clinical estimation by Johnson's Formula gave the least average absolute error. Dare's Formula had a tendency to underestimate the foetal weight and had least error in <3500 grams group. Johnson's and Ultrasound method overestimated the foetal weight. Ultrasound methods showed advantage in intrauterine growth restricted and macrosomic babies. MRI is important to detect central fat deposition in babies of diabetic and hypothyroid mothers.

Conclusion: The abdominal girth multiplication by symphysiofundal height can be a great concern in developing countries. It is easy and simple and can be used by even by midwives. Ultrasound may be reserved to detect abnormal blood flow in umbilical arteries in growth restricted babies and detecting central fat deposition in clinically macrosomic babies. This would ensure a better use of clinical and diagnostic modalities available to us

Index Terms- Abdominal girth, estimated foetal weight, MRI, Symphysio fundal height

I. INTRODUCTION

The Accurate estimation of foetal weight is important in modern obstetrics. During the past two decades estimated foetal weight is incorporated into the standard routine antepartum evaluation of high risk pregnancy. Management of diabetic pregnancy, vaginal birth after caesarean section and breech presentation is guided by the estimated foetal weight. (1,2). In preterm deliveries and intrauterine growth restriction, perinatal counselling on the likelihood of survival, the intervention taken to postpone delivery, optimal route of delivery or the level of

hospital where delivery should occur is completely based on the estimated foetal weight (2,3,4,5). High rate of perinatal mortality (40 per 1000) is still a major concern in Tamil Nadu while compared to developed nations (3-4 /1000). A large proportion of this problem is related to birth weight which remains the single most important parameter that determines the neonatal survival (6,7,8,9). It is estimated that 16% of live born infants have low birth weight, a condition associated with high perinatal mortality and morbidity. On the other hand foetal macrosomia is associated with maternal morbidity, shoulder dystocia, birth asphyxia and birth trauma (10).

Precise foetal weight estimation would help in successful management of labour and care of newborn. This will prepare us for any complications associated with low birth weight or macrosomia. Perinatal morbidity and mortality may decrease if timely intervention is undertaken (2, 3, 4, 11, 12). The available techniques can be broadly classified as

- a) Clinical Methods: In clinical methods tactile assessment of foetal size, clinical risk factor estimation, Maternal self estimated foetal weight and Prediction equations of birth weight are included.
- b) Imaging Methods: This includes ultrasonography and magnetic resonance imaging. Some investigators consider sonographic estimates to be superior to clinical estimates others confer similar level of accuracy. Several studies indicate that physician conducted physical examination of pregnant women and estimated foetal weight are superior to ultrasonic foetal measurement (3-7,12-46). Williams textbook concludes that estimation of foetal weight from ultrasonic measurements is not proven to be reliable (47). It even carries a risk of sonologically induced chromosomal anomalies.

II. NUMEROUS RESEARCH ARTICLES

Fetal weight estimation methods have been discussed by various authors.

Tactile assessment of foetal size

Dare et al used this technique by multiplying the abdominal girth (cm) with symphysiofundal height (cm) and calculated the estimated foetal weight in grams (21). However, this is less accurate for obese than non obese and carries a significant intra observer variation. The inherent growth potential of the baby and nutritional status of the mother are concurrently measured. The resultant estimate is closest to the actual birth weight as pointed by several prospective studies (1, 26, 27, 29, 34).

Clinical risk Factor

This method involves quantitative assessment of clinical risk factors and has been shown to be valuable in predicting foetal weight. In case of foetal macrosomia, the presence of risk factors, such as maternal diabetes mellitus, prolonged pregnancy, obesity, pregnancy weight gain of >20 kg, maternal age >35 years, maternal height > 5ft 3 inches, multiparity, male foetal sex and white race should be added. In low estimated birth weight socioeconomic status, constitutionally small mother, poor maternal weight gain, foetal infections, congenital malformations, chromosomal abnormality, teratogenic exposure, maternal anaemia, Anti phospholipid Antibody syndrome and other medical disorders complicating pregnancy should be mentioned.

Maternal Self estimation

In literate society maternal self estimation of foetal birth weight in multiparous women show comparable accuracy to clinical palpation in some studies for predicting abnormally large foetus (24,29).

Birth weight Prediction equations

Various calculations and formulae based on measuring uterine fundal height above symphysis pubis have been developed. Ojwang et al used the product of symphysiofundal height and abdominal girth measurement at various levels in centimetres above symphysis pubis in obtaining a fairly acceptable predictive value but with considerable variation from the mean(20). Dare et al simplified and used the product of symphysiofundal height (Mc Donald's measurement) and abdominal girth at the level of umbilicus measured in centimetres and result expressed in grams to estimate foetal weight in utero at term, and the estimation correlated well with birth weight (21).

Johnson's formula for estimation of foetal weight in vertex presentation is as follows

Foetal weight (grams) = (Mc Donald's measurement of symphysiofundal height in cm - X) x 155 where X = 13, when presenting part was not engaged, X = 12 when presenting part is at 0 station and X = 11 when presenting part was at +1 station. If a patient weighs more than 91 kg, 1cm is subtracted from the fundal height.

Dawn's formula states that weight (grams) = longitudinal diameter of the uterus x transverse diameter of the uterus x 1.44/2. Measurements are made with pelvimeter. Double abdominal wall thickness was also measured pelvimeter. If Double abdominal wall thickness was more than 3 cm, the excess was deducted from the longitudinal diameter.

Obstetrical ultrasonography

Early expectations that this method might provide an objective standard for identifying foetus of abnormal size for gestation age was recently undermined by prospective studies that showed sonographic estimates of foetal weight to be no better than clinical palpation for predicting foetal weight (1, 26, 27, 29, 34). Susiki et al used ultrasound measurement of foetal heart volume to estimate foetal weight (44). Paulos et al used foetal volume by ultrasound (45). Sonographic predictions based on algorithms using various combinations of foetal parameters, such as abdominal circumference (AC), Femur Length (FL),

Biparietal Diameter (BPD), and Head Circumference (HC) both singly and in combination have been used (3,10,18,25,37-42). When other sonographic foetal measurements are used for estimating foetal weight e.g. humerus soft tissue thickness, ratio of subcutaneous tissue to, femur length, cheek to cheek distance, these nonstandard measurements do not help to predict birth weight except in special subgroups e.g. Diabetic mothers(32). Multiple sonographic foetal biometry also do not improve prediction(25,26). Foetal imaging is limited by maternal obesity, oligohydramnios and anterior placentation. Besides these formulas are obtained from populations which do not include pregnant women of all genetic background resulting in an inherent sampling error.

Magnetic Resonance Imaging

There is use of fast acquisition protocols, including echo planer MRI and T1 weighted and T2 weighted imaging for foetal volume calculation. The data so far does not suggest any better prediction (49, 50, 51, 52, 53, 54) than ultrasonography. For weight calculation, foetal volume is multiplied by foetal density although the exact value of latter is not known. In addition foetal density is a function of gestational age owing to changes in proportion of tissue represented by muscle, bone and fatty tissue. In majority of cases the authors selected a density value of 1.031g/ml (51, 52, 54, 55), but value of 1gm/ml (50) and 1.07 gm/ml (53) were also used. The great majority of measurements were calculated at term. As less adipose tissue is present at early gestational ages and growth restricted foetus, a different density value may be required for these estimations. Reported disadvantages of the method include higher cost and longer processing time (45 minutes). The vast number of articles published on the topic point that no currently available tool is precise. This study aims to determine the most accurate method of foetal weight estimation at term by comparing the various publications.

III. DISCUSSION

Now it is the time to articulate the research work with ideas gathered in above steps by understanding the biophysics of fetal growth.

Biophysics of fetal growth

Human foetal growth is characterised by sequential patterns of tissue and organ growth, differentiation and maturation. This is determined, by maternal provision of substrate, placental transfer of these substrate and foetal growth potential governed by genomes. Foetal growth has been divided into three consecutive cell growth phases. The initial phase of hyperplasia occurs during the first sixteen weeks and is characterised by a rapid increase in cell number. The second phase which extends upto 32 weeks, includes both cellular hyperplasia and hypertrophy. After 32 weeks, foetal growth occurs via cellular hypertrophy and it is during this phase that most foetal fat and glycogen deposition take place (47).

The foetal growth is complex involving biophysical and biochemical dimensions. Although many factors have been implicated in the process of foetal growth, the precise cellular and molecular mechanism by which normal foetal growth occurs

is not well understood. The foetal growth rate is 5 gm/day at 15 weeks, 15-20 gms at 24 weeks and 30-35 gms at 34 weeks.

In early foetal life the major determinant of growth is foetal genome, but later in pregnancy environmental, nutritional and hormonal influences become increasingly important. There is a considerable evidence that insulin like growth factors and insulin (c-peptide) concentrations have a role in the regulation of foetal birth weight. Insulin like growth factors and insulin levels were measured throughout gestation in women without diabetes and it was found that levels correlated with birth weight. The insulin like growth factors, structurally proinsulin like peptide are produced by virtually by all foetal organs from early development and are potent stimulators of cell division and differentiation. Insulin like growth factor 1 and 2 and foetal insulin in umbilical circulation are all related to foetal growth and weight gain, but IGF-1 correlates best birth weight. Insulin is mainly related to foetal overgrowth (macrosomia) while IGF binding protein may be a growth inhibitor (47). Foetal fat deposition represents approximately 90% of calorie accretion at term. The quantity of foetal adipose tissue is the cause of incorrect estimation of weight by ultrasonography. Neonatal fat mass constitutes only 12-14 % of birth weight it explains 46% of its variance (22). Foetal fat deposition in the extremities was found to be characterised by an exponential increase when plotted against gestational age (56). Since the discovery of the obesity gene and its protein product leptin, which is synthesised in adipose tissue there has been an interest in leptin levels in maternal and umbilical circulation. Foetal levels increase during the first two trimester and they correlate with birth weight.

Indirect Estimation

All currently available techniques have a significant degree of inaccuracy. The vast number of articles published on the topic point that no currently available tool is precise. A good estimate will help to screen high risk cases and timely perinatal management may reduce morbidity and mortality. Foetal weight is not directly proportional to foetal volume. Ultrasounds methods do not estimate foetal weight directly rather they do so indirectly by measuring the various segments of the body. Two dimensional ultrasonography is routinely used for the purpose, and the estimated foetal weight is calculated using appropriate tables or integrated computer programmes. The most frequently used parameters include the biparietal diameter, abdominal circumference and femur length. There is a cumulative error inherent in each of the foetal dimensions measured. Then, there is acoustic shadowing at extreme ends of diaphysis. A single formula is not capable of covering the entire range of foetal weight (22). Weight of smaller foetus tends to be overestimated while that of large foetus tends to be under estimated. The potential errors of measurement of each dimension add to the error when the values are put in a formula. So increasing the individual dimensions to be measured will only increase the error in the estimated foetal weight. Using three dimensional ultrasonography reproducible measurements of circumference and volume have become possible through simultaneous visualisation of three orthogonal foetal limb sections. This technique has the advantage of obtaining limb circumference measurements at the exact midpoints.

Advantage of MRI

Foetal volumetric measurements have also become a field of interest for magnetic resonance imaging. There is use of fast acquisition management protocols, including echoplaner MRI and T1 weighted and T2 weighted imaging for foetal volume calculation. Foetal volume can be calculated either using the Cavalieri principal or semi automatically with special software. None of the programmes available allow fully automatic volume assessment. For weight calculation; foetal volume is multiplied by foetal density although the exact value for the latter is not known. A recent concept is to MRI segment the foetal body into various compartments of different tissue consistency (56). Volume of each segment can be multiplied with specific tissue density of each segment. The weights of each segment can be added to derive the total birth weight.

To Sum up

Clinical assessment of foetal weight is extensively used because it is both convenient and virtually costless. However, it is less accurate for an obese gravida and cases of polyhydramnios. There is significant inter observer variation. But interestingly both nature (the inherent growth potential of the baby) and nurture (the nutritional status of the mother) are concurrently measured (47). The resultant estimates are closest to the actual birth weight as pointed out by several prospective studies. This study aims at resolving these controversies by determining the most accurate method of foetal weight estimation of the three available in our institute. We have made an attempt in standardising the methods of estimation and achieving the best estimated foetal weight.

Foetal macrosomia and intrauterine growth restriction has to be detected prenatally to reduce perinatal mortality and morbidity in term of long term neurological and developmental disorders (10). Intrauterine growth restriction after 37 weeks is an indication of immediate delivery. A diagnosis of macrosomia helps us to do a timely lower segment caesarean section and reduce the risk of macrosomia. The aim of our study was to reduce the perinatal morbidity by devising a protocol where we measure the biacromial diameter if the estimated foetal weight is two standard deviation above the mean. A Doppler study of umbilical artery should be added if estimated foetal weight is less than two standard deviation below the mean. This requires accurate assessment of foetal weight prenatally.

As foetal weight cannot be measured directly it has to be estimated from foetal and maternal anatomic and biochemical characteristics. Ultrasound only measures foetal characteristics. Interestingly, while intrauterine growth retarded babies have a compromised blood flow, macrosomic foetus do not have an increased uteroplacental blood flow. For, similar birth weight babies fat deposition is more in the foetus of diabetic mothers (47). The higher birth weight baby is an issue of abnormal content with preferential central fat deposition (56). Large foetus with truncal obesity should be differentiated from symmetrically large foetus. So an objective assessment of humeral soft tissue thickness and abdominal circumference should be measured and reported while estimating birth weight of higher orders (56). Clinical estimation is as accurate routine ultrasonographic estimation in average birth weight is emphasised by other authors as well (57).

All currently available techniques have a significant degree of inaccuracy. A vast number of articles published on the topic point that no currently available tool is precise.

IV. LEARNING POINTS

- Foetal growth is complex with biophysical and biochemical dimensions.
- Clinical estimates of birth weight are more precise than ultrasound estimations as they measure the growth potential of the foetus and nutritional status of mother collectively.
- Ultrasound formula measurements can be inaccurate as they are not representative of the genetic background and acoustic shadowing inhibits anatomical vision.
- Ultrasound Doppler can be used to measure umbilical artery vascular indices in cases of intrauterine growth restriction.
- 3-D ultrasound and MRI should be reserved for detecting central and peripheral fat deposition in macrosomic foetus.

V. COMPETING INTERESTS

We do not have any commercial association that might pose a conflict of interest in connection with the manuscript. We certify that neither this manuscript nor one with substantially similar content under our authorship has been published or is being considered for publication elsewhere.

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REFERENCES

- [1] Sherman DJ, Arieli S, Tovbin J, Siegal G, Caspi E, Bukovsky A. A comparison of clinical and ultrasound estimation of fetal weight. *Obstet Gynaecol* 1998; 91:212-7.
- [2] Chauhan SP, Hendrix NW, Magann EF, Morrison JC, Jenney SP, Devoe LD. Limitations of clinical and sonographic estimation of birth weight: experience with 1034 parturients. *Obstet Gynecol* 1998;91:72-7.
- [3] Nzeh DA, Oyawoye O, Adetoro OO. Ultrasound estimation of birth weight in late pregnancy among African women. *West African J ultrasound* 2000; 1:9-14.
- [4] Hanretty KP, Neilson JP, Fleming EE. Re-evaluation of clinical estimation of fetal weight: a comparison with ultrasound. *J Obstet Gynaecol* 1990; 10:199-201.
- [5] Hendrix NW, Grady CS, Chauhan SP. Clinical versus sonographic estimates of birth weight in term parturients. A randomized clinical trial. *J Reprod Med* 2000; 45:317-22.
- [6] Raman S, Urquhart R, Yusof M. Clinical versus ultrasound estimation of fetal weight. *Aust N Z J Obstet Gynaecol* 1992; 32:196-9.
- [7] Watson WJ, Soissons AP, Harlass FE. Estimated weight of the term fetus. Accuracy of ultrasound vs. clinical examination. *J Reprod Med* 1988; 33:369-711.
- [8] Dawn CS, Modale GC, Galosh A. A simple procedure for determination of antenatal fetal weight. *J Obstet gynocol* 1983; 33:133-7.
- [9] Tiwari R, Sood M. Comparative study of various methods of fetal weight estimation at term pregnancy. *J Obstet Gynaecol* 1989; 39:279-86.
- [10] Nahum G. Estimation of fetal weight-a review article last updated on 11 July 2002 (<http://www.emedicine.com>)
- [11] Mhaskar R ,Mhaskar A, Molly SR. Symphysiofundal height (SFH) measurement for prediction of birth weight-A new formula. *J obstet Gynaecol Ind* 2001; 51:73-6
- [12] Mehdizadeh A, Alaghebandan R, Horsan H. Comparison of clinical versus ultrasound estimation of fetal weight. *Am J Perinatol* 2000; 17:233-6.
- [13] Wilcox AJ, Skjaerven R. Birth weight and perinatal mortality: the effect of gestational age. *Am J public health* 1992; 82:378-82.
- [14] Cecatti JG, Machado MR, Dos santos FF, Marussi EF. [curve of normal fetal weight values estimated by ultrasound according to gestational age]. *Cad Saude Publica Brazil* 2000; 16:1083-90.
- [15] Johar R, Rayburn W, Weir D, Eggert I. Birth weight in term infants. A 50-year prospective. *J Reprod Med*1988; 33:813-6.
- [16] Hulsey TC, Levkoff AH, Alexander GR. Birth weights of infants of black and white mothers without pregnancy complications. *Am J Obstet gynocol* 1991; 164(pt 1):1299-302.
- [17] Richards M, Hardy R, Kuh D, Wadsworth ME. Birth weight and cognitive function in british 1946 cohort. Longitudinal population based study. *BMJ* 2001; 322:199-203.
- [18] Hadlock FP, Harrist RB, Sharman RS, Deter RL, Park SK. Estimation of fetal weight with the use of head, body and femur measurements-a prospective study. *Am J Obstet gynaecol* 1985; 151:33-7.
- [19] Ebomoyi E, Adetoro OO, Wickremasinghe AR. Birth weight and sociological factors in lorin, Nigeria. *J Bio Soc* 1991; 23:417-23.
- [20] Ojwang S, Ouko BC. Prediction of fetal weights in utero by fundal height/girth measurements. *J Obstet Gynecol East Central Afr* 1984; 3:111.
- [21] Dare FO, Ademowore AS, Ifaturoti OO, Nganwuchu A. The value of symphysiofundal height/abdominal girth measurement in predicting fetal weight. *Int J gynaecol Obstet* 1990; 31:243-8.
- [22] Schild RL, Fimmers R, Hansmann M. Fetal weight estimation by three-dimensional ultrasound. *Ultrasound Obstet Gynaecol (England)* 2000; 16:445-52.
- [23] Benacerraf BR, Gelman R, Frigoletto FD, Jr. Sonographically estimated fetal weight: accuracy and limitation. *Am J Obstet Gynecol* 1988; 159:1118-21.
- [24] Chauhan SP, Lutton PM, Bailey KJ, Guerrieri JP, Morrison JC. Intrapartum clinical, sonographic, and parous patients' estimates of newborn birth weight. *Obstet Gynecol* 1992; 79:956-8.
- [25] Nzeb DA, Rimmars S, More WMO, Hunt I. Prediction of birth weight by fetal ultrasound biometry. *Br J Radiol* 1992; 66:987-9.
- [26] Ratanasiri T, Jirapornkul S, Sombooporn W, Seejorn K, Patumnakul P. Comparison of the accuracy of ultrasonic fetal weight estimation by using the various equations. *J Med Assoc Thai* 2002; 85:962-7.
- [27] Bossak WS, Spellacy WN. Accuracy of estimating fetal weight by abdominal palpation. *J Reprod Med* 1972; 9:58-60.
- [28] Lawn J. E, Cousens S and Zupan J. Four Million neonatal deaths: When? Where? Why? *Lancet* 2005; 365:891-900
- [29] Banin JD, Gussman D, Stone P. Clinical and patient estimation of fetal weight vs. ultrasound estimation. *J Reprod Med* 2002; 47:194-8.
- [30] Nahum GG, Stanislaw H, Huffakar BJ. Accurate prediction term birth-weight from prospectively measurable maternal characteristics. *J Reprod Med* 1999; 44:705-12.
- [31] Pernoll ML, Taylor CM. Normal pregnancy and perinatal care. In: DeCherney AH, Pernoll ML, editors. *Current obstetrics and gynaecologic diagnosis & treatment*. 8th ed. Connecticut: Appleton and Lange,1994:183-7.
- [32] Abramowicz JS, Sherer DM, Bar-Tov E, Woods JR,jr. The cheek-to-cheek diameter in ultrasonographic assessment of fetal growth. *Am J Obstet Gynaecol* 1991; 165(pt 1):846-52.
- [33] Abramson JH, Gahlinger M. *Computer Programme for Epidemiologist (PEPI) version 3.10*. Ilanidloes: Brixton Books, 1999.

- [34] Titapant V, Chawanpaiboon S, Mingmitpatanakul K. A comparison of clinical and ultrasound estimation of fetal weight. *J Med Assoc Thai* 2001;84:1251-7.
- [35] Shamley KT, Landon MB. Accuracy and modifying factors for ultrasonographic determination of fetal weight at term. *Obstet Gynecol* 1994;88:926-30.
- [36] Johnstone FD, Prescott RJ, Steel JM, Mao JH, Chambers S, Muir N. Clinical and ultrasound prediction of macrosomia in diabetic pregnancy. *Br J Obstet Gynaecol* 1996; 103:747-54.
- [37] Campbells, Wilkin D. ultrasonic measurement of foetal abdominal circumference in the estimation of fetal weight. *Br J Obstet Gynaecol* 1975; 82:689-97.
- [38] Combs CA, Jaekle RK, Rosenn B, Pope M, Miodovnik M, Siddiqi TA. Sonographic estimation of fetal weight based on a model of fetal volume. *Obstet Gynecol* 1993; 82:365-70.
- [39] Ott WJ, Doyle S, Flamm S, Wittman J. accurate ultrasonic estimation of fetal weight. Prospective analysis of new ultrasonic formulas. *A m J Perinatol* 1986;3:307-10.
- [40] Warsof SL, Wolf P, Coulehan J, Queenan JT. Comparison of fetal weight estimation formulas with and without head measurements. *Obstet Gynecol* 1986;67:569-73
- [41] Shepard MJ, Richards VA, Berkowitz RL, Warsof SL, Hobbins JC. An evaluation of two equations for predicting fetal weight by ultrasound. *Am J Obstet Gynecol* 1982; 142:47-54.
- [42] Deter RL, Hadlock FP. Use of ultrasound in the detection of macrosomia: a review. *J Clin Ultrasound* 1985;13:519
- [43] Richards M, Hardy R, Kuh D, Wadsworth ME. Birth weight and cognitive function in the British 1946 birth cohort: longitudinal population-based study. *BMJ* 2001; 322:199-203.
- [44] Susuki K, Minei LJ, Schintzer LE. Ultrasonographic measurement of foetal heart volume for estimation of birth weight. *Obstet Gynecol* 1974; 43:867-71.
- [45] Poulos PP, Langstadt JR. The volume of the uterus during labor and its correlation with birth weight. I. A method for the prediction of birth weight. *Am J Obstet Gynecol* 1953; 65:233-44.
- [46] Wikstrom I, Bergstrom R, Bakketaig L. Prediction of high birth weight from internal characteristics, symphysis-fundal health and ultrasound biometry. *Gynaecol Obstet Invest* 1993;35:27-33.
- [47] Williams Obstetrics 21st edition. Chapter 29. Fetal growth disorders Pg 743-760.
- [48] Bhandary Amritha A, Pinto Palric J, Shetty Ashwin P. Comparitive study of various methods of foetal weight estimation at term pregnancy. *Ind J Obstet Gynaecol* 2004; 54:336-339.
- [49] Duncan KR, Issa B, Moore R, Baker PN, Johnson IR, Gowland PA. A comparison of foetal organ measurements by echoplanar magnetic resonance imaging and ultrasound. *BJOG* 2005; 112:43-49.
- [50] Gong QY, Roberts N, Garden AS, Whitehouse GH. Fetal and fetal brain volume estimation in the third trimester of human pregnancy using gradient echo MR imaging. *Magn Reson Imaging* 1998; 16:235-240.
- [51] Hassibi S, Farhataziz N, Zartsky M, McIntire D, Twickler DM. Optimisation of fetal weight estimates using MRI: comparison of acquisitions. *AJR Am J Roentgenol* 2004; 183:487-492.
- [52] Kubik-Huch RA, Wildermuth S, Cettuzzi L, Rake A, Seifert B, Chaoui R, Marincek B. Fetus and uteroplacental unit: fast MR imaging with three-dimensional reconstruction and volumetry—feasibility study. *Radiology* 2001; 219:567-573.
- [53] Uotila J, Dastidar P, Heinonen T, Ryymin P, Punnonen R, Laasonen E. Magnetic resonance imaging compared to ultrasonography in fetal weight and volume estimation in diabetic and normal pregnancy. *Acta Obstet Gynecol Scand* 2000; 79:255-259.
- [54] Zartsky MV, Reichel TF, McIntire DD, Twickler DM. Comparison of magnetic resonance imaging to ultrasound in the estimation of birth weight at term. *Am J Obstet Gynecol* 2003; 189: 1017-1020
- [55] Baker PN, Johnson IR, Gowland PA, Hykin J, Adams V, Mansfield P, Worthington BS. Measurement of foetal liver, brain and placental volumes with echo-planar magnetic resonance imaging. *Br J Obstet Gynaecol* 1995; 102:35-39.
- [56] R.L. Shield. Three dimensional volumetry and fetal weight measurement. *Ultrasound Obstet gynaecol* 2007; 30: 799-803
- [57] Akinola S. Shittu, Oluwafemi Kuti, Earnest O. Orji, Niyi O. Makinde, Solomon O, Ogunniyi, Oluwagbemiga O. Ayoola. Clinical versus sonographic estimation of foetal weight in South west Nigeria. *J Health Popul Nutr* 2007 Mar; 25(1):14-23

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A Study on the impact of nutrition education programme conducted for adolescent girls and parents of Changanacherry Taluk of Kottayam district

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Abstract- The present study was conducted to assess the nutritional knowledge of the adolescent girls participating in the nutritional awareness programme in Anganwadis of Changanacherry Taluk of Kottayam district and to educate the girls and parents about the importance and the ways to achieve optimum nutrition during adolescence. Data on the dietary pattern and anthropometric assessments like height and weight were collected using a pre-structured interview schedule. It is clear from the results that majority of the subjects were assessed to have either poor or fair levels of awareness about the importance of nutrition. Hence during nutrition education, emphasis was given to the dietary guidelines during adolescence as diet influences the future nutritional status.

Index Terms- Nutrition education, Adolescence, Dietary guidelines, Anthropometric assessment, Growth spurt and growth velocity

I. INTRODUCTION

Adolescence is the period of transition from childhood to adulthood with accelerated physical, mental and emotional development (Srilakshmi, 2002). During this period, the final growth spurt occurs. There are many body changes occur due to the influence of hormones and with profound growth there is increased demands for energy, proteins, minerals and vitamins. The process of maturation becomes rapid from the puberty stage, that is from 11 to 13 years (Easwaran and Poorani, 1991). To strengthen any nation, there is need of healthy mothers as they only can produce healthy citizens (Elizebeth, 2000).

According to the Society for Nutrition Education and Behavior, nutrition education is any combination of educational strategies, accompanied by environmental supports, designed to facilitate voluntary adoptions of food choices and other food and nutrition related behaviors conducive to health and well being. Nutrition education is delivered through multiple venues and involves activities at the individual, community and policy levels (Jones and Bartlett, 2007). The importance of nutrition education as a means for improving the nutrition of the community in the developing countries, has been increasingly realized during recent years.

Anganwadis functions under the Integrated Child Development Service programmes conducted basic health-care activities which include contraceptive counseling and supply, nutrition education and supplementation, as well as pre-school activities (National Population Policy, 2008). Studies have

documented the high prevalence of unhealthy dietary behaviors among adolescent girls (Felts et al., 1996). Hence nutrition education was given to both girls and parents to increase the awareness regarding the role of diet and to find out the effectiveness of nutrition education.

II. MATERIALS AND METHODS

30 Adolescent girls (12 to 16 years) and parents were selected purposively from Anganwadis as a part of execution of Kishori Shakti Yojana {KSY} under Ministry of Women and Child Development. The area selected was the Anganwadis of Changanacherry Taluk of Kottayam district. Anthropometric measurements like weight and height, data on socio economic status and dietary assessment were done using a prestructured interview schedule. Nutrition education was given using developed pamphlet and charts showing the necessary dietary guidelines and importance of nutrition during adolescence. To find out the effectiveness of nutrition education, a simple questionnaire was distributed among the subjects to answer, before and after nutrition education. The parents were also oriented regarding the physiological and mental changes during adolescence.

The nutrition education was done using colourful charts and pamphlets and the class was very simple for the subjects to understand. The content of the class was as follows:

- 1 Growth velocity is maximum for girls between 10 to 13 years
- 2 Adequate well balanced nutritious foods should be taken to prevent under nutrition or obesity.
- 3 No meal of the day should be missed, especially breakfast which is regarded as the 'food for brain'
- 4 Calorie and protein rich foods should be taken to support the growth spurt
- 5 The girls need to ensure adequate intake of iron as they lose 0.5mg/day by way of menstruation (if this lost iron is not replaced, it predisposes to iron deficiency anemia)
- 6 Bone growth during adolescence demands more calcium as the deficiency causes susceptibility for osteoporosis later in their life
- 7 Include fruits and vegetables in the diet to meet the vitamins, minerals and fibre requirements
- 8 Home based diets are best for children's growth
- 9 Avoid foods which use unpermitted colours or flavours
- 10 Avoid empty calorie foods such as carbonated beverages

- 11 Parents should encourage the adolescents to cook at home, nutritious and tasty food
- 12 Adolescents need to be encouraged to do physical activities as it regulates appetite

III. RESULT AND DISCUSSION

From the height and weight taken, BMI (Body Mass Index) was measured According to Visweswara Rao (1999), BMI is one of the best set of indices found useful for nutritional status of adolescents.

TABLE I
BMI of the subjects

N=30

BMI	Grade/Diagnosis	Number	percentage
<18.5	Undernourished	14	47
18.5-25	Normal	15	50
25-30	Overweight	1	3
>30	Obese	-	-
Total		30	100

Table- 1 clearly depicts that 50% of the subjects belonged to normal weight category, 47% were under nourished and only 3% overweight. That is proper nutrition or nutritional awareness is still lacking among certain groups

Most of the subjects were non vegetarians (80%), 11% ovovegetarians and 9% pisovegetarians. No subjects had the habit of regular outside food consumption. Mean nutrient intake of samples shows that there is a deficit intake in case of vitamin C and Iron by -13 and -8.33 respectively. Most of the subjects

Source: NIN, Hyderabad

had the habit of skipping meals especially breakfast (89%). Anaemia was prevalent in a small number of subjects; the requirement for iron is higher in adolescent girls than boys' to combat the menstrual loss. So the importance of the inclusion of locally available iron rich foods like green leafy vegetables was emphasized during lectures.

Table-II
Details on the socioeconomic status of the subjects

Criteria	Number	Percentage
A) Religion		
Hindu	17	56
Christian	13	40
Muslim	1	4
Total	30	100
B) Type of family		
Joint	6	20
Nuclear	24	80
Total	30	100

N=30

Table I clearly depicts the socioeconomic status of the target group. Majority of the subjects selected were Hindus (56 per cent) and (40 per cent) were Christians and only 4 per cent were Muslims. Of the 30 subjects, 80 per cent came from nuclear family, while only 20 per cent were from joint family. Only 17

percent from middle income families with family income of Rs.4500-7500 per month. Nobody belonged to high income families, 30 percent from low income families and 53 percent had a family income of less than Rs.2100, which is, below poverty line as per HUDCO classification, 2002

TABLE III

Details of the marks obtained by the subjects for the distributed questionnaire

N=30

Marks Obtained	Before nutrition education		After nutrition education	
	Number of subjects	%	Number of subjects	%
0-5	22	73	-	-
5-10	7	23	2	7
10-15	1	4	18	60
15-20	-	-	10	33
Total	30	100	30	100

The table clearly shows that the nutrition education was very much effective for the subjects to increase their nutritional awareness and to make necessary dietary modifications during adolescence. For the questionnaire distributed among the subjects, 73 per cent of the subjects had only 0-5 marks before nutrition education, and after the classes no one belonged to this category. Only four per cent got 10-15 marks and none had 15-20 marks before nutrition education, which is replaced by 60 and 33 per cent respectively.

To find out whether there is statistical significance in the increase in nutritional awareness after nutrition education, t-test has been applied. Since the calculated t-value is (10.80) greater than the table value (2.58 which is significant at 0.01 level) there exist significant difference between the groups which means the effect of nutrition education on the adolescent girls and parents was statistically significant. That is, the nutrition education was effective in elevating the nutritional knowledge of the subjects.

IV. CONCLUSION

The nutrition education programme was reached the real beneficiaries as most of the Indian women and girl's diet is lacking in many nutrients and having low haemoglobin levels (Greger and Divilabiss, 1979 and Jondhale et al., 1999). So the nutrition education was given to adolescent girls and parents regarding the importance of nutrition, well balanced diet, calcium and iron rich foods, break fast and exercise. Diet in adolescence is very crucial because it influences the future nutritional status. So it is important to conduct awareness programmes on food choices and nutritional requirements on a regular basis especially among low income groups.

REFERENCES

[1] Easwaran PP and Poorani R, The Indian Journal of Nutrition and Dietetics, 1991, 28, p.207-213
 [2] Elizabeth B M, Developmental Psychology: a lifespan approach, 5th ed., Tata McGraw Hill, 2000
 [3] Felts MW, Parillo A, Chenier T, Dunn P. Adolescent's Perceptions of relative weight and self-reported weight loss activities :Analysis of YRBS National data. Journal of Adolescent health, 1996; 18:20-

[4] Greger J L and Divilabiss L ,Indian Journal of Ecology of Food and Nutrition, 1979, no.4, p.213-218 Nutrition Education: Linking search, theory and practice, Jones and Bartlett, 2007
 [5] Sri lakshmi. B, Dietetics New Age International (P) Limited, 5th ed., 2006.
 [6] Visweswara Rao. K, Bio statistics, Jaypee brothers, Medical publishers (P) Ltd, New delhi.

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Analysis on big data over the years

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Abstract- Big Data is characterized by increasing volume and velocity of data. IBM estimates that every day 2.5 quintillion bytes of data are created – so much that 90% of the data in the world today has been created in the last two years. The traditional data-intensive sciences such as astronomy, high energy physics, meteorology, genomics, biological and environmental research in which peta- and Exabyte of data are generated are common domain examples. Here even the capture and storage of the data is a challenge. Google implemented hundreds of special-purpose computations that process large amounts of raw data, such as crawled documents, Web request logs, etc., to compute various kinds of derived data, such as inverted indices, various representations of the graph structure of Web documents, summaries of the number of pages crawled per host, and the set of most frequent queries in a given day. In this paper big data that is navigating in years from the past to present and to the future is analyzed. To address the problem space of unstructured analytics, Map Reduce with Hadoop distributed File System (HDFS) is also discussed. To process terabytes of data efficiently on daily basis some of tools and techniques available and challenges, issues and benefits of big data is also listed.

Index Terms- Hadoop Distributed File System (HDFS), MapReduce, NoSQL, NLP, Big Data, Name Node (NN)

I. INTRODUCTION

The amount of Digital data being produced, in real time, has been exploding at an unknown rate, even across the developing world, just as we all go about our daily lives. Today, 98 percent of all stored data is in digital form whereas storing in paper goes hand in hand along with digital form some 15 years before. The size of the databases has been growing at exponential rates in today's enterprises. The need to process and analyze these large volumes of data for decision making in businesses has also increased along with it. There is also a need to process petabytes of data in efficient manner on daily basis in several business and scientific applications.

The interactions of billions of people using mobile devices and Internet every day, generates a flood of data. The increasing volume of enterprise information, genomics, medical records, information- sensing mobile devices, multimedia and social media will fuel exponential growth in data in the future. This has given rise to the big data problem due to the inability of conventional database systems and software tools to manage or process the big data sets within tolerable time limits by the industries.

The International Data Corporation (IDC) study predicts that overall data will grow by 50 times by 2020, driven in large part more by embedded systems such as sensors in clothing, medical devices and structures like buildings and bridges. This study also determined that unstructured information - such as files, email and video - will account for 90% of all data created over the next decade^[12].

Analyzing and making intelligent decision out of these large data sets comprising of unstructured, semi structured and structured big data—will become a key basis of competition in business and technology.

II. BIG DATA –WHAT AND WHY?

Big data is a term that came from the need of big companies like yahoo, google, Facebook, Etc. and in many enterprises and R&D to analyze big amounts of unstructured data they are generating every second.

Big Data, in general, falls into 3 categories:

- Business application data (e.g. CRM, SAP or Oracle ERP)
- Human-generated content (e.g., Internet text, social media traffic etc.) and
- Machine data (e.g., M2M, RFID, Log Files, sensors etc.).

The most common definition for big data which is used by many others is “Big data refers to the large data sets which are very difficult to store, analyze and manage due to their size as well as complexity. Their size ranges from thousands of terabytes to peta-, and exa- bytes.”^[10]

A. Big Data Characteristics

The most common characteristics of big data arises from 3v's by Gartner namely

- Volume – The size of data is very large and in terabytes and petabytes.
- Velocity –The pace at which data flows in from sources. The time plays a key role. The reasons for data getting generated faster includes,
 - a. Increasingly automated processes
 - b. Increasingly interconnected systems
 - c. Increasing social interaction by people
- Variety –It includes structured,semi-structured and unstructured data of all varieties: text, audio, video, posts, log files etc

In addition many papers propose new v’s other than the above 3v’s by Gartner to characterize big data. They are,

- Veracity –It refers to the biases, noise and abnormality in data. Is the data that is being stored, and mined meaningful to the problem being analyzed.
- Value –Measures the usefulness of data in making decisions. The purpose of computing is insight and not numbers

B.Big data Trends

"Information is one of the four powerful forces changing the way business is done," said Regina Casonato, managing vice president at Gartner, Inc. and they have identified Big data as one of the top technology trends that will play key roles in modernizing information management (IM) in 2013 and beyond.

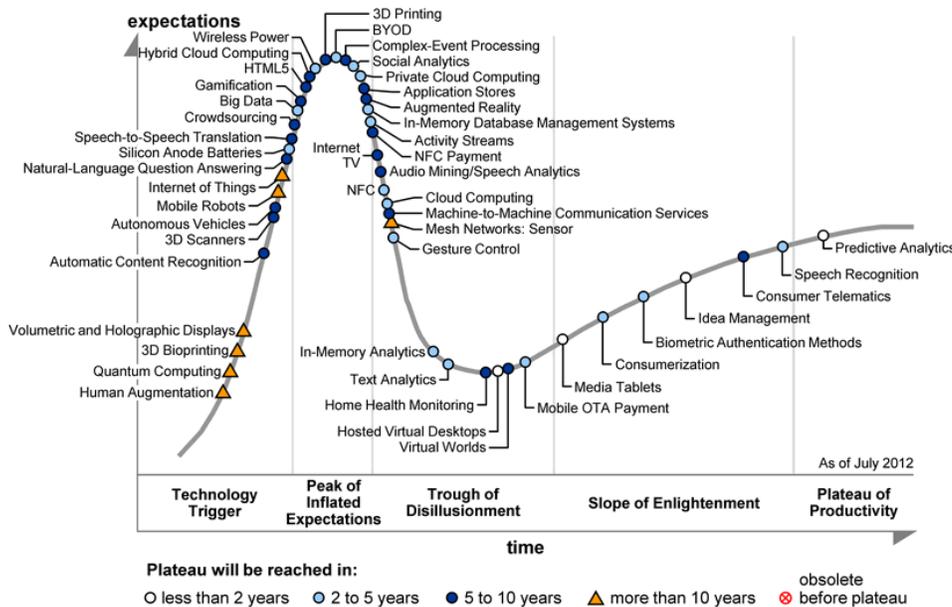


Figure 1: Gartner Hype cycle^[11]

III. EVOLUTION OF BIG DATA

1944
 1956

Wesleyan University Librarian estimated and published in a book "The Scholar and the Future of the Research"^[11] that American university libraries were doubling in size every sixteen years

FICO, then called Fair, Isaac, and Company, a leading provider of credit scoring, decision management, fraud detection and credit risk score services was founded which works on the principle that data, used intelligently, can improve business decisions.

1958 ————— FICO builds its first credit scoring system for American Investments.

1961 ————— Derek Price publishes "Science since Babylon", in which he charts the growth of scientific knowledge by looking at the growth(doubling every fifteen years) inthe number of scientific journals and papers. Price calls this the "law of exponential increase," explaining that "each [scientific] advance generates a newseries of advances at a reasonably constant birth rate, so that the number of births is strictly proportional to the size of the population of discoveries at any given time."

1967 ————— B. A. Marron and P. A. D. de Maine publish "Automatic data compression" in the Communications of the ACM, stating that"The 'information explosion' noted in recent years makes it essential that storage requirements for all information be kept to a minimum." The paper describes"a fully automatic and rapid three-part compressor which can be used with 'any' body of information to greatly reduce slow external storage requirements and to increase the rate of information transmission through a computer."

1971 ————— Arthur Miller writes in "The Assault on Privacy"^[1] that "Too many information handlers seem to measure a man by the number of bits of storage capacity his dossier will occupy."

1975 ————— The Ministry of Posts and Telecommunications in Japan starts conducting the Information Flow Census, tracking the volume of information ("amount of words" as the unifying unit of measurement) circulating in Japan. The 1975 censusalready finds that information supply is increasing much faster than information consumptionand in 1978 it reports that "the demand for information provided by mass media, which are one-way communication, has become stagnant, and the demand for information provided by personal telecommunications media, which are characterized by two-way communications, has drastically increased. Our society is moving toward a new stage... in which more priority is placed on segmented, more detailed information to meet individual needs, instead of conventional mass reproduced conformed information."

1980 ————— I.A. Tjomsland gives a talk titled "Where Do We Go From Here?"at the Fourth IEEE Symposium on Mass Storage Systems, in which he says"Those associatedwith storage devices long ago realized that Parkinson's First Law may be paraphrased to describe our industry—'Data expands to fill the space available' I believe that large amounts of data are being retained because users have no way of identifying obsolete data; the penalties for storing obsolete data are less apparent than are the penalties for discarding potentially useful data."

1980 ————— The CPG / Retail industry transitioned from bi-monthly audit data to scanner data changed the dynamics of the industry.

1981 ————— The Hungarian Central Statistics Office starts a research project to account for the country's information industries, including measuring information volume inbits.

1983 ————— Ithiel de Sola Pool publishes "Tracking the Flow of Information" in Science. Looking at growth trends in 17 major communications media from 1960 to 1977, heconcludes that "words made available to Americans (over the age of 10) through these media grew at a rate of 8.9 percent per year. In the period ofobservation, much of the growth in the flow of information was due to the growth in broadcasting.But toward the end of that period [1977] the situation was changing: point-to-point media were growing faster than broadcasting."

1986 ————— Hal B. Becker publishes "Can users really absorb data at today's rates? Tomorrow's?" in Data Communications.^[1] Becker estimates that "the recoding density achieved by Gutenberg was approximately 500 symbols (characters) per cubic inch—500 times the density of [4,000 B.C. Sumerian] clay tablets. By the year 2000, semiconductor random access memory should be storing 1.25×10^{11} bytes per cubic inch."

1996 ————— The world's leading online travel company which is a small division within Microsoft launched online travel booking site Expedia.com®, giving consumers a revolutionary new way to research and book travel
[October]

- 1996** ————— Digital storage becomes more cost-effective for storing data than paper according to R.J.T. Morris and B.J. Truskowski, in “The Evolution of Storage Systems,” IBM Systems Journal, July 1, 2003.
- 1997** ————— The first article in the ACM digital library to use the term “big data” was published. Michael Cox and David Ellsworth publish “Application controlled demand paging for out-of-core visualization”^[2] in the Proceedings of the IEEE 8th conference on Visualization. They start the article with “Visualization provides an interesting challenge for computer systems: data sets are generally quite large, taxing the capacities of main memory, local disk, and even remote disk. We call this the problem of big data.”
- [October]**
- 1997** ————— Michael Lesk publishes “How much information is there in the world?” Lesk concludes that “There may be a few thousand petabytes of information all told; and the production of tape and disk will reach that level by the year 2000. So in only a few years, (a) we will be able [to] save everything—no information will have to be thrown out, and (b) the typical piece of information will never be looked at by a human being.”
- [October]**
- 1998** ————— Most visited website in the world Google was founded. It has been estimated to run more than one million servers in data centers and to process over one billion search requests and about 24 petabytes of user-generated data each day.
- 1998** ————— John R. Masey, Chief Scientist at SGI, presents at a USENIX meeting a paper titled “Big Data... and the Next Wave of Infrastrass.”
- [April]**
- 1998** ————— K.G. Coffman and Andrew Odlyzko publish “The Size and Growth Rate of the Internet.” They conclude that “the growth rate of traffic on the public Internet, while lower than is often cited, is still about 100% per year, much higher than for traffic on other networks. Hence, if present growth trends continue, data traffic in the U. S. will overtake voice traffic around the year 2002 and will be dominated by the Internet.”
- [October]**
- 1999** ————— comScore, an American Internet analytics company providing marketing data and analytics to many of the world's largest enterprises, agencies, and publishers was founded.^[4]
- 1999** ————— Steve Bryson, David Kenwright, Michael Cox, David Ellsworth, and Robert Haimes publish “Visually exploring gigabyte data sets in real time” in the Communications of the ACM. It is the first CACM article to use the term “Big Data” (the title of one of the article’s sections is “Big Data for Scientific Visualization”). The article opens with the following statement: “Very powerful computers are a blessing to many fields of inquiry. They are also a curse; fast computations spew out massive amounts of data. . Richard W. Hamming, mathematician and pioneer computer scientist, pointed out, the purpose of computing is insight, not numbers.”
- [August]**
- 1999** ————— Bryson, Kenwright and Haimes join David Banks, Robert van Liere, and Sam Uselton on a panel titled “Automation or interaction: what’s best for big data?” at the IEEE 1999 conference on Visualization.
- [October]**
- 2000** ————— Peak of dot-com boom, also known as dot-com bubble, the Internet bubble and the information technology bubble.^[5]
- 2000** ————— Peter Lyman and Hal R. Varian at UC Berkeley publish “How Much Information?” It is the first comprehensive study to quantify, in computer storage terms, the total amount of new and original information (not counting copies) created in the world annually and stored in four physical media: paper, film, optical (CDs and DVDs), and magnetic. The study finds that in 1999, the world produced about 1.5 exabytes of unique information, or about 250 megabytes for every man, woman, and child on earth. It also finds that “a vast amount of unique information is created and stored by individuals” and that “not only is digital information production the largest in total, it is also the most rapidly growing.”
- [October]**
- 2001** ————— Paper on 3D Data management^[6] by Doug laney explaining about 3 v's.

2004	Facebook is a social networking service was launched. Google published a paper on MapReduce
2005	Apache Hadoop, an open-source software framework for storage and large scale processing of data-sets on clusters of commodity hardware, was created by Doug Cutting and Mike Cafarella.
2006 [July]	Twitter called as "the SMS of the Internet" an online social networking and microblogging service was launched.
2007	The first generation iPhone (smart phone from Apple inc) was released
2008	Facebook reaches 100M users.
2010	Special report on Data, data everywhere by "The Economist", EMC buys Greenplum, IBM buys Netezza
2011	Mckinsey report on big data, oracle buys endecoa, Hp buys vertica.
2012	Big Data becomes buzz word after Gartner prediction, Facebook user hits 1B
2013	Fast Data era, YouTube hits 1B users

V. SQL VS NOSQL

A big truth about big data in traditional databases: it's easier to get the data in than out. Database gets overloaded and "Time out error occurs on inserting into database". The trouble comes when we want to take that accumulated data, collected over months or years, and learn something from it—and naturally we want the answer in seconds or minutes. The pathologies of big data are primarily those of analysis. Traditional methods of database shard, scaling with queue, RDBMS-based dimensional modeling and cube-based OLAP (online analytical processing) turn out to be either too slow or too limited to support big data. SQL based databases are data warehouses and data marts where dimensional and normalized approaches of storing is done.

To solve several needs of big data a variety of "NoSQL (NOT ONLY SQL) databases have appeared.

1. For storing and managing unstructured data (non-relational data).
2. Focus on high-performance scalable data storage, and provide low-level access to a data management layer (data validity and integrity). Also called key-value stores, schema-free massive scaling on-demand Databases.
3. NOSQL databases^[8] separate data management and data storage.
4. Relaxes the consistency requirement. Relaxing consistency is often called eventual consistency.
5. Also has ACID properties and follows CAP theorem^[3] (consistency, availability and tolerance of network partition), customized replication, high availability and greater flexibility in storing heterogeneously structured data.

VI. BIG DATA TECHNIQUES AND TOOLS

Big data is spawning new tools that are mix of significant processing power, parallelism and statistical, machine learning, or pattern recognition techniques. A wide variety of techniques and technologies has been developed and adapted to aggregate, manipulate, analyze, and visualize big data includes massively parallel processing (MPP) databases, data mining, grids, distributed file systems, distributed databases, cloud computing platforms, the Internet, and scalable storage systems

- Natural Language Processing (NLP) techniques (Lexical/morphological analysis, Syntactic analysis, Semantic analysis) to extract information from unstructured data
- CBIR (Content-Based Image Retrieval) enable us to pave the way toward new accessibility for large-volume multimedia collections.
- Sentiment analysis uses semantic technologies
- SAP HANA
- Hadoop - reliable data storage and high-performance parallel data processing
- Cloud is extensible, flexible, scalable, elastic, self-healing, on-demand, etc. and provides the inexpensive hardware/software platform with all applications with lower capital cost requirements
- For streaming data it includes IBM's InfoSphere Streams and emerging Twitter's Storm, and Yahoo S4
- Using multi/many cores, wide SIMD and dynamic optimization of the applications requiring exascale computing
- IBM InfoSphere Big Insights

- WX2 kognitio Analytical Platform(fast and scalable in-memory analytic database)
- SAND Analytic Platform(columnar analytic database)
- IBM Infosphere Streams(analysis of massive volumes of streaming data in sub-millisecond)
- New parallel programming models and programming languages such as Map Reduce, Software Transactional Memory,Galois,CUDA,X10,Chapel,Fortress,POSIX Threads,C++ Thread Support Library,MPI,OpenMP,OpenCLTask Parallel Library, Threading Building Blocks, CilkPlus

VII. UNSTRUCTURED DATA ANALYSIS

A. Hadoop and Map Reduce

Hadoop is both a distributed file system (HDFS) modeled on GFS (2004), a distributed processing framework, using Map Reduce concepts and a distributed database called HBase. It is a framework for distributed computing and large datasets on a scale-out shared-nothing architecture to address processing of large unstructured data sets. It is open-source software, reliable and scalable. The principle here is “Moving computation is cheaper than Moving data”^[7]

HDFS (Hadoop Distributed File System):

- fault tolerance
- run on commodity hardware
- high throughput access
- store data across thousands of servers
- running work (Map/Reduce jobs) across those machines,
- running the work near the data
- Master/slave architecture.

B. HDFS System Architecture

- Hadoop cluster contains 1 MN (master node) and no of slaves or WN (worker nodes).
- MN consist of
 - a. Job tracker(JT)-schedules jobs across TT slaves
 - b. Task tracker(TT)- Runs tasks within job
 - c. Name node (NN) -contains metadata of DN,mapping of file blocks to DN(replication).
 - d. Data node(DN)(acts also as TT) -stores and serves blocks of data
 - e. Secondary NN (SNN) -snapshots of the name node's memory structures, preventing file system corruption and reducing loss of data.
- User data is stored in files.
- File is split into one or more blocks
- It stores each file as a sequence of blocks
- Blocks are stored in a set of Data Node
- Name Node determines the mapping of blocks to Data nodes.

C. Map Reduce Programming

- It is a Software framework introduced by Google in 2004
- Map step
 - a. Master nodes(MN) takes the input, partitions it up into smaller sub-problems and distributes it to worker nodes(WN)
 - b. Multi-level tree structure (WN distribute again) is used to sort.
 - c. WN passes answer to MN
- Reduce step
 - Merges answers to all sub-problems to form output.

VIII. BENEFITS AND CHALLENGES OF BIG DATA PROCESSING

Some bigger benefits that enterprises and organizations utilize includes,

- Making more informed decisions
- Increase productivity and reduce costs
- Increase transparency
- Improve citizen service and satisfaction for government
- Predicting trends
- Identify irregular patterns and activities that are often a sign of error or fraud

- Improve mission outcomes
- Ability to find, acquires, extract, manipulate, analyze, connect and visualize data with the tools of choice
- The capability of Hadoop for volumes to manage vast amounts of data, in or out of the Cloud, with validation and verification.
- Real-time monitoring and forecasting of events that impact either business performance or operation

Big data incurs management issue, transport issue, processing issue and storage issues. Some of the design and analytical challenges of big data include,

- Real time requirements
- Memory management
- Load balancing
- Support for Data Partitioning
- Latency-Throughput trade-off
- Multi-tenancy
- Data ownership
- Compliance & Security
- Data getting in is easier than getting it out
- Quality versus Quantity
- Need retrospective analysis due to expanding data
- Speed versus scale
- Distributed data and processing
- Turning straw into gold (processing large discrete data points into high valued data)
- Finding the needle in the haystack (finding key data among large)
- Need to address arising unpredicted effects due to data from diverse sources.

IX. CONCLUSION

The key skills in today's big data environments are data integration, triangulation, pattern recognition, predictive models and simulations. Big data has a lot to learn about projection, bias correction and sampling, which, when applied correctly, could yield even more important big data insight... In a study by Mc Kinsey Global Institute (MGI) firm calculated that U.S faces shortage of 140,000 to 190,000 people with analytical expertise and 1.5 million managers and analysts with skills to understand and make decisions based on analysis of Big Data^[9]. But while the big data issues are fixable, big research's issues are endemic. To be competitive, organizations will require new technology with clear implementation strategies, iterative test-and-learn environments and data science talent.

REFERENCES

- [1] <http://www.forbes.com/sites/gilpress/2013/05/09/a-very-short-history-of-big-data/>
- [2] <http://www.nasa.gov/assets/pdf/techreports/1997/nas-97-010.pdf>.
- [3] https://blogs.oracle.com/MAA/entry/the_cap_theorem_consistency_and
- [4] <http://en.wikipedia.org/wiki/ComScore>
- [5] http://en.wikipedia.org/wiki/Dot-com_bubble
- [6] <http://blogs.gartner.com/doug-laney/files/2012/01/ad949-3D-Data-Management-Controlling-Data-Volume-Velocity-and-Variety.pdf>
- [7] http://hadoop.apache.org/docs/stable1/hdfs_design.html
- [8] Deka Ganesh Chandra, Ravi Prakash and Swati Lamdharia "A Study on Cloud Database " in proc. Fourth Int'l Conference on Computational Intelligence and Communication Networks, 2012.
- [9] http://www.mckinsey.com/insights/business_technology/big_data_the_next_frontier_for_innovation
- [10] http://en.wikipedia.org/wiki/Big_data.
- [11] Gartner Hype Cycle 2012 , <http://www.gartner.com/id=2065716>
- [12] World's data will grow by 50X in next decade, IDC study predicts
http://www.computerworld.com/s/article/9217988/World_s_data_will_grow_by_50X_in_next_decade_IDC_study_predicts

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Heavy Metal (Pb, Cd, Zn, Cu, Cr and Fe) Content in Almeda Textile Industry Sludge, Northern Tigray, Ethiopia

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Abstract- The present study was carried out with specimens of sludge from Apex Weaving and Finishing Mills in Almeda Textile Industry, Northern Tigray, Ethiopia, to determine the concentration of heavy metals (Cd, Cr, Fe, Cu, Zn and Pb) in the sludge samples and an assessment was made with the heavy metal content in agricultural soil. Atomic Absorption Spectroscopy (AAS) method was employed for the analysis purpose. The mean concentrations of Cd, Cr, Fe, Cu, Zn and Pb in mg/kg were 1.13, 47.00, 16827, 290, 410, and 13 respectively. All the heavy metal concentrations except Pb and Cr in the sludge samples were higher than that of in agricultural soil. Finally, the study concluded that pre-treatment process for reducing the amount of heavy metal is mandatory before the sludge can be used as a soil conditioner or fertilizer in the agricultural soil.

Index Terms- Textile waste, contaminated soil, toxic trace metal, waste water management

I. INTRODUCTION

Agricultural soils normally contain low background levels of heavy metals. Contamination from industrial activities or byproducts can increase the natural levels of heavy metals in soil, creating a health hazard to people, livestock and plants. Fertilizers and other soil amendments also add small amounts of heavy metals to the soil, which can build up over time with repeated applications [1]. The actual toxicity of a heavy metal will be affected by soil texture, organic matter, and pH. The health effects of exposure to heavy metals depend on the amount and duration of exposure, i.e. the volume of contaminated soil or food consumed over time [2].

The final disposal of industrial sludge in Ethiopia has become a critical issue due to public concern and the limited availability of land. The most effective strategy is to reduce the quantity of sludge produced by various industrial processes. If this reduction is not feasible, then the reuse of sludge should be considered [3]. One of the biggest industries, Textile and dyeing, are now viewed as a major environmental threat in the industrial area of Ethiopia and they contribute huge amounts of sludge in wastewater treatment processes [4]. Although characteristics of sludge depend on the wastewater treatment process and sludge stabilization methods, it contains substantial amounts of toxic heavy metals [4, 5]. Another recent investigation reported that elevated levels of heavy metals in vegetables are found from the areas having long term uses of treated or untreated wastewater [6].

Heavy metals are very harmful because of their non-biodegradable nature, long biological half-lives and their potential to accumulate in different body parts [7-10]. Excessive accumulation of heavy metals in agricultural soils through wastewater irrigation may not only result in soil contamination, but also affect food quality and safety [11]. Some research also confirmed that heavy metals such as Cd, Pb, Cu, Zn and Ni have carcinogenic or toxic effects on human beings and environment [12-14].

The management of sludge is becoming increasingly difficult due to the presence of heavy metals [15]. It is now established that application of sludge into land can increase soil water-holding capacity, decrease soil bulk density, increase soil aeration and root penetrability and stimulate soil microorganism activity [16]. In addition, land utilization of sludge could represent a step forward to more sustainable farming practices and municipal waste management. Achieving this purpose it is pivotal to know the heavy metal content in textile sludge as without investigating toxic substances it is not feasible to use sludge as a soil conditioner or fertilizer in agricultural land.

II. MATERIALS AND METHODS

Sludge sample collection

The sludge samples were collected from Almeda Textile Industry, Northern Tigray, Ethiopia in first October, 2013. The collected samples were stored into separate plastic container and stored at ambient temperature prior to treatment. The sludge samples were homogenized by manual mixing, air-dried for 24 h, disaggregated using a pestle and mortar made by porcelain to pass through a 2 mm mesh sieve.

Digestion of Sample with Aqua-Regia

An aliquot of 0.200 g of powdered sludge of each sample was taken in a silica crucible (150 cm³). Then 1 M concentrated hydrochloric acid (9Cm³) was added followed by 1 M concentrated nitric acid (3cm³). The content of crucible was carefully heated in sandbath nearly to dryness in fumhood. After cooling the crucible at room temperature, deionized water was added to the sample and was filtrated through a filter paper (Whatman N0. 42). The filtrate was collected in the measuring flask and was preserved for the determination of Pb, Cd, Zn, Cu, Cr and Fe. All reagents used were Merk, Analytical grade (AR) including standard stock solutions of known concentrations of different heavy metals.

Heavy Metal Analysis

Heavy metals analysis was carried out using Varian AA240 FS Fast Sequential Atomic Absorption Spectrophotometry. The

AAS was calibrated for all the metals by running different concentrations of standard solutions. Average values of three replicates were taken for each determination. The detection limits for the selected heavy metals were 1.00 ppm.

III. RESULT AND DISCUSSION

The present study found that the average concentration of lead in the sludge samples was 13 mg kg⁻¹, Table 1. This result revealed that examined sludge samples contained relatively lower amount of Pb than that of agricultural soil. According the US Environmental Protection Agency (EPA) and NY Department of Environmental Conservation (NYSDEC) guidelines, threshold natural background of Pb in agricultural soil is 200 mg kg⁻¹ [1]. The average concentration of cadmium of the sludge samples was 1.13 mg kg⁻¹ in Table 1. The permissible level of Cd in agricultural soils set by US Environmental Protection Agency (EPA) and NY Department of Environmental Conservation (NYSDEC) is 0.43 mg kg⁻¹ [1]. Natural background level of Cd

in agricultural soil in China is ≤0.20 mg kg⁻¹ [17]. The values of Cd found in the present investigation were higher than those of above critical value set by the international guidelines and other researchers. In addition, some cadmium compounds are able to leach through soils to ground water. When cadmium compounds bind the sediments of rivers, they can be more easily bio-accumulated or re-dissolved when sediments are disturbed, such as during flooding. Therefore, the use of sludge as a soil conditioner or fertilizer in arable soils can cause severe pollution with Cd and the production of crops and vegetables may be at a risk whenever its concentration is above the permissible values. The maximum Zn value in light soil used in cultivation in India given by [18] was 100 mg kg⁻¹. The threshold natural background value of Zn in crop soils and paddy soils in China is ≤100 mg kg⁻¹. In Table 1, the concentration of Zn was found 410 mg kg⁻¹ in the sludge samples, which was higher than those of permissible levels given by different guidelines and nations.

Table 1: Comparison of heavy metal content (mg kg⁻¹) in soil

Heavy metals	Present study	Control (uncontaminated) soil sample	SEPA limit in China ^a
Pb	13	-	350
Cd	1.13	1.6	0.6
Zn	410	107	300
Cu	290	26.4	100
Cr	47	1.4	250
Fe	16827	11418	NA

NA: Not Available, ^a source: SEPA (1995)

Similarly, the Cu content in the sludge samples was 290 mg kg⁻¹ which was also extremely higher than that of in China (≤35 mg kg⁻¹) and India (20-30 mg kg⁻¹). Some well documented studies disclosed that heavy metals such as zinc (Zn) and copper (Cu) are the principal elements restricting the use of sludge for agricultural purposes [19-21].

The average concentration of chromium (Cr) in these samples was 47 mg kg⁻¹. The maximum content of Cr reported by [16] in soil used in cultivation was 100 mg kg⁻¹. Natural background of Cr in agricultural soils in China is ≤ 90 mg kg⁻¹. The Cr content in soils obtained from the present study was lower than the permissible levels recommended by the above sources.

Long term exposure of iron from the sludge into soils may contaminate it and change the soil structure and thus make it harmful for cultivation. The concentrations of Fe in agricultural soils in India varying from 289.3-338.5 mg kg⁻¹ dry weight [22]. The Fe content in soils obtained from the present study was 16827 mg kg⁻¹ which is higher than the permissible value described by above researcher.

IV. CONCLUSION

The concentrations of Cd, Zn, Cu and Fe in the sludge samples were exceed the safe limit set by SEPA limit in China whereas Pb and Cr found within the safe limit (Table 1). The present study failed to compare the results with Ethiopian

standard as the Department of Environment; Government of Ethiopia has not yet established any standard for heavy metal content in agricultural soil. Therefore, it is very necessary to establish a safe or standard limit for the concentration of heavy metal in sludge that can be used as a fertilizer as well as soil conditioner. The study also concluded that pre-treatment process for reducing the amount of heavy metal is mandatory before the sludge can be used as a soil conditioner or fertilizer in the agricultural soil.

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REFERENCES

- [1] Vern Grubinger and Don Ross, "Interpreting the results of soil tests for heavy metals", University of Vermont.
- [2] Mehari Muuz Weldemariam and Mulu Berhe Desta, "Distribution of trace metals in two commercially important fish species (Tilapia zilli and Oreochromis niloticus) sediment and water from lake Gudbahri, Eastern Tigray of Northern Ethiopia", Vol. 3, International Journal of Scientific and Research Publications, 2013, pp. 2250-3153.
- [3] Ab. Aziz Abdul Latiff, Ahmad armizi Abd. Karim, Ahmad Shukri Ahmad, "Phytoremediation of Metals in Industrial Sludge by Cyperus Kyllin ia-

- Rasi a, *Asystassia Intrusa* and *Scindapsus Pictus* Var *Ar yaeus* Plant Species," Vol. 4, International Journal of Integrated Engineering, 2012, pp.18.
- [4] Karim, M.M., A.K. Das and S.H. Lee, "Treatment of colored effluent of the textile industry in Bangladesh using zinc chloride treated indigenous activated carbons," Vol.576, Anal. Chimica. Acta., 2006, pp.37-42.
- Chen, Y., C. Wang and Z. Wang, "Residues and source identification of persistent organic pollutants in farmland soils irrigated by effluents from biological treatment plants," Vol.31, Environ. Int.,2005, pp. 778-783.
- [5] Singh, K.P., D. Mohan, S. Sinha and R. Dalwani, "Impact assessment of treated/untreated wastewater toxicants discharged by sewage treatment plants on health, agricultural and environmental quality in the wastewater disposal area," Vol.55, Chemosphere, 2004, pp. 227-255.
- [6] Sharma, R.K., M. Agrawal and F. Marshall, "Heavy metal contamination of soil and vegetables in suburban areas of Varansi," Vol.66, India. Ecotoxicol. Environ. Safety,2007, pp. 258-266.
- [7] Manaham, S.E., "Environmental Chemistry," 8th Edn., Boca Raton, Florida, Lewis Publisher, 2005, ISBN 1566706335.
- [8] Mehari Muuz Weldemariam, "Physico-Chemical Analysis of Gudbahri River Water of Wukro, Eastern Tigray, Ethiopia," Vol.3, International Journal of Scientific and Research Publications,2013.
- [9] Amhawold, M. Mehari* et al. "CHEMICAL COMPOSITION AND ANTIBACTERIAL ACTIVITY OF ESSENTIAL OIL OF LANTANA CAMARAL OF MEKELLE, ETHIOPIA," Vol.5, International Journal of Pharmacy & Technology, 2013, pp 5129-5135.
- [10] Mehari Muuz et al., "Chemical Composition and Antibacterial Activity of Essential Oil of *Mentha Longifolia* L of Mekelle, Ethiopia," Vol.1, Journal of Biological and Scientific Opinion, 2013.
- [11] Wilson, B. and F.B. Pyatt, "Heavy metal dispersion, persistence, and bioaccumulation around an ancient copper mine situated in Anglesey," Vol.66, UK. Ecotoxicol. Environ. Safety, 2007, pp.224-231.
- [12] Muchuweti et al., "Heavy metal content of vegetables irrigated with mixture of wastewater and sewage sludge in Zimbabwe: Implications for human health," Vol.112, Agric. Ecosyst. Environ., 2006, pp. 41-48.
- [13] Trichopoulos, D., "Epidemiology of Cancer", Lippincott Company, Philadelphia, 2001, pp: 231-258.
- [14] Turkdogan, M.K., et al., "Heavy metals in soil, vegetables and fruits in the endemic upper gastrointestinal cancer region of Turkey," Vol.13, Environ. Toxicol. Pharmacol., 2002, pp.175-179.
- [15] Kocasoy, G. and V. Sahin, "Heavy metal removal from industrial wastewater by clinoptilolite," Vol.42, J. Environ. Sci. Health Part A, 2007, pp. 2139-2146.
- [16] Zorpas, A.A., V.J. Inglezakis and M. Loizidou, "Heavy metals fractionation before, during and after composting of sewage sludge with natural zeolite," Vol.28, Waste Manage., 2008, pp.2054-2060.
- [17] Kvarnstrom, E., C Morel, J. Fardeau and J. Morel, "Changes in the phosphorus availability of a chemically precipitated urban sewage sludge as a result of different dewatering processes," Vol.18, Waste Manage., 2000, pp.249-258.
- [18] Wong, S.C., et al., "Heavy metals in agricultural soils of the pearl river delta, South China," Vol.119, Environ. Pollut., 2002, pp. 33-44.
- [19] Kabata-Pendias, A. and H. Pendias, "Trace Elements in Soils and Plants," 3rd Edn., CRC Press Inc., Boca Raton, FL., USA., 2000, pp. 431.
- [20] Su, D.C. and J.W.C. Wong, "Chemical speciation and phytoavailability of Zn, Cu, Ni and Cd in soil amended with fly ash-stabilized sewage sludge," Vol. 29, Environ. Int., 2003, pp.895-900.
- [21] Udom, B.E., et al., "Distributions of zinc, copper, cadmium and lead in a tropical ultisol after long-term disposal of sewage," Vol. 30, Environ. Int., 2004, pp.467-470.
- [22] Dai, J.Y., et al., "Heavy metals in the sewage sludge from six wastewater treatment plants in Beijing," Vol.66, China Chemosphere, 2007, pp.353-361.
- [23] Kisku, G.C., S.C. Barman and S.K. Bhargava, "Contamination of soil and plants with potentially toxic effluents irrigated with mixed industrial effluent and its impact on the environment," Vol.120, Water Air Soil Pollut.,2000, pp.121-137.

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Library and Information Services in College Library of Hisar: A User Survey

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Abstract- Knowledge about the users and their demands is necessary to make library and information services more effective and user oriented. The present study deals with users attitude towards information sources and information services in the library of F.C.College for Women, Hisar. Data is collected from the students as well as faculty members of the college. 100 out of 125 questionnaires are taken for consideration. The paper attempts to analyse use pattern, adequacy of library collection, users opinion on information sources and services. Maximum users are found satisfied with the physical facilities and collection as well as arrangement of library reading material

Index Terms- Information resources, Library and information services, users, adequacy, college library

IV. INTRODUCTION

F.C.College was started in 1935 at Lahore and in 1954 college was reestablished in Hisar. Library has been an integral part of the college since its inception. Value of library for an educational institution is felt at that time by the governing body. Addition of new books has been a regular feature of the library.. Library was shifted to a separate new building in 2001. At present the library has over 36000 books related to different streams. Rapid accumulation and dissemination of information is the major concern of each academic library. Library is fully computerized and all sections are fully automated using LIBSYS software. Library has started its own blog for direct and online communication with users.

I. LITERATURE REVIEW

Review of related literature is very important for every research. Many scholars have surveyed to get acquainted with user information seeking behavior and status of information sources and information services of library from user point of view. A few research works are reviewed in the present study. Tadasad and Talikoto (2000) have carried a survey to study the awareness and utilization of resources and services of City Central Library, Gulbarga. Major findings are that many users are unaware of the resources and services. Majority of users are satisfied with information services. Maximum users visit library to borrow and return books. Mahapatra and Panda(2000) in their study analysed reading interests and utilization of information resources by working journalists of Orissa. Study makes it clear that 79.64 % of the working journalists assigned top priority to reading newspapers and popular magazines compared to other form of documents. Khot and Patil (2002) studied the attitude of

scholars towards library and information services in Shivaji University's Barr. Balasaheb Khardekar Library. Majority of researchers were found to be aware of the information services. But CAS,SDI and ILL services were not satisfactory. Users were not satisfied with the availability of journals but physical facilities were up to the mark. Kannappanavar and Swamy (2004) in their work checked library and information services in University of Agricultural Sciences in Karnataka. It is seen that reading materials are adequate but users are not satisfied about the physical facilities of library. The users are unaware of the majority of library services. Singh (2013) in his paper studies information seeking behavior of users of Dr. B.R.Ambedkar NIT Central Library. His conclusion is that Most students use library daily. Users prefer to use books and CD –ROMs. Interestingly users use controlled vocabulary for information searching purpose.

II. OBJECTIVES

The study was undertaken to find out the existing library and information service facilities in the Shrimati Janki Devi Library situated in Fateh Chand College for Women, Hisar for the year 2013-2014. The specific objectives of the study are as follows :-

1. To find out the information needs of the users.
2. To find out the method that the readers of the library adopt to locate the required information sources.
3. To ascertain the opinion of the users regarding the adequacy of information resources and services available in the library.
4. To find out the types of information sources required by the library users.
5. To know the problems faced by the users in using the library.
6. To know users opinion with regard to behavior of library staff.

III. METHODOLOGY AND DATA COLLECTION

The methodology adopted for this study was descriptive survey method. A structured questionnaire is prepared for the purpose of data collection and circulated to both the students as well as the faculty members of the college. Questionnaire consisting of 25 questions was designed to elicit the options of the users. Total 125 questionnaires were distributed, out of which 110 users responded. But 10 questionnaires were not fully filled, so 100 questionnaires are taken for analysis. The details of the sample size along with the responses have been provided in the following Table-1.

Table – 1
Sample Size and Responses for the Questionnaire

Categories of Respondents	Questionnaires Distributed	Responses Responded	Responses Percentage
Students	75	60	80.00
Teaching Faculty	45	40	88.88

Analysis and Interpretation of Data

Frequency of Visit to the Library

Frequency of library visit of users is the best way to measure the use of the library. Table 1 is a great help in knowing this factor.

Table – 2
Frequency of Visit to the Library

Sr.No.	Frequency of Library Visit	No. of Responses (Students)	No. of Responses (Teachers)	Total No. of Responses
1	Daily	23	16	39
2	Once in a Week	13	3	16
3	Twice in a week	20	16	36
4	Once in 15 Days	2	1	3
5	Once in a Month	1	1	2
6	Occasionally	1	3	4
	Total	60	40	100

Users are using the library frequently, but how frequently they use the library is a big question. Table 2 reflects the details of frequency of visit to the library by the users. It shows 39 % of users are using the library everyday followed by 36 % of users are using the library twice in a week, 16 % are using the library once in a week. The percentage of occasional visitors is very low, which is a good sign for library.

Time Spent in the Library

It is very important for a librarian to know that how much time users spend in the library for reading or some other purposes.

Table – 3
Time Spent in the Library

Sr. No.	Time	No. of Responses (Students)	No. of Responses (Teachers)	Total No. of Responses
1	Below ½ hour	6	10	16
2	½ hour to 1 hour	31	18	49
3	1 hour to 2	18	8	26

	hour			
4	2 hour to 3 hour	4	1	5
5	More than 3 hour	1	3	4

Table 3 indicates clearly the time spent by the users in library. It shows majority of users spent ½ hour to 1 hour, whereas 26 % users spent 1 hour to 2 hour. It is interesting to notice that 4 % users are using the library more than 3 hours, although the percentage is very low yet this is very motivating.

Purpose of Visit to the Library

Every library wants to enhance and improve its services and for this purpose it becomes necessary to know the purpose of visit of the users to library.

Table – 4
Purpose of Visit to the Library

Sr. No.	Purpose	No. of Responses (Students)	No. of Responses (Teachers)	Total No. of Responses
1	To borrow books	17	15	32
2	To consult periodicals	10	3	13
3	To read newspapers	19	13	32
4	To consult reference books	14	9	23

From Table 4 gives necessary information to the librarian on the documents and type of information that the library users are interested in . 32 % users visit library to borrow books and to read newspapers as well. Second preference is given to reference section by the users.

Use of Library Information Sources

Each and every type of information source has its own value.. Users use these kind of sources for their specific needs.

Table – 5
User’s Preference to Information Sources

Sr. No	Resource Type	User’s Preference Order				
		1	2	3	4	5
1	Books	41	27	14	6	-
2	Newspapers	32	32	18	19	-
3	Periodicals	3	15	16	44	11
4	Reference Books	13	15	38	20	2
5	CD-ROMs	-	-	2	11	75

Table 5 depicts ranking of preferences stated by the users. Total 12 users have not responded on this question. Books are the most preferred resource used by users and 32 users have given first preference to newspapers. It is clear from the table that the

users are either not aware of CD-ROM or they do not use this type of resources.

Users Opinion on Library Information Sources

Each academic library has the responsibility to fulfill the needs of its patrons. Users need advanced study material which consists of various information sources like books, journals, reference books, CD-ROM etc. Table 6 clarifies what users think about the adequacy of library collection

**Table – 6
Adequacy of Library Collection**

Sr. No.	User’s Opinion	No. of Responses (Students)	No. of Responses (Teachers)	Total No. of Students
1	Adequate	47	30	77
2	Partially	10	8	18
3	Inadequate	1	-	1
4	No Response	2	2	4

Every library needs to know whether the existing collection of information sources is adequate enough to meet the information requirements of its users. 77 % users are satisfied with library collection and 19 % users are of the opinion that library collection is not adequate. Librarian must take care of this.

Users Approach to Locate Information

Every reader has its own specific needs of information for which she comes to the library. It is necessary to find out user’s approach to locate required information.

**Table – 7
User’s Approach to Locate Information**

Sr. No.	Method	No. of Responses (Students)	No. of Responses (Teachers)	Total No. of Responses
1	Consulting Catalogue/OPAC	16	9	25
2	Assistance of library staff	9	15	24
3	Guidance of Subject Expert	11	1	12
4	Help of Friends	6	2	8
5	Self	18	13	31

Table 7 demonstrates that 31 users locate the required reading material by themselves, followed by 25 search by consulting catalogue and 24 users find their required information with the assistance of library staff.

User’s Views on Library Collection

Collection development is the major concern area of every academic library. Libraries regularly update their collection with the inclusion of latest publications. Its very important to know user’s opinion about library collection.

**Table – 8
Types of Problems Faced by the Users**

Sr. No.	Users views on collection	No. of Responses (Students)	No. of Responses (Teachers)	Total No. of Responses
1	Books are in bad condition	1	-	1
2	Less no. of copies of needed books	16	16	32
3	Latest books are not available	9	1	10
4	Important books are for reference only	12	1	13
5	No such problem exists	22	22	44

Table 8 attempts to identify the reasons of user’s dissatisfaction in the context of library collection. 44 % readers stated that there is no such problem, 32 % readers feel that there is less number of copies of needed books, only 1 % reader feels that books are in bad condition.

Arrangement of Library Collection

Proper arrangement of reading material is very important for libraries. Users can not find the required material if it is not properly shelved. Users opinion in this regard is very important.

**Table – 9
Arrangement of Reading Material in the Library**

Sr. No.	Type of Information Source	Satisfactory			Unsatisfactory		
		Students	Teachers	Total	Students	Teachers	Total
1	Text Books	58	39	97	2	1	3
2	Newspapers/Periodicals	58	39	97	2	1	3
3	General Books	56	38	94	4	2	6

Table 9 denotes maximum number of users have expressed their satisfaction with the arrangement of text books, periodicals, general books in the library. A few percent readers have shown their dissatisfaction regarding arrangement.

Readers Views on Library Services

Academic libraries provide various information services to its readers. Library wants to investigate whether the users are aware of these services.

Table – 10
User Awareness of Library and Information Services

Sr. No.	Library and Information Services	Yes			No		
		Students	Teachers	Total	Students	Teachers	Total
1	Circulation	55	37	92	5	3	8
2	Reference	55	37	92	5	3	8
3	Reading Facilities	55	39	94	5	1	6
4	CAS	39	28	67	21	12	33
5	Reprographic	35	28	63	25	12	37
6	OPAC	9	9	18	51	31	72

Table 10 shows that 94 % readers are aware of reading facilities, 92 % readers know about both circulation and reference services. Only 18 % users are aware of OPAC service.

Every library introduces many information services for the benefit of user community. It is required to measure satisfaction level of users.

Evaluation of Library & Information Services

Table – 11
Rating of Satisfaction of Users with the Library Services

Sr. No.	Library and Information Services	Satisfactory			Unsatisfactory		
		Students	Teachers	Total	Students	Teachers	Total
1	Circulation	54	39	93	6	1	7
2	Reference	58	39	97	2	1	3
3	Reading Facilities	58	39	97	2	1	3
4	CAS	46	39	85	14	1	15
5	Reprographic	45	35	80	15	5	20
6	OPAC	24	15	39	36	25	61

Table 11 makes it clear that 97 % users are satisfied with reference and reading facilities, followed by 93 % users with circulation service. 61 % users are not satisfied with OPAC service.

Attitude of Library Staff

The attitude of library staff towards users plays an important role. The reputation of the library is somehow based on the behavior of its staff also. Users responses are given here.

Table – 12
Users Opinion on Behaviour of Library Staff

Sr. No.	Attitude of Library Staff	Yes			No		
		Students	Teachers	Total	Students	Teachers	Total
1	Friendly & easy to talk	58	40	98	2	0	2
2	Available when you need them	52	39	91	8	1	9

Table 12 reveals the data about users opinion on library staff. 98 % users believe that library staff is friendly and easy to talk

and 91 % users think that staff is always available to help them whenever they need them.

Physical Facilities

Table – 13
Users Opinion on Quality of Physical Facilities

Sr. No.	Physical Facilities	Satisfactory			Unsatisfactory		
		Students	Teachers	Total	Students	Teachers	Total

1	Reading Space	57	36	93	3	4	7
2	Cleanliness	60	36	96	-	4	4
3	Ventilation	55	37	92	5	3	8
4	Computing Facilities	51	30	81	9	10	19
5	Lighting	59	38	97	1	2	3
6	Property Counter	52	38	90	8	2	10
7	Furniture	58	40	98	2	-	2

Every library tries to provide good physical facilities to its users so that overall good reading environment could be given to the users. User's opinions are tabulated in table 13. Table shows that maximum users are satisfied with all mentioned physical facilities. Computing facilities need a little check.

IV. CONCLUSION

From this study, it is found that majority of users visit library to read newspapers or borrow books. Users do not prefer to use CD-ROM as compared to other information sources. Less number of copies of needed books is another finding, hence library has to work in this direction so that users can take maximum benefit of library. A good percentage of users are not aware of CAS, reprographic and OPAC services. OPAC is not fully used by users is another finding. Almost every reader is satisfied with the behavior of library staff. Users are satisfied with physical facilities like reading space, cleanliness, lighting, ventilation, property counter and furniture etc.

REFERENCES

- [1] Tadasad, P G and Talikoti, S C., Awareness and Utilization of Resources, Services and Facilities of City Central Libraries : A User Survey of City Central Library, Gulbarga, ILA Bulletin, 2000; 36 (3), 80-86.
- [2] Mahapatra, R.K. and Panda, K.C., State of Reading Interest and Utilization of Information Resources by the Working Journalists in Orissa : A Study, ILA Bulletin, 2000; 16 (3), 93-99
- [3] Kannappanavar, B.U. and Swamy, C., Library and Information Services in University of Agricultural Sciences in Karnataka : A Users Survey, Rao, N.L. (Eds.), 49th All India Library Conference, Bundelkhand University Jhansi, ILA, Delh, 2004, pp. 210-225
- [4] Khot, N.B. and Patil, S., Library and Information Services in Shivaji University's Barr. Balasaheb Khardekar Library : A Survey, Rao, N.L. (Eds.), 49th All India Library Conference, Bundelkhand University Jhansi, ILA, Delh, 2004, pp. 226-237
- [5] Singh, H., Information Seeking Behaviour of Users of Dr.B.R.Ambedkar NIT Central Library, DESIDOC Journal of Library & Information Technology, 2013; 33(4), pp. 338-342.

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Effect of Asanas and Pranayama on Self Concept of School Going Children

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Abstract- The purpose of the study was to determine the effect of Asanas and Pranayama on self concept (Behaviour, Intellectual and school status, Physical appearance and attributes, Anxiety, Popularity, Happiness and satisfaction) of school going children. 120 subjects were equally assigned to the four groups by using random sampling procedure i.e. three experimental groups and one control group. The experimental Group A was administered Asanas, Group B was administered Pranayama and Group C was administered combination of Asana Pranayama and Group D control group was given no training of an experimental period of twelve weeks. Analysis of covariance was used exclusively to compare the effect of three yogic experimental treatments programme for school going children. After statistical analysis findings show significant effect of all three experimental groups.

Index Terms- Asana, Pranayama, and self concept.

- To compare the effect of Asanas and Pranayama and their combination on self concept level of school going children.
- To compare the three treatments and its effect on the self concept level.

III. HYPOTHESES

H1 There will be significant effect of Asanas Practice on **self concept level** of school going children.

H2 There will be significant effect of Pranayama Practice on **self concept level** of school going children.

H3 There will be significant effect of Asana Pranayama Practice on **self concept level** of school going children.

H4 There will not be any significant difference between three treatment groups.

I. INTRODUCTION

Yoga, the wealth of India, is one of the greatest gifts of India to the world. Part of daily routine for the Indians for the years. Today yoga is popular not so much as a system of philosophy as a system of practical discipline. The application of yogic techniques is considered beneficial for health and cure of certain diseases and for improving general efficiency of individual in different fields, yoga is being utilized from the most fundamentally personal to the social and educational implications of the society as a whole. No matter how times and life styles change the judgment of the ancient sages in matters relating to life and conduct is still relevant. Even though our attitude to the nature of yoga itself may be different from those who were its instigators. In its evolution, its wisdom applies. It is also a spiritual pursuit for many seekers of truth. In the modern world, western countries like America use yoga as a tool for mental, physical and spiritual upliftment.

II. OBJECTIVES OF THE STUDY

- To study the effect of Asanas on self concept level of school going children.
- To study the effect of Pranayama on self concept level of school going children.
- To study the combination effect of Asana Pranayama on self concept level of school going children.

IV. SELECTION OF SUBJECTS

One hundred twenty (120) school going boys were selected randomly as subjects in the age group of 8-10 years from Muni International School, A-2/16-18, Mohan Garden, Uttam Nagar New Delhi-110059, India. The subjects were divided into three treatment groups and one control group using random method. Group A was allotted Asanas treatment group consisted of 30 subjects, Group B was allotted Pranayama treatment group consisted of 30 subjects, Group C was allotted combination of Asana Pranayama treatment group consisted of 30 subjects and Group D control group consisted of 30 subjects. The study was confined to 12 weeks of training programme.

V. EXPERIMENTAL PROTOCOL

A period of twelve weeks training programme. Experimental population of 90 subjects were assembled in Activity Hall at Muni International School, A-2/16-18, Mohan Garden, Uttam Nagar, New Delhi-110059, India. Experimental training was executed from 9:00 AM onwards for 45 minutes, for six days a week and Sunday has been observed as weekly off. Each subject of the experimental group was ready to learn Asanas and Pranayamas. Group 'A' acts as Asanas Group, 'B' acts as Pranayama group, Group 'C' acts as Combination of Asana and Pranayama group and Group 'D' acts as control group which did not participate in the training programme. The subjects of experimental group 'A' practiced Asana (Surya Namaskar,

Sarvangasana, Matsyasana, Halasana, Bhujangasana, Shalvhasana, Dhanurasana, [Chakrasana](#), Ardha Matsyendrasana, Paschimottanasana, Vajrasana, Yogamudra, Standing kati chakrasana, Tadasana and Shavasana) and group 'B' practiced Pranayama (Anuloma Vilom and Bhastrika) and group 'C' practiced combination of Asana and Pranayama (Surya Namaskar, Sarvangasana, Matsyasana, Halasana, Bhujangasana, Shalvhasana, Dhanurasana, [Chakrasana](#), Ardha Matsyendrasana, Paschimottanasana, Vajrasana, Yogamudra, Standing kati chakrasana, Tadasana ,Shavasana, Anuloma Vilom pranayama and Bhastrika pranayama).

VI. TOOL USED

Self concept scores of the subject were obtained by using children's self concept scale (CSCS) by Dr. S.P Ahluwalia and Dr. Hari Shankar Singh.

VII. RESULTS

**TABLE-1
DESCRIPTIVE STATISTICS OF THE DATA MEASURED
IN THE POST TESTING BEHAVIOUR**

TREATMENT GROUP	MEAN	STD. DEVIATION	N
Asanas Group	11.66	2.46	30
Pranayama Group	11.96	2.73	30
Asana Pranayama Group	11.93	2.72	30
Control Group	9.36	2.39	30
Total	11.23	2.77	120

Table no.1 indicates the values of descriptive statistics of the experimental Groups (Asanas Group, Pranayama Group, Asana Pranayama Group) & Control Group for psychological variable of behaviour, which shows that the mean and S.D. values of Asanas Group, Pranayama Group, Asana Pranayama Group and the Control Group were found to be 11.66±2.46, 11.96±2.73, 11.93±2.72 and 9.36±2.39 respectively. Total the same was 11.23±2.77.

TABLE-2

**DESCRIPTIVE STATISTICS OF THE DATA MEASURED
IN THE POST-TESTING AFTER ADJUSTMENT WITH
THE INITIAL DIFFERENCE BEHAVIOUR**

TREATMENT GROUP	MEAN	STD. ERROR	95% CONFIDENCE INTERVAL	
			LOWER BOUND	UPPER BOUND
Asanas Group	11.56 ^a	0.37	10.82	12.30
Pranayama Group	11.82 ^a	0.37	11.08	12.56
Asana Pranayama Group	12.07 ^a	0.37	11.33	12.81
Control Group	9.46 ^a	0.37	8.72	10.21

(a) Covariates appearing in the model are evaluated at the following values: pre behaviour = 8.86

The mean and standard error of different post-testing Groups after adjustment have been shown in table 2. Which is for Asanas Group 11.56 & 0.37, Pranayama Group 11.82 & 0.37, Asana Pranayama Group 12.07 & 0.37 and Control Group 9.46 & 0.37.

**TABLE-3
ANCOVA TABLE FOR THE POST-TEST DATA ON
BEHAVIOUR**

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG. (p-value)
Pre behavior	304.72	1	304.72	72.34	0.00
Treatment Group	128.38	3	42.79	10.16	0.00
Error	484.36	115	4.21		
Corrected Total	917.46	119			

Table no. 3 indicates the values test of difference between the subject effects, which shows that there was a significant difference in pre test values of psychological variable of behaviour for the four selected Groups, as the value was found to be 72.34, which proves to be the base of Analysis of Co-Variance. Also, a significant difference was found between the post test values of the experimental and Control Group as the value was found to be 10.16, which was significant at 0.05 level.

**TABLE-4
POST HOC COMPARISON FOR THE GROUP MEANS IN POST-MEASUREMENT ADJUSTED WITH THE INITIAL DIFFERENCES BEHAVIOUR**

(I) TREATMENT GROUP	(J) TREATMENT GROUP	MEAN DIFFERENCE (I-J)	SIG. ^a (p-value)
Asanas Group	Pranayama Group	-0.25	0.62

	Asana Pranayama Group	-0.51	0.33
	Control Group	2.09*	0.00
Pranayama Group	Asanas Group	0.25	0.62
	Asana Pranayama Group	-0.25	0.63
	Control Group	2.35*	0.00
Asana Pranayama Group	Asanas Group	0.51	0.33
	Pranayama Group	0.25	0.63
	Control Group	2.60*	0.00
Control Group	Asanas Group	-2.09*	0.00
	Pranayama Group	-2.35*	0.00
	Asana Pranayama Group	-2.60*	0.00

Based on estimated marginal means

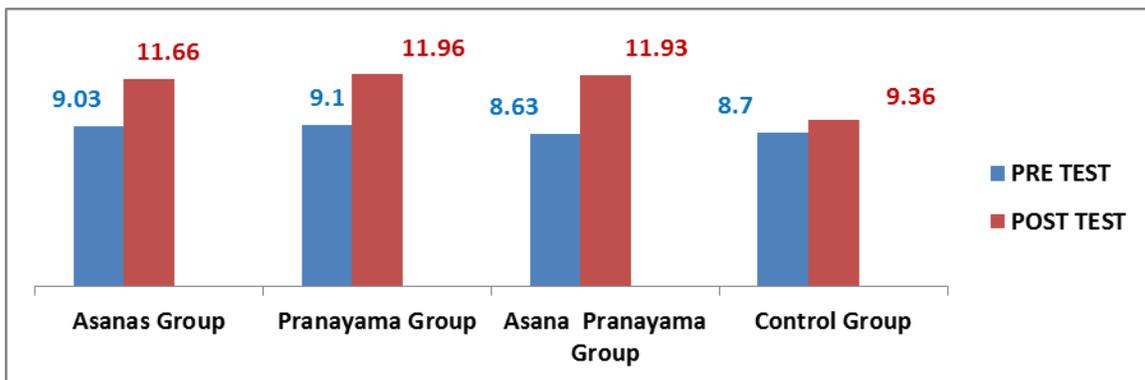
a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

* The mean difference is significant at the 0.05 level.

Table no. 4 indicates the values of post hoc test for the selected Groups for psychological variable of behaviour, which shows that a significant difference was found between the post

test values of Asanas Group and the Control Group as the value was found to be 2.09 which was significant at 0.05 level, the post test values of Pranayama Group and the Control Group as the value was found to be 2.35 which was significant at 0.05 level, Asana Pranayama Group and the Control Group as the value was found to be 2.60 which was significant at 0.05 level (uday, 2010)

FIGURE:-1



COMPARISON OF THE MEANS ON BEHAVIOUR OF THE CONTROL GROUP AND THREE EXPERIMENTAL GROUPS

**TABLE-5
DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST TESTING INTELLECTUAL AND SCHOOL STATUS**

TREATMENT GROUP	MEAN	STD. DEVIATION	N
Asanas Group	14.16	2.19	30
Pranayama Group	13.33	3.43	30
Asana Pranayama Group	14.16	2.56	30
Control Group	11.76	2.78	30
Total	13.35	2.91	120

Table no.5 indicates the values of descriptive statistics of the experimental Groups (Asanas Group, Pranayama Group, Asana Pranayama Group) & Control Group for psychological variable of intellectual and school status, which shows that the mean and S.D. values of Asanas Group, Pranayama Group, Asana

Pranayama Group and the Control Group were found to be 14.16±2.19, 13.33±3.43, 14.16±2.56 and 11.76±2.78 respectively. Total the same was 13.35±2.91.

TABLE-6
DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST-TESTING AFTER ADJUSTMENT WITH THE INITIAL DIFFERENCE INTELLECTUAL AND SCHOOL STATUS

TREATMENT GROUP	MEAN	STD. ERROR	95% CONFIDENCE INTERVAL	
			LOWER BOUND	UPPER BOUND
Asanas Group	13.72 ^a	0.397	12.93	14.51
Pranayama Group	13.23 ^a	0.394	12.45	14.01
Asana Pranayama Group	14.44 ^a	0.395	13.66	15.23
Control Group	12.02 ^a	0.395	11.24	12.81

(a) Covariates appearing in the model are evaluated at the following values: pre intellectual and school status = 11.63

The mean and standard error of different post-testing Groups after adjustment have been shown in table 6. Which is for Asana Group 13.72 & 0.397, Pranayama Group 13.23 & 0.394, Asana Pranayama Group 14.44 & 0.395 and Control Group 12.02 & 0.395.

TABLE-7
ANCOVA TABLE FOR THE POST-TEST DATA ON INTELLECTUAL AND SCHOOL STATUS

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG. (p-value)
Pre intellectual and school status	384.90	1	384.90	82.64	0.00
Treatment Group	93.11	3	31.03	6.66	0.00
Error	535.57	115	4.65		
Corrected Total	1013.59	119			

Table no. 7 indicates the values test of difference between the subject effects, which shows that there was a significant difference in pre test values of psychological variable of intellectual and school status for the four selected Groups, as the value was found to be 82.64, which proves to be the base of

Analysis of Co-Variance. Also, a significant difference was found between the post test values of the experimental and Control Group as the value was found to be 6.66, which was significant at 0.05 level.

TABLE-8
POST HOC COMPARISON FOR THE GROUP MEANS IN POST-MEASUREMENT ADJUSTED WITH THE INITIAL DIFFERENCES INTELLECTUAL AND SCHOOL STATUS

(I) TREATMENT GROUP	(J) TREATMENT GROUP	MEAN DIFFERENCE (I-J)	SIG. ^a (p-value)
Asanas Group	Pranayama Group	0.49	0.38
	Asana Pranayama Group	-0.72	0.20
	Control Group	1.69*	0.003
Pranayama Group	Asanas Group	-0.49	0.38
	Asana Pranayama Group	-1.21*	0.03
	Control Group	1.20*	0.03
Asana Pranayama Group	AsanaGroup	0.72	0.20
	Pranayama Group	1.21*	0.03
	Control Group	2.42*	0.00
Control Group	AsanaGroup	-1.69*	0.003

	Pranayama Group	-1.20*	0.03
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Based on estimated marginal means

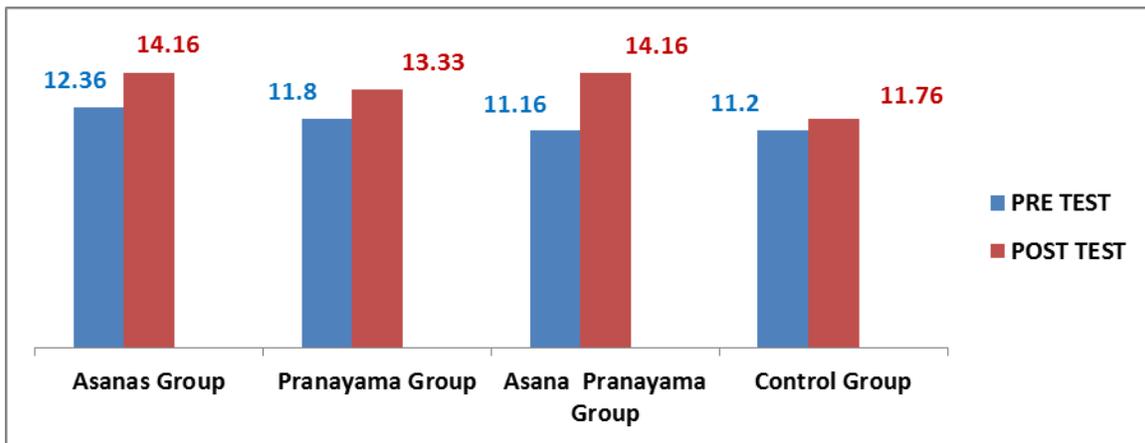
a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

*The mean difference is significant at the 0.05 level.

Table no. 8 indicates the values of post hoc test for the selected Groups for psychological variable of intellectual and school status, which shows that a significant difference was found between the post test values of Asanas Group and the Control Group as the value was found to be 1.69 which was significant at 0.05 level, the post test values of Pranayama Group

and the Control Group as the value was found to be 1.20 which was significant at 0.05 level, Asana Pranayama Group and the Control Group as the value was found to be 2.42 which was significant at 0.05 level and Asana Pranayama Group and the Pranayama Group as the value was found to be 1.21 which was significant at 0.05 level.

FIGURE:-2



COMPARISON OF THE MEANS ON INTELLECTUAL AND SCHOOL STATUS OF THE CONTROL GROUP AND THREE EXPERIMENTAL GROUPS

TABLE-9

DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST TESTING PHYSICAL APPEARANCE AND ATTRIBUTES

TREATMENT GROUP	MEAN	STD. DEVIATION	N
Asanas Group	10.60	1.30	30
Pranayama Group	10.56	1.38	30
Asana Pranayama Group	10.50	1.47	30
Control Group	8.93	1.98	30
Total	10.15	1.69	120

Table no.9 indicates the values of descriptive statistics of the experimental Groups (Asanas Group, Pranayama Group, Asana Pranayama Group) & Control Group for psychological variable of physical appearance and attributes, which shows that the mean

and S.D. values of Asanas Group, Pranayama Group, Asana Pranayama Group and the Control Group were found to be 10.60±1.30, 10.56±1.38, 10.50±1.47and 8.93±1.98respectively. Total the same was 10.15±1.69.

TABLE-10

DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST-TESTING AFTER ADJUSTMENT WITH THE INITIAL DIFFERENCE PHYSICAL APPEARANCE AND ATTRIBUTES

TREATMENT GROUP	MEAN	STD. ERROR	95% CONFIDENCE INTERVAL	
			LOWER	UPPER

			BOUND	BOUND
Asanas Group	10.66 ^a	0.24	10.17	11.15
Pranayama Group	10.61 ^a	0.24	10.12	11.11
Asana Pranayama Group	10.49 ^a	0.24	10.00	10.98
Control Group	8.82 ^a	0.25	8.32	9.31

(a)Covariates appearing in the model are evaluated at the following values: physical appearance and attributes pre test = 8.68.

The mean and standard error of different post-testing Groups after adjustment have been shown in table 10. Which is for Asana Pranayama Group 10.49 & 0.24 and Control Group 8.82 & 0.25. Asanas Group 10.66 & 0.24, Pranayama Group 10.61 & 0.24,

TABLE-11
ANCOVA TABLE FOR THE POST-TEST DATA ON PHYSICAL APPEARANCE AND ATTRIBUTES

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG. (p-value)
Pre physical appearance and attributes	57.23	1	57.23	30.81	0.00
Treatment Group	70.46	3	23.48	12.64	0.00
Error	213.60	115	1.85		
Corrected Total	341.30	119			

Table no. 11 indicates the values test of difference between the subject effects, which shows that there was a significant difference in pre test values of psychological variable of physical appearance and attributes for the four selected Groups, as the value was found to be 30.81, which proves to be the base of

Analysis of Co-Variance. Also, a significant difference was found between the post test values of the experimental and Control Group as the value was found to be 12.64, which was significant at 0.05 level.

TABLE-12
POST HOC COMPARISON FOR THE GROUP MEANS IN POST-MEASUREMENT ADJUSTED WITH THE INITIAL DIFFERENCES
PHYSICAL APPEARANCE AND ATTRIBUTES

(I) TREATMENT GROUP	(J) TREATMENT GROUP	MEAN DIFFERENCE (I-J)	SIG. ^a (p-value)
Asanas Group	Pranayama Group	0.04	0.89
	Asana Pranayama Group	0.17	0.63
	Control Group	1.84*	0.00
Pranayama Group	Asanas Group	-0.04	0.89
	Asana Pranayama Group	0.12	0.72
	Control Group	1.79*	0.00
Asana Pranayama Group	Asanas Group	-0.17	0.63
	Pranayama Group	-0.12	0.72
	Control Group	1.67*	0.00
Control Group	Asanas Group	-1.84*	0.00
	Pranayama Group	-1.79*	0.00
	Asana Pranayama Group	-1.67*	0.00

Based on estimated marginal means

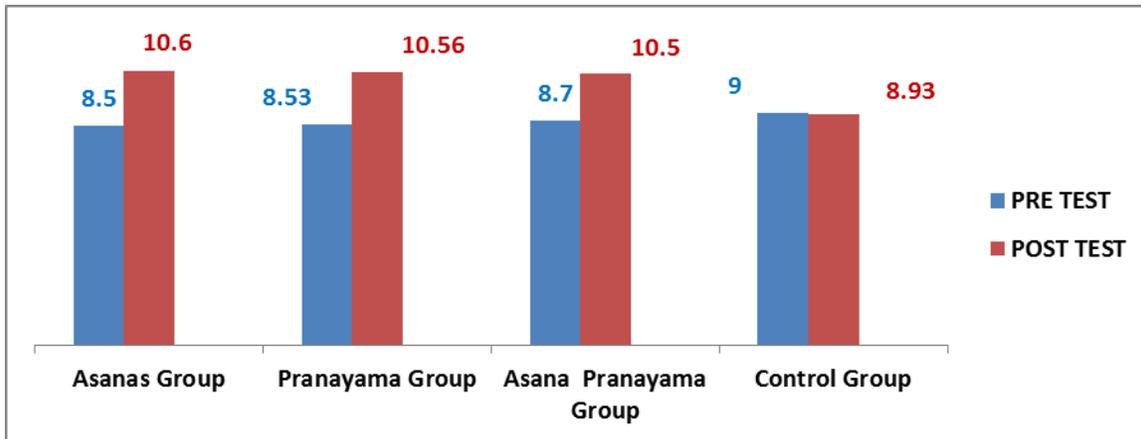
a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

*The mean difference is significant at the 0.05 level.

Table no.12 indicates the values of post hoc test for the selected Groups for psychological variable of physical appearance and attributes, which shows that a significant difference was found between the post test values of Asanas Group and the Control Group as the value was found to be 1.84

which was significant at 0.05 level, the post test values of Pranayama Group and the Control Group as the value was found to be 1.79 which was significant at 0.05 level, Asana Pranayama Group and the Control Group as the value was found to be 1.67 which was significant at 0.05 level.

FIGURE:-3



COMPARISON OF THE MEANS ON PHYSICAL APPEARANCE AND ATTRIBUTES OF THE CONTROL GROUP AND THREE EXPERIMENTAL GROUPS

**TABLE-13
DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST TESTING ANXIETY**

TREATMENT GROUP	MEAN	STD. DEVIATION	N
Asanas Group	5.73	1.77	30
Pranayama Group	5.80	2.02	30
Asana Pranayama Group	5.00	1.76	30
Control Group	7.66	2.89	30
Total	6.05	2.35	120

Table no.13 indicates the values of descriptive statistics of the experimental Groups (Asanas Group, Pranayama Group, Asana Pranayama Group) & Control Group for psychological variable of anxiety, which shows that the mean and S.D. values of Asanas Group, Pranayama Group, Asana Pranayama Group and the Control Group were found to be 5.73±1.77, 5.80±2.02, 5.00±1.76 and 7.66±2.89 respectively. Total the same was 6.05±2.35.

**TABLE-14
DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST-TESTING AFTER ADJUSTMENT WITH THE INITIAL DIFFERENCE ANXIETY**

TREATMENT GROUP	MEAN	STD. ERROR	95% CONFIDENCE INTERVAL	
			LOWER BOUND	UPPER BOUND
Asanas Group	5.68 ^a	0.26	5.15	6.20
Pranayama Group	5.61 ^a	0.26	5.08	6.13
Asana Pranayama Group	5.16 ^a	0.26	4.63	5.68
Control Group	7.75 ^a	0.26	7.22	8.27

(a) Covariates appearing in the model are evaluated at the following values: general anxiety scale for children pre test = 7.54.

The mean and standard error of different post-testing Groups after adjustment have been shown in table 14. Which is for

Asanas Group 5.68 & .26, Pranayama Group 5.61 & 0.26, Asana Pranayama Group 5.16 & 0.26 and Control Group 7.75 & 0.26.

TABLE-15
ANCOVA TABLE FOR THE POST-TEST DATA ON ANXIETY

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG. (p-value)
Pre Anxiety Scale For Children	298.94	1	298.94	142.95	0.00
Treatment Group	120.26	3	40.09	19.17	0.00
Error	240.48	115	2.09		
Corrected Total	659.70	119			

Table no.15 indicates the values test of difference between the subject effects, which shows that there was a significant difference in pre test values of psychological variable of anxiety for the four selected Groups, as the value was found to be

142.95, which proves to be the base of Analysis of Co-Variance. Also, a significant difference was found between the post test values of the experimental and Control Group as the value was found to be 19.17, which was significant at 0.05 level.

TABLE-16
POST HOC COMPARISON FOR THE GROUP MEANS IN POST-MEASUREMENT ADJUSTED WITH THE INITIAL DIFFERENCES ANXIETY

(I) TREATMENT GROUP	(J) TREATMENT GROUP	MEAN DIFFERENCE (I-J)	SIG. ^a (p-value)
Asanas Group	Pranayama Group	0.07	0.85
	Asana Pranayama Group	0.51	0.16
	Control Group	-2.07*	0.00
Pranayama Group	Asanas Group	-0.07	0.85
	Asana Pranayama Group	0.44	0.23
	Control Group	-2.14*	0.00
Asana Pranayama Group	Asanas Group	-0.51	0.16
	Pranayama Group	-0.44	0.23
	Control Group	-2.58*	0.00
Control Group	Asanas Group	2.07*	0.00
	Pranayama Group	2.14*	0.00
	Asana Pranayama Group	2.58*	0.00

Based on estimated marginal means

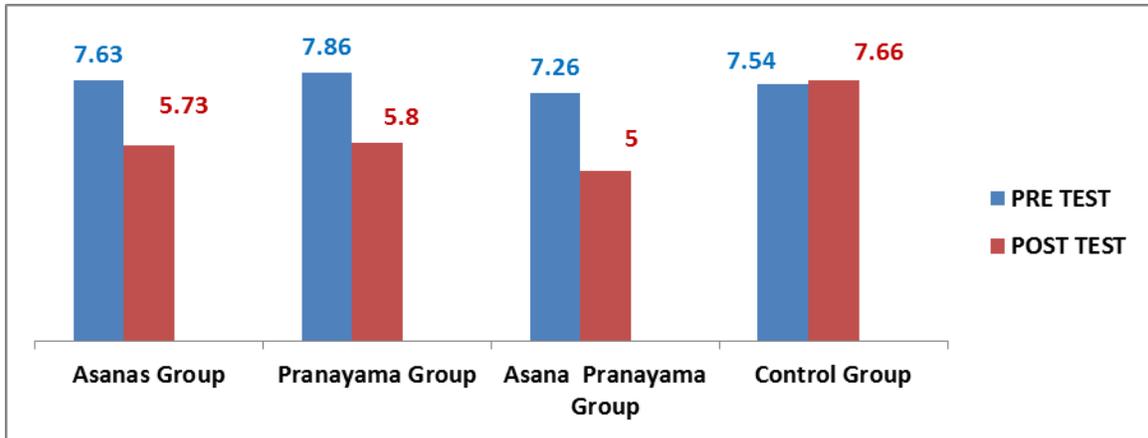
a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

*The mean difference is significant at the 0.05 level.

Table no. 16 indicates the values of post hoc test for the selected Groups for psychological variable of anxiety, which shows that a significant difference was found between the post test values of Asanas Group and the Control Group as the value was found to be 2.07 which was significant at 0.05 level, the post

test values of Pranayama Group and the Control Group as the value was found to be 2.14 which was significant at 0.05 level, Asana Pranayama Group and the Control Group as the value was found to be 2.58 which was significant at 0.05 level.

FIGURE:-4



COMPARISON OF THE MEANS ON ANXIETY OF THE CONTROL GROUP AND THREE EXPERIMENTAL GROUPS

TABLE-17
DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST TESTING POPULARITY

TREATMENT GROUP	MEAN	STD. DEVIATION	N
AsanaGroup	9.16	2.15	30
Pranayama Group	9.20	1.98	30
Asana Pranayama Group	9.70	1.91	30
Control Group	6.26	2.28	30
Total	8.58	2.47	120

Table no.17 indicates the values of descriptive statistics of the experimental Groups (Asanas Group, Pranayama Group, Asana Pranayama Group) & Control Group for psychological variable of popularity, which shows that the mean and S.D.

values of Asanas Group, Pranayama Group, Asana Pranayama Group and the Control Group were found to be 9.16 ± 2.15 , 9.20 ± 1.98 , 9.70 ± 1.91 and 6.26 ± 2.28 respectively. Total the same was 8.58 ± 2.47 .

TABLE-18
DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST-TESTING AFTER ADJUSTMENT WITH THE INITIAL DIFFERENCE POPULARITY

TREATMENT GROUP	MEAN	STD. ERROR	95% CONFIDENCE INTERVAL	
			LOWER BOUND	UPPER BOUND
AsanaGroup	9.00 ^a	0.270	8.46	9.53
Pranayama Group	9.21 ^a	0.270	8.68	9.74
Asana Pranayama Group	9.55 ^a	0.270	9.02	10.09
Control Group	6.55 ^a	0.271	6.02	7.09

(a) Covariates appearing in the model are evaluated at the following values: popularity pre test = 6.95.

The mean and standard error of different post-testing Groups after adjustment have been shown in table 18. Which is for Asanas Group 9.00 & 0.270, Pranayama Group 9.21 & 0.270,

Asana Pranayama Group 9.55 & 0.270 and Control Group 6.55 & 0.271.

TABLE-19
ANCOVA TABLE FOR THE POST-TEST DATA ON POPULARITY

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG. (p-value)
Pre popularity	309.54	1	309.54	141.70	0.00
Treatment Group	166.41	3	55.47	25.39	0.00
Error	251.21	115	2.18		
Corrected Total	727.16	119			

Table no.19 indicates the values test of difference between the subject effects, which shows that there was a significant difference in pre test values of psychological variable of popularity for the four selected Groups, as the value was found to

be 141.70, which proves to be the base of Analysis of Co-Variance. Also, a significant difference was found between the post test values of the experimental and Control Group as the value was found to be 25.39, which was significant at 0.05 level.

TABLE-20
POST HOC COMPARISON FOR THE GROUP MEANS IN POST-MEASUREMENT ADJUSTED WITH THE INITIAL DIFFERENCES POPULARITY

(I) TREATMENT GROUP	(J) TREATMENT GROUP	MEAN DIFFERENCE (I-J)	SIG. ^a (p-value)
AsanaGroup	Pranayama Group	-0.21	0.58
	AsanaPranayama Group	-0.55	0.15
	Control Group	2.44*	0.00
Pranayama Group	AsanaGroup	0.21	0.58
	Asana Pranayama Group	-0.34	0.37
	Control Group	2.65*	0.00
AsanaPranayama Group	AsanaGroup	0.55	0.15
	Pranayama Group	0.34	0.37
	Control Group	2.99*	0.00
Control Group	AsanaGroup	-2.44*	0.00
	Pranayama Group	-2.65*	0.00
	Asana Pranayama Group	-2.99*	0.00

Based on estimated marginal means

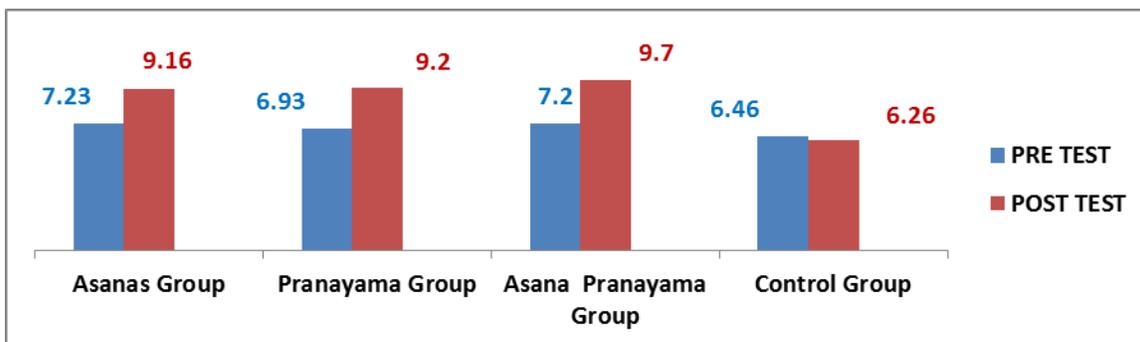
a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

* The mean difference is significant at the 0.05 level.

Table no.20 indicates the values of post hoc test for the selected Groups for psychological variable of popularity, which shows that a significant difference was found between the post test values of Asanas Group and the Control Group as the value was found to be 2.44 which was significant at 0.05 level, the post

test values of Pranayama Group and the Control Group as the value was found to be 2.65 which was significant at 0.05 level, Asana Pranayama Group and the Control Group as the value was found to be 2.99 which was significant at 0.05 level.

FIGURE:-5



COMPARISON OF THE MEANS ON POPULARITY OF THE CONTROL GROUP AND THREE EXPERIMENTAL GROUPS

**TABLE-21
DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST TESTING HAPPINESS AND SATISFACTION**

TREATMENT GROUP	MEAN	STD. DEVIATION	N
AsanaGroup	7.93	1.41	30
Pranayama Group	8.00	1.43	30
Asana Pranayama Group	7.86	1.52	30
Control Group	6.00	1.41	30
Total	7.45	1.65	120

Table no.21 indicates the values of descriptive statistics of the experimental Groups (Asanas Group, Pranayama Group, Asana Pranayama Group) & Control Group for psychological variable of happiness and satisfaction, which shows that the mean and S.D. values of Asanas Group, Pranayama Group, Asana Pranayama Group and the Control Group were found to be 7.93±1.41, 8.00±1.43, 7.86±1.52 and 6.00±1.41 respectively. Total the same was 7.45±1.65.

**TABLE-22
DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST-TESTING AFTER ADJUSTMENT WITH THE INITIAL DIFFERENCE HAPPINESS AND SATISFACTION**

TREATMENT GROUP	MEAN	STD. ERROR	95% CONFIDENCE INTERVAL	
			LOWER BOUND	UPPER BOUND
Asanas Group	7.95 ^a	0.22	7.50	8.40
Pranayama Group	8.05 ^a	0.22	7.60	8.50
Asana Pranayama Group	7.86 ^a	0.22	7.41	8.31
Control Group	5.92 ^a	0.22	5.47	6.37

(a)Covariates appearing in the model are evaluated at the following values: happiness and satisfaction pre test = 6.22.

The mean and standard error of different post-testing Groups after adjustment have been shown in table 22. Which is for Asanas Group 7.95 & 0.22, Pranayama Group 8.05 & 0.22, Asana Pranayama Group 7.86 & 0.22 and Control Group 5.92 & 0.22.

**TABLE-23
ANCOVA TABLE FOR THE POST-TEST DATA ON HAPPINESS AND SATISFACTION**

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG. (p-
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					value)
Pre happiness and satisfaction	55.91	1	55.91	35.98	0.00
Treatment Group	93.08	3	31.02	19.96	0.00
Error	178.69	115	1.55		
Corrected Total	327.70	119			

Table no. 23 indicates the values test of difference between the subject effects, which shows that there was a significant difference in pre test values of psychological variable of happiness and satisfaction for the four selected Groups, as the value was found to be 35.98, which proves to be the base of

Analysis of Co-Variance. Also, a significant difference was found between the post test values of the experimental and Control Group as the value was found to be 19.96, which was significant at 0.05 level.

TABLE-24
POST HOC COMPARISON FOR THE GROUP MEANS IN POST-MEASUREMENT ADJUSTED WITH THE INITIAL DIFFERENCES
HAPPINESS AND SATISFACTION

(I) TREATMENT GROUP	(J) TREATMENT GROUP	MEAN DIFFERENCE (I-J)	SIG.^a (p-value)
Asanas Group	Pranayama Group	-0.09	0.76
	Asana Pranayama Group	0.09	0.76
	Control Group	2.03*	0.00
Pranayama Group	Asanas Group	0.09	0.76
	Asana Pranayama Group	0.19	0.55
	Control Group	2.12*	0.00
Asana Pranayama Group	Asanas Group	-0.09	0.76
	Pranayama Group	-0.19	0.55
	Control Group	1.93*	0.00
Control Group	Asanas Group	-2.03*	0.00
	Pranayama Group	-2.12*	0.00
	Asana Pranayama Group	-1.93*	0.00

Based on estimated marginal means

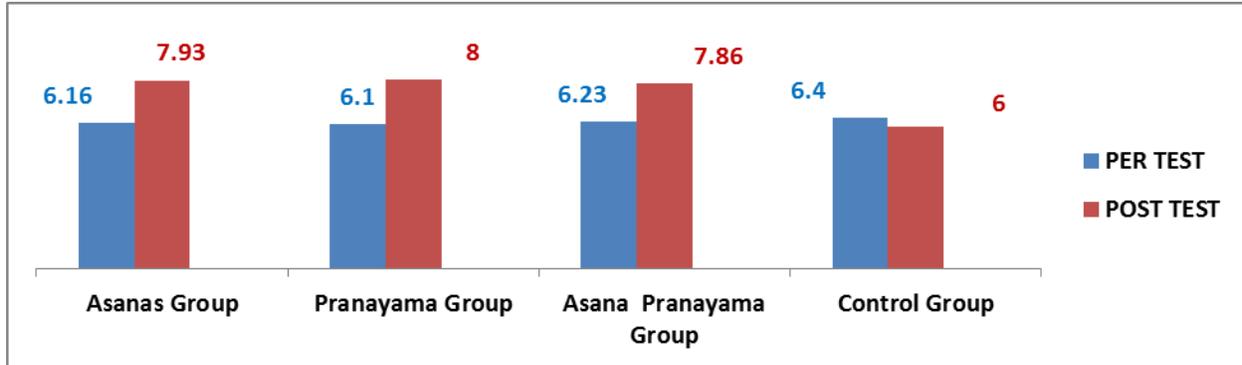
a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

*The mean difference is significant at the 0.05 level.

Table no. 24 indicates the values of post hoc test for the selected Groups for psychological variable of happiness and satisfaction, which shows that a significant difference was found between the post test values of Asanas Group and the Control Group as the value was found to be 2.03 which was significant at

0.05 level, the post test values of Pranayama Group and the Control Group as the value was found to be 2.12 which was significant at 0.05 level, Asana Pranayama Group and the Control Group as the value was found to be 1.93 which was significant at 0.05 level.

FIGURE:-6



COMPARISON OF THE MEANS ON HAPPINESS AND SATISFACTION OF THE CONTROL GROUP AND THREE EXPERIMENTAL GROUPS

TABLE-25
DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST TESTING SELF CONCEPT

TREATMENT GROUP	MEAN	STD. DEVIATION	N
Asanas Group	59.26	5.53	30
Pranayama Group	58.86	6.32	30
Asana Pranayama Group	59.16	5.66	30
Control Group	50.00	7.31	30
Total	56.82	7.33	120

Table no.25 indicates the values of descriptive statistics of the experimental Groups (Asanas Group, Pranayama Group, Asana Pranayama Group) & Control Group for psychological variable of self concept, which shows that the mean and S.D. values of Asanas Group, Pranayama Group, Asana Pranayama Group and the Control Group were found to be 59.26 ± 5.53 , 58.86 ± 6.32 , 59.16 ± 5.66 and 50.00 ± 7.31 respectively. Total the same was 56.82 ± 7.33 .

TABLE-26
DESCRIPTIVE STATISTICS OF THE DATA MEASURED IN THE POST-TESTING AFTER ADJUSTMENT WITH THE INITIAL DIFFERENCE SELF CONCEPT

TREATMENT GROUP	MEAN	STD. ERROR	95% CONFIDENCE INTERVAL	
			LOWER BOUND	UPPER BOUND
Asanas Group	58.69 ^a	0.761	57.19	60.20
Pranayama Group	58.63 ^a	0.760	57.12	60.13
Asana Pranayama Group	59.55 ^a	0.760	58.05	61.06
Control Group	50.41 ^a	0.760	48.90	51.91

(a)Covariates appearing in the model are evaluated at the following values: self concept pre test = 49.90.

The mean and standard error of different post-testing Groups after adjustment have been shown in table 26. Which is for Asanas Group 58.69 & 0.761, Pranayama Group 58.63 & 0.760, Asana Pranayama Group 59.55 & 0.760 and Control Group 50.41 & 0.760.

TABLE-27
ANCOVA TABLE FOR THE POST-TEST DATA ON
SELF CONCEPT

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG. (p-value)
Pre self concept	2749.35	1	2749.35	158.92	0.00
Treatment Group	1658.47	3	552.82	31.95	0.00
Error	1989.49	115	17.30		
Corrected Total	6397.32	119			

Table no. 27 indicates the values test of difference between the subject effects, which shows that there was a significant difference in pre test values of psychological variable of self concept for the four selected Groups, as the value was found to

be 158.92, which proves to be the base of Analysis of Co-Variance. Also, a significant difference was found between the post test values of the experimental and Control Group as the value was found to be 31.95, which was significant at 0.05 level.

TABLE-28
POST HOC COMPARISON FOR THE GROUP MEANS IN POST-MEASUREMENT ADJUSTED WITH THE INITIAL DIFFERENCES
SELF CONCEPT

(I) TREATMENT GROUP	(J) TREATMENT GROUP	MEAN DIFFERENCE (I-J)	SIG.^a (p-value)
Asanas Group	Pranayama Group	0.06	0.95
	Asana Pranayama Group	-0.86	0.42
	Control Group	8.28*	0.00
Pranayama Group	Asanas Group	-0.06	0.95
	Asana Pranayama Group	-0.92	0.39
	Control Group	8.22*	0.00
Asana Pranayama Group	Asanas Group	0.86	0.42
	Pranayama Group	0.92	0.39
	Control Group	9.14*	0.00
Control Group	Asanas Group	-8.28*	0.00
	Pranayama Group	-8.22*	0.00
	Asana Pranayama Group	-9.14*	0.00

Based on estimated marginal means

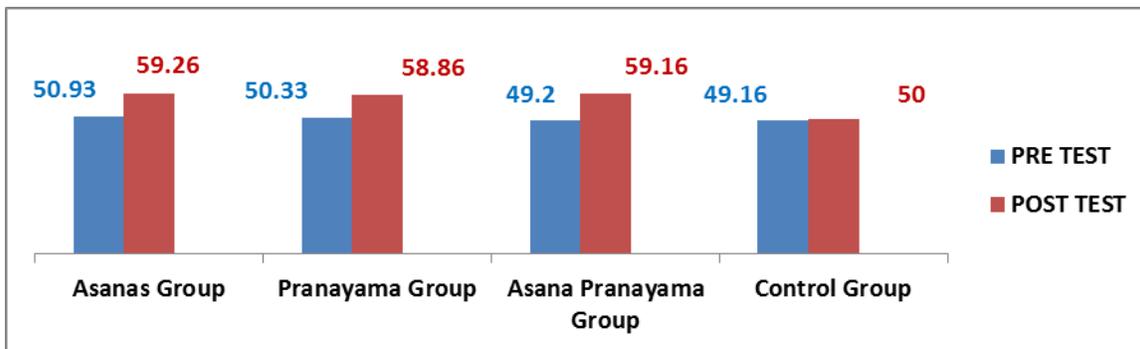
a. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

* The mean difference is significant at the 0.05 level.

Table no. 28 indicates the values of post hoc test for the selected Groups for psychological variable of self concept, which shows that a significant difference was found between the post test values of Asanas Group and the Control Group as the value was found to be 8.28 which was significant at 0.05 level, the post

test values of Pranayama Group and the Control Group as the value was found to be 8.22 which was significant at 0.05 level, Asana Pranayama Group and the Control Group as the value was found to be 9.14 which was significant at 0.05 level.

FIGURE:-7



COMPARISON OF THE MEANS ON SELF CONCEPT OF THE CONTROL GROUP AND THREE EXPERIMENTAL GROUPS

VIII. DISCUSSION

BEHAVIOUR

Table 3 was referred back into the result section. It could be seen from the table that there was a significant difference in case of behaviour after administrating the different training programme namely Asana, Pranayama and combination of Asana Pranayama.

The post hoc test (Table 4) revealed that behaviour was significantly improved in Asana Pranayama among the three experimental programme followed by Pranayama programme and Asanas programme Groups.

The effectiveness of combination of Asana Pranayama programme in comparison to other training programme may be due to the reason that both Asana Pranayama programme increase the level of behaviour. Therefore, proposed hypothesis has been accepted in case of behaviour.

INTELLECTUAL AND SCHOOL STATUS

Table 7 was referred back into the result section. It could be seen from the table that there was a significant difference in case of intellectual and school status after administrating the different training programme namely Asana, Pranayama and combination of Asana Pranayama.

The post hoc test (Table 8) revealed that intellectual and school status was significantly improved in Asana Pranayama among the three experimental programme followed by Asanas programme and Pranayama programme Groups.

The effectiveness of combination of Asana Pranayama programme in comparison to other training programme may be due to the reason that both Asana Pranayama programme increase the level of intellectual and school status. Therefore, proposed hypothesis has been accepted in case of intellectual and school status.

PHYSICAL APPEARANCE AND ATTRIBUTES

Table 11 was referred back into the result section. It could be seen from the table that there was a significant difference in case of physical appearance and attributes after administrating the different training programme namely Asana, Pranayama and combination of Asana Pranayama.

The post hoc test (Table 12) revealed that physical appearance and attributes was significantly improved in Asanas among the three experimental programme followed by Pranayama programme and Asana Pranayama programme Groups.

The effectiveness of Asanas programme in comparison to other training programme may be due to the reason that Asanas programme increase physical appearance and attributes. Therefore, proposed hypothesis has been accepted in case of physical appearance and attributes.

ANXIETY

Table 15 was referred back into the result section. It could be seen from the table that there was a significant difference in case of anxiety after administrating the different training programme namely Asana, Pranayama and combination of Asana Pranayama.

The post hoc test (Table 16) revealed that anxiety was significantly improved in Asana Pranayama among the three experimental programme followed by Pranayama programme and Asanas programme Groups.

The effectiveness of combination of Asana Pranayama programme in comparison to other training programme may be due to the reason that both Asana Pranayama programme decrease the level of anxiety of individuals. Therefore, proposed hypothesis has been accepted in case of anxiety.

POPULARITY

Table 19 was referred back into the result section. It could be seen from the table that there was a significant difference in case of popularity after administrating the different training programme namely Asana, Pranayama and combination of Asana Pranayama.

The post hoc test (Table 20) revealed that popularity was significantly improved in Asana Pranayama among the three experimental programme followed by Pranayama programme and Asanas programme Groups.

The effectiveness of combination of Asana Pranayama programme in comparison to other training programme may be due to the reason that both Asana Pranayama programme

increase popularity. Therefore, proposed hypothesis has been accepted in case of popularity.

HAPPINESS AND SATISFACTION

Table 23 was referred back into the result section. It could be seen from the table that there was a significant difference in case of happiness and satisfaction after administrating the different training programme namely Asana, Pranayama and combination of Asana Pranayama.

The post hoc test (Table 24) revealed that happiness and satisfaction was significantly improved in Pranayama among the three experimental programme followed by Asanas programme and Asana Pranayama programme Groups.

The effectiveness of Pranayama programme in comparison to other training programme may be due to the reason that Pranayama programme increase happiness and satisfaction. Therefore, proposed hypothesis has been accepted in case of happiness and satisfaction.

SELF CONCEPT

Table 27 was referred back into the result section. It could be seen from the table that there was a significant difference in case of self concept after administrating the different training programme namely Asana, Pranayama and combination of Asana Pranayama.

The post hoc test (Table 28) revealed that self concept was significantly improved in Asana Pranayama among the three experimental programme followed by Pranayama programme and Asanas programme Groups.

The effectiveness of combination of Asana Pranayama programme in comparison to other training programme may be due to the reason that both Asana Pranayama programme increase self awareness of an individual regarding self and others. Therefore, proposed hypothesis has been accepted in case of self concept.

IX. CONCLUSIONS

1. Asanas, Pranayama and combination of Asana Pranayama also improve the Behaviour of school going children.
2. Asanas, Pranayama and combination of Asana Pranayama also improve the Intellectual and school status of school going children.
3. Asanas, Pranayama and combination of Asana Pranayama also improve the Physical appearance and attributes of school going children.
4. Asanas, Pranayama and combination of Asana Pranayama also improve the Anxiety of school going children.
5. Asanas, Pranayama and combination of Asana Pranayama also improve the Popularity of school going children.
6. Asanas, Pranayama and combination of Asana Pranayama also improve the Happiness and satisfaction of school going children.
7. Asanas, Pranayama and combination of Asana Pranayama also improve the self concept of school going children.

X. RECOMMENDATIONS

It will be appreciated if following studies may be executed in future for upliftment of human beings like

- ❖ Sportsmen from different games and sports.
- ❖ Boys of different age groups (Childhood, College going).
- ❖ Girls of different groups (Childhood, Adolescent & College going).
- ❖ Working and non working males and females from different work of life's.
- ❖ Senior Citizens male and female .
- ❖ It is further noted that the same research may be conducted on larger population of different age groups and genders.

REFERENCES

- [1] Alvarez, J. A. (1993) A study of high school students perceptions of school stress, coping resources and stress responses. Unpublished Doctoral Thesis, Dissertation Abstracts International, Vol. 55(3), 468.
- [2] Archer, J. & Lamin, A. (1985) An investigation of personal and academic stressors on college campuses, *Journal of College Student Personnel*. Vol. 26(3), 210-215.
- [3] Asha, C.B. (2003) Creativity, Intelligence, Academic Stress And Mental Health. *Journal of Community Guidance and Research*, Vol. 20 (1), 41-47.
- [4] Bisht, A.R (1980) Interactive effect of school climate and need for academic achievement on The Academic Stress of Students. Education, Almora Constituent College, Kumon University.
- [5] Bisht, A. R. (1987) Bisht battery of stress scales. National Psychological Corporation Agra. Chauhan S.S (1978) *Advanced Educational Psychology*, Vikash Publication Pvt. Ltd.
- [6] Dewan (2003) *Journal of Educational Research and Extension*. Vol. 41(3), July-Sep. (2004)
- [7] Flocco, D. C. (2005) School schedules and how they impact student perceptions of stress. Unpublished Doctoral Thesis, Dissertation Abstracts International, June Vol. 65 (12), 4411.
- [8] Graver et.al (1988) Role of Yoga in the treatment of Psychoneurosis, *PGI Psychiatry*, 29 253 -258.
- [9] Kochar, H.C (1972) Yoga practice as a variable in neuroticism, anxiety and hostility, *Yoga*
- [10] *Mimansa*, 15, 37-46.
- [11]
- [12] Kochar, H.C (1976) Influence of Yogic Practices on mental Fatigue. *Yoga-Mimansa* Vol. 28 (2), 3.
- [13] Kochar, H.C (1976-77) Effect of yogic practices on immediate memory, *Yoga Mimansa* 18, 57-
- [14] 61.
- [15] Kumari, Santosh et.al (2005) Impact of Yogic Shatkriyas and Pranayamas on stress of senior
- [16] secondary student, *Yoga Mimansa*, Vol. 37, No. 1 & 2., 23-30.
- [17] Mangal, S.K (2002) *Advanced Educational Psychology*, Prentice Hall of India Private Lim.
- [18] Pratap, V. (1971) Investigation on Trataka, collected papers on yoga, Lonavala, Kaivalyadhama, 16.
- [19] Tirth, Omanand (1960) *Patanjal Yog Paradeep*, Geeta Press Gorkhpur. Sahu, R.J & Bhole, M.V. (1983) Effect of three week Yogic training programme on psychomotor performance, *Yoga Mimansa*, 22, 59-62.

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Synthesis, Characterization of Water Soluble PS-*b*-PEO-*b*-PS Tri-block Copolymers and its Corrosion Inhibition Behaviour on Mild Steel in Acidic Solution

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Abstract- The high molecular weight poly (ethylene oxide) was used to synthesize telechelic bromine terminated poly (ethylene oxide) polymers. The low molecular weight polystyrene anion was generated by living anionic polymerization by controlling monomer/initiator ratio. The living polystyrene anion was reacted with telechelic bromine terminated poly (ethylene oxide) polymers to obtain water soluble polystyrene-*b*-poly(ethylene oxide)-*b*-polystyrene tri-block copolymers. The effect of polystyrene-*b*-poly(ethylene oxide)-*b*-polystyrene (PS-*b*-PEO-*b*-PS) block copolymer on the mild steel corrosion in 1M sulfuric acid solution has been investigated at various inhibitor concentrations and temperatures by Potentiodynamic Polarization Study. The investigated results showed that the corrosion rate decreased significantly with increase in the concentration of inhibitors. The shape of polarization profiles of the polymer at various concentrations indicated their mixed-type nature of inhibition.

Index Terms- poly(ethylene oxide), PS-*b*-PEO-*b*-PS block copolymer, anionic polymerization, potentiodynamic polarization studies.

I. INTRODUCTION

Mild steel is an alloy, which is one of the commercial forms of iron and is very prone to corrosion particularly in acidic medium. Acidic solutions are extensively used for different purposes in chemical laboratories and in several industrial processes such as acid pickling, acid cleaning, acid descaling and oil well acidizing, etc. Iron and its alloys could corrode during these acidic applications particularly with the use of hydrochloric acid and sulphuric acid, which effects in dreadful waste of both resources and money. One way to protect the metal against corrosion is to add certain organic molecules, which adsorb on the surface and form a protective layer.¹⁻⁴ The unique advantage of the possibility of adding inhibitors is that this can be done without disruption of the industrial process. Specific chemical compounds are often used as inhibitors in these processes mainly to control the metal dissolution reaction and thereby increasing the service life of steel materials. Organic corrosion inhibitors are useful when their addition in small amounts prevents corrosion. At higher concentrations of organic compounds added additional testing for environmental impact is required. Compounds

containing nitrogen, sulphur and oxygen are being used as inhibitors.⁵ The most efficient inhibitors are organic compounds having pi bonds in their structures. Owing to the multiple adsorption sites, polymeric compounds adsorb more strongly on the metal surface compared with their monomer analogues. Therefore, it is expected that the polymers will be better corrosion inhibitors.⁶⁻¹⁶ However, by increasing the hydrocarbon chain length, solubility of the polymer decreases. Thus, the presence of hydrophilic functional groups which increase the solubility is required. The PEO was used as hydrophilic block in many polymers.^{10,17-22} Depending on the ratio of hydrophilic and hydrophilic block solution behaviour of the block copolymers may change. For instance if the block copolymers consist of bulkier hydrophilic block and smaller hydrophobic block then it can directly dissolve in water to studied the solution behaviour.²³ Since the concept was established by Szwarc in 1956.²⁴ The living anionic polymerization method has become a very useful technique to synthesize well-defined polymeric materials with controlled molecular weight and narrow polydispersity index.²⁵ This technique is very helpful to design the degree of polymerization in requisite block by simply controlling the monomer/initiator ratio for the synthesis of block copolymers by sequential living anionic polymerization.²⁶⁻²⁸ But due to due to the low nucleophilic reactivity of poly(ethylene oxide) oxyanion which cannot initiate the polymerization of styrene,^{28,29} it was difficult to synthesize amphiphilic polystyrene-*b*-poly(ethylene oxide)-*b*-polystyrene (PS-*b*-PEO-*b*-PS) triblock copolymers through living anionic polymerization.²⁸ The synthesis of PS-*b*-PEO-*b*-PS tri-block copolymers was carried out by our research group by using telechelic bromine-terminated PEO oligomer (Br-PEO-Br).³⁰ However, the low contents of PEO block results poor water solubility of. In this report, telechelic bromine-terminated PEO polymers was used to synthesize water soluble PS-*b*-PEO-*b*-PS tri-block copolymers through living anionic polymerization by controlling monomer/initiator ratio. The water soluble PS-*b*-PEO-*b*-PS tri-block copolymers were used to study its inhibition action on the mild steel corrosion in H₂SO₄ solution at a temperature range of 298 K-328 K. The work is carried out to establish the effective concentration for good inhibition action for mild steel corrosion in H₂SO₄ solution.

II. MATERIALS AND METHODS

Poly(ethylene glycol) (PEG, Aldrich, USA) of molecular weight 20000, were dried by azeotropic distillation with toluene prior to use. A trace of residual toluene was removed under vacuum just prior to use. Styrene (Aldrich, USA) was washed with 10 % (w/v) of aqueous NaOH solution followed by washing with distilled water to remove the inhibitor and stirred over CaH₂ overnight. Then, the styrene was distilled under reduce pressure and the middle portion was stored under argon atmosphere until use. Tetrahydrofuran (THF, Spectrochem, India) was first distilled and then the middle portion was refluxed over Na-benzophenone complex until the purple colour persists. Phosphorous tribromide (Spectrochem, India) and *sec*-butyllithium (*sec*-BuLi, Aldrich, USA) were used as received.

The chemical compositions weight % of mild steel was as follows:

C	Si	S	P	Mn	Fe
0.15	0.31	0.025	0.025	1.02	Balance

All solutions were prepared from doubly distilled water and AR grade H₂SO₄ was used. The concentration range of inhibitor employed was 1600ppm, 1200ppm, 800ppm and 400ppm in 1 M H₂SO₄.

The working electrode (WE) for the potentiodynamic studies was cut from mild steel rod and was soldered on one end with an insulated copper wire and it was then embedded in chemical epoxy resin (ARALDITE) leaving the exposed surface area of 1 cm² for the studies. The counter electrode was platinum and reference was saturated calomel electrode (SCE) coupled to luggin capillary. The potential of the metal electrode versus reference electrode was measured with the help of Galvanostat. A steady state potential was achieved in 4-5 hours. Potentiodynamic polarization measurements were performed using electrochemical analyzer CHI 6021B under aerated conditions. Potentiodynamic anodic and cathodic polarization curves were obtained with a scan rate of 0.001Vs⁻¹ in the potential range from -1.2V to 0.2V relative to the corrosion potential (E_{corr}).

III. EXPERIMENTAL

Synthesis of bromine terminated poly(ethylene oxide) (Br-PEO-Br)

Bromine terminated poly(ethylene oxide) (Br-PEO-Br) was prepared as reported in the literature.³¹ The procedure to prepare Br-PEO-Br from PEG of molecular weight 20000 (PEG) is presented here as reference procedure. Dried PEG (25 g, 1.25 mmol) was taken in a 250 mL two necked round bottom flask, which was kept under argon atmosphere after applying vacuum for two hours. Phosphorous tribromide (PBr₃) (0.1 mL, 1.25 mmol) was added over a period of 30 min and the mixture was stirred at 110 °C for 5 h. The unreacted PBr₃ was removed by applying vacuum of 10⁻⁶ torr at 60 °C and after cooling, chloroform (100 mL) was added to the reaction mixture, which was then filtered. Chloroform was evaporated in vacuum to get Br-PEO-Br as white waxy material.

Synthesis of PS-*b*-PEO-*b*-PS tri-block copolymers using Br-PEO-Br

To synthesize PS-*b*-PEO-*b*-PS tri-block copolymers, first, Br-PEO-Br was prepared as reported in the literature.³¹ Then, in a reaction flask, living polystyryl anion (PSLi) was generated as reported in the literature.³² In a separate reaction flask, fitted with the 3-way stopcock which consists of argon containing balloon, required quantity of Br-PEO-Br was taken and vacuum of 10⁻⁶ mm/Hg was applied at 80 °C for 6 h to remove any traces of moisture. Then, a known quantity of freshly freeze-pump-thawed THF was vacuum-transferred into the flask containing Br-PEO-Br. The resulting THF solution of Br-PEO-Br (20 % w/v) was transferred into the living PSLi (polystyrene anion: Br-PEO-Br = 2.4:1 molar ratio) under argon atmosphere at -78 °C using flamed dried cannula. Within few seconds, the persisting orange red colour of living PSLi was disappeared and turns into colourless solution. The solution was stirred for another 3 h at -78 °C and then warmed to room temperature. At the end, the reaction mixture was poured into ten fold excess of hexane and the resulting white precipitate was filtered, dried, washed with cyclohexane to remove homo polystyrene.

Characterization

Fourier transform infrared (FT-IR) spectra were recorded as KBr pellets using Nicolet Impact 400 FTIR spectrophotometer. Fourier-transform nuclear magnetic resonance (FT-NMR) spectra were recorded using a Bruker DPX-300 NMR instrument using deuterated chloroform (CDCl₃) as the solvent and tetramethylsilane as an internal standard. Number average (\bar{M}_n) and weight-average (\bar{M}_w) molecular weights and molecular weight distribution (MWD) were determined by using a gel permeation chromatography (GPC; Waters, USA) instrument equipped with a 2414 differential refractometer (RI Detector) and three μ -styragel columns (10⁵, 10⁴, 10³ Å) in series. HPLC grade THF was used as an eluent at a flow rate of 1.0 mL min⁻¹ and molecular weight calibrations were carried out using polystyrene standards. Differential scanning calorimetric (DSC) studies were carried out using a DSC Q200 instrument (TA Instruments, USA) at a heating rate of 10 °C/min. under nitrogen atmosphere. All the glass transition temperatures (T_g) considered in this investigation are the middle points between the onset and offset points.

Potentiodynamic Polarization Studies

In the present study, 1 M H₂SO₄ was used for the polarization of mild steel at four temperatures namely 298K, 308K, 318K, and 328K. Solutions of various concentrations of inhibitor were prepared in 1M H₂SO₄ namely 1600ppm, 1200ppm, 800 ppm and 400 ppm which were then used for the polarization studies. Potential values were plotted against the logarithm of current densities and various parameters were calculated which are given in table 3. Figure 4 gives the cathodic and anodic polarization curves for these solutions at 298K. An increase in corrosion current values for 1 M H₂SO₄ is observed with the increase in temperature thereby indicating that the extent of corrosion increases with the increase in temperature. E_{corr} almost remains

constant with increase in temperature. Anodic and cathodic Tafel slopes remain almost constant with temperature and $b_c \approx b_a$.

The inhibition efficiency was calculated using the following expression:

$$I\% = \left(\frac{i_o - i}{i_o} \right) \times 100$$

where, i_o is the corrosion current in the uninhibited solution and i is the corrosion current in the inhibited solution.

The corrosion current values are much lower in the presence of the inhibitor than in pure acid. The inhibition efficiency increases with the increase in concentration of the inhibitor. This shows that the inhibition is due to the adsorption of the additive on the mild steel surface. The values of b_c and b_a show irregular trend indicating the involvement of other species/anions present in the solution in the adsorption process. E_{corr} remains constant indicating that polyethylene oxide is a mixed type of inhibitor i.e. blocks both cathodic and anodic reactions to an equal extent.

IV. RESULTS AND DISCUSSION

Living anionic polymerization is playing a major role for the synthesis of well-defined block copolymers by simply controlling the initiator/monomer ratio. Depending on the nature and ratio of other block, the block copolymers having hydrophilic block like PEO shows solubility in water. The PS-*b*-PEO-*b*-PS tri-block copolymers may act as efficient mild steel corrosion inhibitor due to presence of pi bond to its structure as well as hetero elements like oxygen. It is an amphiphilic block copolymers. To increase the solubility in water the telechelic bromine-terminated PEO polymer was used to synthesize PS-*b*-PEO-*b*-PS tri-block copolymers through living anionic polymerization. The degree of polymerization of polystyrene (PS) was controlled by styrene/*sec*-BuLi ratio.

Synthesis of PS-*b*-PEO-*b*-PS tri-block copolymers from Br-PEO-Br

The well-known reaction between alkyl bromide and PSLi was effectively used³³⁻³⁸ by reacting bromide terminated PEO with PSLi to obtain PS-*b*-PEO-*b*-PS tri-block as shown in Scheme 2. For the synthesis of PS-*b*-PEO-*b*-PS tri-block copolymers, bromine terminated PEO, **Br-PEO-Br**, was prepared from PEG (M_n , 20000) using the known procedure.³¹ The complete substitution of hydroxyl group by bromine can be confirmed by the absence of OH signal in the ¹H NMR spectrum^{30,39} of **Br-PEO-Br**, as depicted in Figure 1(b). The -CH₂ protons of -CH₂-CH₂-O- repeating units present in **Br-PEO-Br** resonate at 3.65 ppm, and -CH₂-Br and -OCH₂ protons of -OCH₂-CH₂-Br group resonate at 3.4 ppm and 3.7 ppm respectively. Though ¹H NMR in CDCl₃ confirms complete substitution of OH by Br, the molecular weight determination of PEG using the ¹H NMR in CDCl₃ was not accurate as reported by Jankova.²⁸ To know the molecular weight of PEG through NMR, similar to Jonkova,⁴⁰ ¹H NMR spectrum of PEG in DMSO d₆ was used.⁴⁰ The molecular weight was determined by

comparing the integration values of -OH and -CH₂-CH₂-O protons of PEG. The complete conversion of -OH to Br was also confirmed by FT-IR spectroscopy⁴¹ using the peak at 3600-3400 cm⁻¹ for -OH in PEG which is missing in **Br-PEO-Br** as shown in figure 2(b). In figure 2 (b) the absorption band at 1110 cm⁻¹ is due to the stretching vibration of -C-O-C- of -CH₂-CH₂-O repeating units. GPC analysis of **Br-PEO-Br** and PEG was carried out and the results are presented in Table 1. GPC analysis shows that there is no molecular weight reduction during the synthesis of **Br-PEO-Br** and absence of any side reaction during the synthesis of **Br-PEO-Br**.

After successful synthesis of **Br-PEO-Br**, as shown in Scheme 1, it was reacted with PSLi to get PS-*b*-PEO-*b*-PS tri-block copolymers and the results are presented in Table 2. For the polymerization, the molar concentration of **Br-PEO-Br** was calculated by using the molecular weight of **Br-PEO-Br** obtained through ¹H NMR in DMSO d₆. The stoichiometry of 1: PSLi is very crucial factor to obtain PS-*b*-PEO-*b*-PS tri-block copolymer otherwise it may give mixture of di-block and tri-block copolymers. To ensure the formation of tri-block copolymers, the mole ratio between **Br-PEO-Br** and living PSLi was maintained at 1: 2.4 and the excess polystyrene was removed by washing the product with cyclohexane. To confirm the formation of the tri-block copolymers, GPC was carried out and the results are presented in Table 2. The theoretical molecular weight matches with the experimental molecular weight and MWD of all the tri-block copolymers are narrow. These results show that the formation of tri-block copolymers is through living polymerization.

Spectral studies of PS-*b*-PEO-*b*-PS tri-block copolymers

After successful synthesis, the structure of the PS-*b*-PEO-*b*-PS tri-block copolymers was confirmed using ¹H NMR spectroscopy and ¹H NMR spectrum of P2 shown in Figure 1(c). The -CH₂ protons of CH₂-CH₂-O repeating units of PEO appear at 3.65 ppm, but the peaks at 3.4 ppm and 3.7 ppm are absent due to the removal of Br during the synthesis of tri-block copolymers. The terminal -CH₃ protons of *sec*-BuLi appear at 0.56 ppm. The -CH and -CH₂ protons of polystyrene block generally appear at 1.90 ppm and 1.42 ppm respectively, but in the present case, they merge with the -CH₂ and -CH protons of

sec-BuLi at 1.22-1.92 ppm. The \overline{M}_n values of the tri-block copolymers were calculated also using ¹H NMR spectra by comparing the integration values of -OCH₂-CH₂ protons of PEO and phenyl protons present in the polystyrene block of the tri-

block copolymers. It is interesting to note that the \overline{M}_n values calculated through ¹H NMR spectra match with the \overline{M}_n determined through GPC as summarized in Table 2. These results, again, confirm the formation of PS-*b*-PEO-*b*-PS tri-block copolymers. The PS-*b*-PEO-*b*-PS tri-block copolymer, P2. To confirm the structure further, FT-IR spectra of PS-*b*-PEO-*b*-PS tri-block copolymer were obtained. **Figure 2 (c)** depicts the FT-IR spectrum of PS-*b*-PEO-*b*-PS triblock copolymer P2 (c.f **Table 2**). In the FT-IR spectrum of PS-*b*-PEO-*b*-PS triblock copolymer, -C-H asymmetric and symmetric stretching vibrations of -CH₂ groups present in PSt and PEO are observed at 2853-3058 cm⁻¹.

The absorption band at 1110 cm⁻¹ is due to the stretching vibration of -C-O-C- of -CH₂-CH₂-O repeating units present in PEO block. In addition to these absorption peaks, new peaks were observed at 3060-3095 cm⁻¹, 1601 cm⁻¹, 1454-1492 cm⁻¹, and 757-698 cm⁻¹ which are due to the -C=C-H stretching of phenyl ring, -C=C- stretching of phenyl ring, benzene ring stretching and -C=C-H out plane bending of phenyl ring of PSt blocks respectively. These new peaks were not present in the FT-IR spectrum of Br-PEO-Br. The presence of all peaks which corresponds to PEO block and new peaks of PSt blocks further support the formation of PS-*b*-PEO-*b*-PS triblock copolymer.

Thermal studies of PS-*b*-PEO-*b*-PS tri-block copolymers

PS-*b*-PEO-*b*-PS triblock (P2) copolymer and Br-PEO-Br were further characterized by DSC and the results are presented in **Figure 3**. PEO segment present in Br-PEO-Br shows *T_g* at -77 °C and melting point (*T_m*) and crystallization temperature (*T_c*) of Br-PEO-Br were observed at 18 °C and -45 °C respectively. The glass transition temperatures of the PEO and the PS segments present in the PS-*b*-PEO-*b*-PS tri-block copolymers were observed at -70 °C and 72 °C respectively. The presence of two

the solution as indicated by the irregular trends of *b_c* and *b_a*.

glass transition temperatures in the PS-*b*-PEO-*b*-PS tri-block copolymers shows the presence of phase separation in the tri-block copolymers.

V. CONCLUSIONS

PS-*b*-PEO-*b*-PS tri-block copolymers are synthesized by living anionic polymerization. The PS-*b*-PEO-*b*-PS tri-block copolymers found to be water soluble having low content of polystyrene block. These PS-*b*-PEO-*b*-PS tri block copolymers are found to be an excellent inhibitor for mild steel in H₂SO₄. The inhibition efficiencies increase with increase in concentration but decrease with increase in temperature for PS-*b*-PEO-*b*-PS. *E_{corr}* remains constant indicating that PS-*b*-PEO-*b*-PS is a mixed type of inhibitor in 1 M H₂SO₄ i.e., blocking both cathodic and anodic reactions almost to an equal extent. Adsorption of PS-*b*-PEO-*b*-PS may have the involvement of other species/anions present in the solution as indicated by the irregular trends of *b_c* and *b_a*.

**Table 1: Characterization of PEG and Br-PEO-Br
For *M_n* = 20,000**

Polymer	$\bar{M}_{n,th} \times 10^{-3}$	$\bar{M}_{n,NMR} \times 10^{-3}$	GPC results		
			$\bar{M}_n \times 10^{-3}$	$\bar{M}_w \times 10^{-3}$	\bar{M}_w / \bar{M}_n
PEG	20.00	20.86	21.34	23.26	1.09
Br-PEO-Br	21.12	21.36	21.46	23.61	1.10

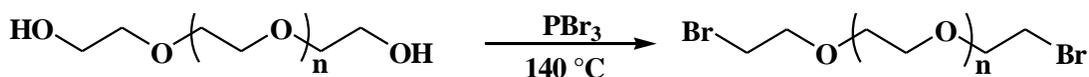
Table 2: Synthesis of PS-*b*-PEO-*b*-PS tri-block copolymers by using 1 at -78 °C

Code	Styrene (mmol)	<i>sec</i> -BuLi (mmol)	^a <i>sec</i> -BuLi : Styrene	Br-PEO-Br (mmol)	^b $\bar{M}_{n,th} \times 10^{-3}$	^c $\bar{M}_{n,NMR} \times 10^{-3}$	GPC Results		
							$\bar{M}_n \times 10^{-3}$	$\bar{M}_w \times 10^{-3}$	\bar{M}_w / \bar{M}_n
P1	9.27	10.87	1:0.852	5.435	20.41	20.89	21.07	23.18	1.10
P2	12.13	4.25	1:2.854	2.125	20.83	21.25	21.89	23.20	1.06
P3	13.45	2.77	1:4.855	1.385	21.24	21.67	22.13	23.45	1.06
P4	28.79	1.53	1:18.816	0.765	24.16	24.78	25.37	27.14	1.07
P5	65.87	1.69	1:38.976	0.845	28.33	28.96	29.89	32.28	1.08

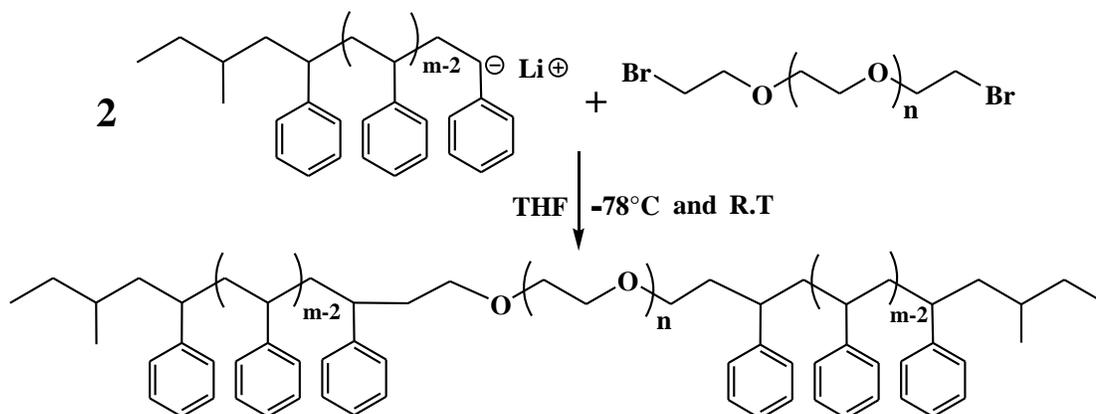
Table 3: Corrosion Parameters of mild steel in 1 M H₂SO₄ in the presence of PS-*b*-PEO-*b*-PS triblock copolymer

Temp.(K)	Conc. (ppm)	I _{corr} (mA/cm ²)	-E _{corr} vs SCE (mV)	b _a (mV/dec.)	b _c (mV/dec.)	IE%
298 K	Blank	9.679	465	70.59	60.89	-
	400	1.682	447	127.19	75.19	82.62
	800	0.962	460	268.13	77.79	90.06
	1200	0.362	457	241.14	82.16	96.26
	1600	0.124	441	283.45	89.13	98.72
308 K	Blank	17.12	475	59.24	52.82	-
	400	3.371	441	83.47	65.45	80.31
	800	2.280	425	87.52	81.79	86.68
	1200	1.349	432	123.12	85.48	92.12
	1600	0.656	425	163.67	88.19	96.17
318 K	Blank	19.54	481	50.91	48.05	-
	400	7.296	427	74.97	59.09	62.66
	800	6.049	451	72.11	65.52	69.04
	1200	3.836	428	83.32	61.78	80.37
	1600	1.155	473	165.31	59.14	94.09
328 K	Blank	22.09	490	58.00	47.05	-
	400	8.889	429	79.19	53.13	59.76
	800	8.137	485	43.21	49.51	63.16
	1200	7.405	424	81.54	54.32	66.48
	1600	6.746	438	78.09	59.25	69.46

Scheme 1: Synthesis of Br-PEO-Br from PEG



Scheme 2: Synthesis of PS-*b*-PEO-*b*-PS triblock copolymers by living anionic polymerization



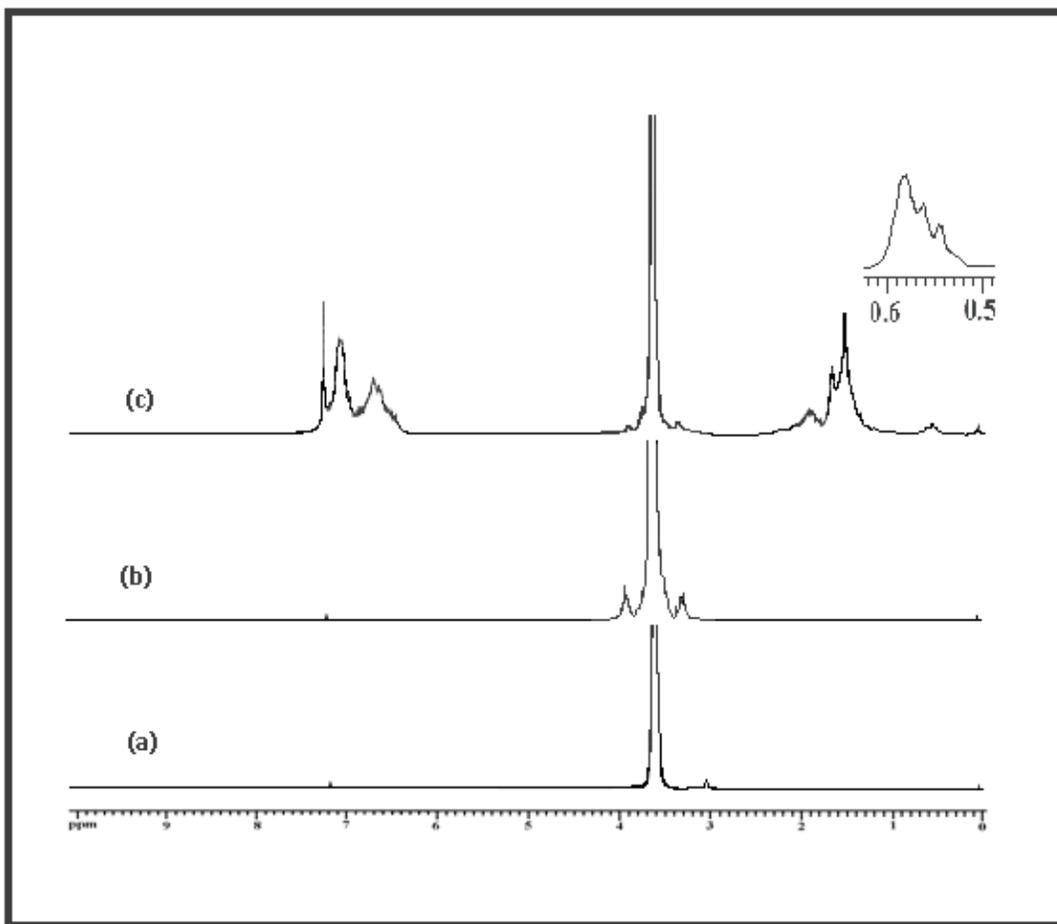


Figure 1: ^1H NMR spectra of (a) PEG (b) Br-PEO-Br and (c) PS-*b*-PEO-*b*-PS tri-block copolymers, P2

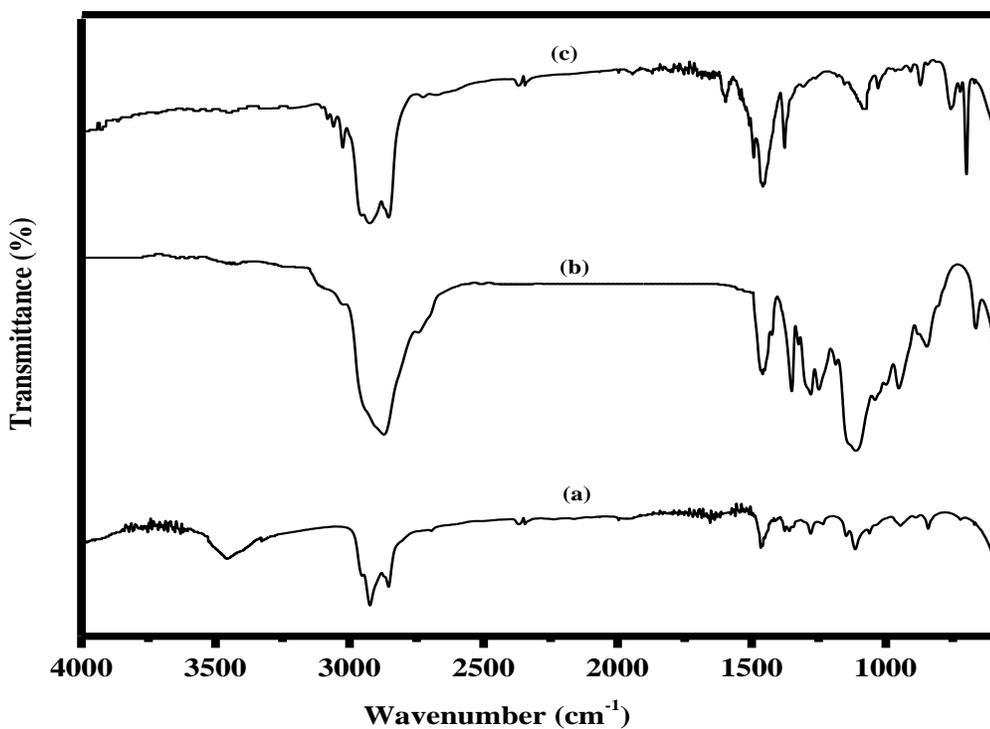


Figure 2: FT-IR spectra of (a) PEG, (b) Br-PEO-Br and (c) PS-*b*-PEO-*b*-PS tri-block copolymer, P2

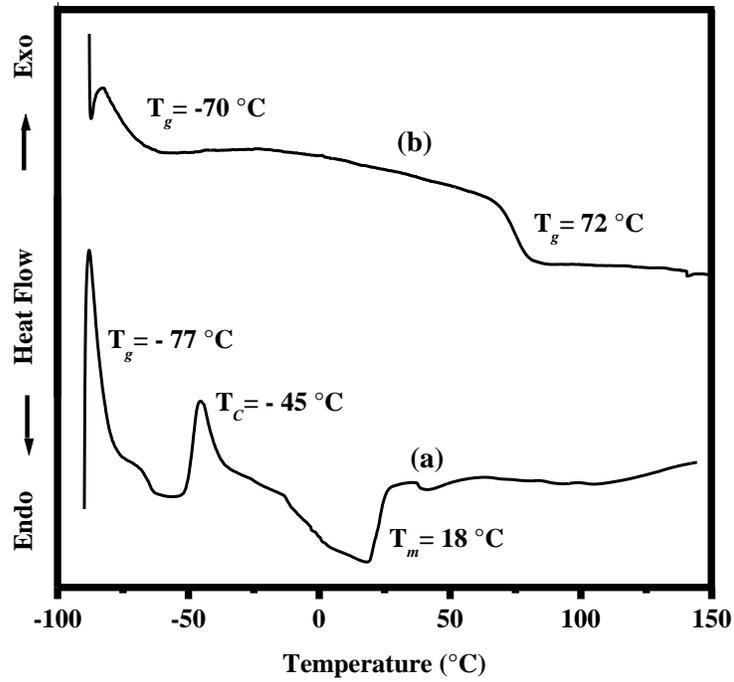


Figure 3: DSC curves of Br-PEO-Br and (b) PS-*b*-PEO-*b*-PS tri-block copolymer, P2

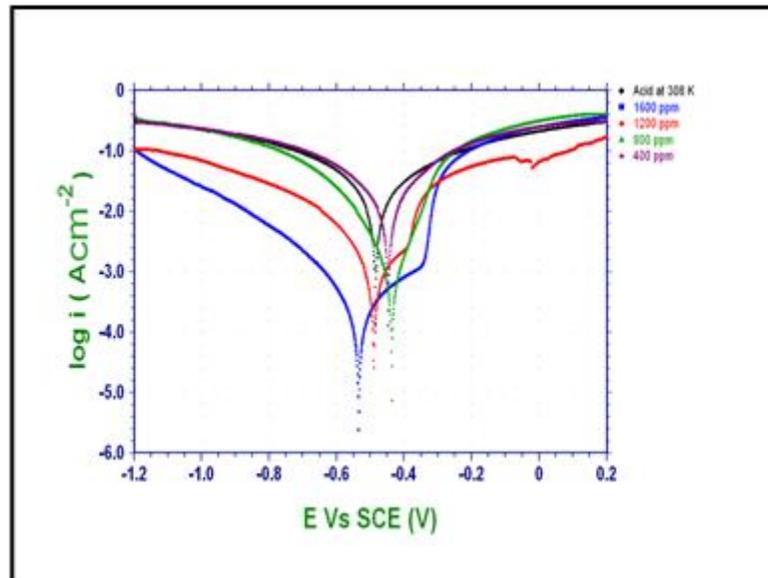


Figure 4: Tafel polarization curves of mild steel in 1M H₂SO₄ and in the presence of different concentrations of PS-*b*-PEO-*b*-PS tri-block copolymer, P2 at 298K.

REFERENCES

- [1] S.A. Ali; M.T. Saeed; S.V. Rahman, *Corros. Sci.* 45, 253 2003.
- [2] J.E. Albuquerque; L.H.C. Mattoso; D.T. Balogh; R.M. Faria; J.G. Masters; A.G. MacDiarmid, *Synth. Met.* 113, 19 2000.
- [3] E.M. Genies; A. Boyle; M. Lapkowski; C. Tsintavis, *Synth. Met.* 36 139 1990.
- [4] M.G. Hosseini; M. Sabouri; T. Shahrabi, *Progress in Organic Coatings* 60, 178 2007.
- [5] M. Lagrenee; B. Mernari; M. Bouanis; M. Traisnel; F. Bentiss, *Corros. Sci.* 44, 573 2002.
- [6] Y. Wei; J.M. Yeh; H. Wang; X. Jia; C. Yang; D. Jin, *Polym. Mater. Sci. Eng.* 74, 202 1996.
- [7] V. Muralidharan; K.L.N. Phani; S. Pitchumani; S. Ravichandran; S.V.K. Iyer, *J. Electrochem. Soc.* 142, 148 1995.
- [8] K.F. Khaled; N. Hackerman, *Electrochem. Acta* 48, 2715 2003.
- [9] S. Sathiyarayanan; S.K. Dhawan; D.C. Trivedi; K. Balakrishnan, *Corros. Sci.* 33, 1831 1992.
- [10] S. Sathiyarayanan; K. Balakrishnan; S.K. Dhawan; D.C. Trivedi, *Electrochim. Acta* 39, 831 1994.
- [11] Sakhalkar, S. S.; Hirt, D. E., *Langmuir* 11, 3369 1995.
- [12] Lai, C. L.; Harwell, J. H.; O'Rear, E. A.; Komatsuzaki, S.; Arai, J.; Nakakawaji, T.; Ito, Y., *Langmuir* 11, 905 1995.
- [13] Funkhouser, G. P.; Arevalo, M. P.; Glatzhofer, D. T.; O'Rear, E., *Langmuir* 11, 1443 1995.
- [14] Grady, B. P.; O'Rear, E. A.; Penn, L. S.; Pedicini, A., *Polym. Compos.* 19, 5 1998.
- [15] O. Olivares; N.V. Likhanova; B. Go´mez; J. Navarrete; M.E. Llanos-Serrano; E. Arce; J.M. Hallen, *Appl. Surf. Sci.* 252 2894 2006.
- [16] A.M. Pharhad Hussain; A. Kumar, *Bull. Mater. Sci.* 26 329 2003.
- [17] H. Ashassi-Sorkhabi; N. Ghalebsaz-Jeddi; F. Hashemzadeh; H. Jahani, *Electrochimica Acta* 51 3848 2006.
- [18] B. Muller; I. Forster; W. Klager, *Prog. Org. Coat.* 31 229 1997.
- [19] A. El-Sayed, *Corros. Prev. Control* 43 27 1996
- [20] K.S. Khairou; A. El-Sayed, *J. Appl. Polym. Sci.* 88 866 2003.
- [21] S. Abd El Wanees; A. Abd El Aal; E.E. Abd El Aal, B., *Corros. J.* 28 222 1993.
- [22] H. Ashassi-Sorkhabi; N. Ghalebsaz-Jeddi, *Mater. Chem. Phys.* 92 480 2005.
- [23] Y. Jianguo; W. Lin; V. Otieno-Alego; D.P. Schweinsberg, *Corros. Sci.* 37, 975 1995.
- [24] Szwarc, M., *Nature* 178, 1168 1956.
- [25] Levy, M., *Polym. Adv. Technol.* 18, 681 2007.
- [26] Bywater, S., *Prog. Polym. Sci.* 4, 27 1974.
- [27] Morton, M. F., L., J. *Rubber Chem. Technol.* 48, 359 1975.
- [28] Jankova, K.; Chen, X.; Kops, J.; Batsberg, W., *Macromolecules* 31 538 1998
- [29] Sheikh, R. K.; Tharanikkarasu, K.; Imae, I.; Kawakami, Y., *Macromolecules* 34, 4384 2001.
- [30] Das, P. J.; Barak, A.; Kawakami, Y.; Kannan, T., *J. Polym. Sci. Part A: Polym. Chem.* 49, 1376 2011.
- [31] Dau, J.; Lagaly, G. C., *Chemica Acta* 71, 983 1998
- [32] Hairo, A.; Haraguchi, N.; Sugiyama, K., *Macromolecules* 32 48 1999.
- [33] Hayashi, M.; Nakahama, S.; Hairo, A., *Macromolecules* 32, 1325 1999.
- [34] Hairo, A.; Hayashi, M.; Higashihara, T., *Macromol. Chem. Phys.* 202, 3165 2001.
- [35] Hairo, A.; Higashihara, T.; Nagura, M.; Sakurai, T., *Macromolecules* 39, 6081 2006.
- [36] Wang, X.; Xia, J.; He, J.; Yu, F.; Li, A.; Xu, J.; Lu, H.; Yang, Y., *Macromolecules* 39 6898 2006
- [37] Higashihara, T. H., A., *J. Polym. Sci., Part A: Polym. Chem.* 42 4535 2004.
- [38] Zhao, Y.; Higashihara, T.; Sugiyama, K.; Hairo, A., *Macromolecules* 40, 228 2007
- [39] Tang, X.; Gao, L.; Fan, X.; Zhou, Q., *J. Polym. Sci. Part A: Polym. Chem.* 45, 2225 2007.
- [40] Jankova, K.; Kops, J., *J. App. Polym. Sci.* 54, 1027 1994.
- [41] Xu, Z.; Hu, X.; Li, X.; Yi, C., *J. Polym. Sci. Part A: Polym. Chem.* 46 481 2008.

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Scope of education and dropout among tribal students in Kerala -A study of Scheduled tribes in Attappady

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ABSTARCT

Scheduled Tribes in India are generally considered to be 'Adivasis,' meaning indigenous people or original inhabitants of the country. The tribes have been confined to low status and are often physically and socially isolated instead of being absorbed in the mainstream Hindu population. Psychologically, the Scheduled Tribes often experience passive indifference that may take the form of exclusion from educational opportunities, social participation, and access to their own land. All tribal communities are not alike. They are products of different historical and social conditions. They belong to different racial stocks and religious backgrounds and speak different dialects. Discrimination against women, occupational differentiation, and emphasis on status and hierarchical social ordering that characterize the predominant mainstream culture are generally absent among the tribal groups. Adivasis are not as a general rule regarded as unclean or polluted in the same way as the Scheduled Caste population is perceived by the mainstream culture. However, the mainstream Hindu population considers the general tribal population as primitive, technologically backward, and illiterate. Since the 16th century, the tribes have been perceived as sub-humans who live under primitive conditions. All the reasons are the route cause of the alienation of tribals in education and the Dropout. By giving more emphasis on other activities in the tribal hamlet, they are ignoring the value of education.

Key words: Adivasis, tribal culture, Dropout, Alienation, Mainstream culture

INTRODUCTION

India is homeland to a number of tribal communities with diverse eco-cultural, socio-economic and geographical backgrounds. According to the 2001 Census, Scheduled Tribes (notified by the Government of India under Article 342 of the Indian Constitution) constitute 8.14% of the total population of the country, numbering 84.51 million. In the state of Kerala, 1% of the total population is tribal population, comprising of 36 unique Scheduled Tribes (ST) whose livelihoods are also varied: hunting-gathering, shifting cultivation, settled agriculture, contract labour, etc., are some of them. According to the 2001 Census, the literacy rate of the Scheduled Tribes of India is only 47.10%. Against the National literacy rate of 65.8%, this is appalling. Even in the State of Kerala with a high literacy rate at 90.92%, that of the Scheduled Tribes is far behind, at only 64.5%. Realizing that Scheduled Tribes are one of the most deprived and marginalized groups with respect to education, a host of programmes and measures have been initiated ever since independence of the country. Education of ST children is important not just due to a Constitutional obligation to equality of its citizen or special entitlements to ST, but because it is a crucial input in the nation's strategy of total development of tribal communities. However, despite nation's efforts to ensure constitutional equality, dignity and development that they themselves wish for, the tribal people have lagged behind in education owing to external as well as internal constraints, socio-economic and cultural background of the tribals and psychological problems of first generation learners etc.

The Scheduled Tribe population represents one of the most economically impoverished and marginalized groups in India. Although Scheduled Tribes are a minority, they constitute about 8.2 % of the total population in India (Census of India, 2001), or 85 million people in absolute number. The Scheduled Tribes are not discriminated against in the same way by the mainstream Hindu population as the Scheduled Caste population in India. While the latter group belongs to the lowest hierarchy of social order and is often considered impure or unclean, the Scheduled Tribes have, for the most part, been socially distanced and living outside the mainstream Hindu society. The areas inhabited by the tribal population constitute a significant part of the underdeveloped areas of the country. Scheduled Tribe population represents one of the most economically impoverished and marginalized groups in India.

Education is the most important instrument for human resource development and has a great significance. One cannot imagine education without schools as it plays a major role in moulding the basic ideas, habits and attitudes of the children, with a view to producing well balanced individuals. Schools provide not only education to the children but also keep them away from the social evils. The main problem in schools is the problem of stagnation and drop out phenomena. Education is the key that opens the door of life. It plays a pivotal role in social change and it brings perfections in human life, an upward mobility in social status, radical transformation in outlook and perception. Education is widely accepted as the essential tool for the attainment of the developmental goals and leads to political consciousness, awareness of rights and duties among the

people of a nation and it is the most important instrument for human resource development and has a great significance in the context of developing countries.

The Indian Constitution identifies and provides special consideration for certain ethnic minority groups, traditionally referred to as tribes or tribals, as Scheduled Tribes (STs) who constitute around 8 per cent of the total population of the country. There are 573 STs living in different parts of the country. Most of the tribal communities have their own languages and culture different from the language spoken in the state where they are located. There are more than 270 such languages. Tribal communities in Kerala are scattered in different districts. Of these the highest concentration is located in wayanad, Idukki and Attappady block of Plakkad District. There are more than 37 tribal communities in kerala.

Scheduled Tribes who have been historically out of the mainstream development initiatives partly due to the still continuing socio-economic barriers and partly due to the inadequacy of the Government programmes in reaching these disadvantaged groups, still find themselves in difficult to compete with other sections of the society. Tribes are very important in constituting the population of the country as they are 8.2 percent of the total population of India. They constitute 3.2 percent of the total population of Kerala. Tribal education has many problems to face as hindrance for development. These are external constraints and internal constraints.

External constrains: ST students constitutes 1.2 percent of the total enrollment in schools. The perspective adopted for educational development among tribal communities fails to adequately address the specific disadvantages characterizing tribal population .For instance, the population and distance norms formed by the government have not been beneficial to tribal locations because of their sparse population and sporadic residential patterns. Thogh Kerakla's performance compares well with those of other states. The disparities between the marginalized communities and other social groups in terms of quantitative and qualitative indicators. The disparities increase at higher and higher levels of education, particularly in technical and professional education which provide better access to more remunerative jobs. It theses disparities within the state that matter more in view of the high unemployment rate in the state and consequently the highly competitive nature of the labour market Further, in formulating policies and programmes for tribal education it is essential to understand the complex realities of tribal life and the expectation of tribals from the system, and this has never been done either by the tribal welfare department or by the education department. Consequently, no worthwhile policy for tribal education has been formed. Because the more pass percentage rate from the schools of STs can only produces more students for higher education. Besides most of the increase in

employment in the country and the state is taking place in the private sector rather than in the public sector. In such a context job reservation for STs in the public sector become less relevant today in accessing jobs by them.

Internal constraints: The internal problems of tribal education refer to the quality of school provision, suitable teachers, relevance of content and curriculum, medium of instruction, pedagogy, and special supervision. A majority of schools in tribal areas are without basic infrastructure facilities. Normally, school buildings in tribal areas have thatched roofs, dilapidated walls, and non-plastered floors. Research evidence shows that a large number of tribal schools do not have teaching-learning materials, or even blackboards. In tribal areas the opening of a school is equated with the posting of a teacher and same is the case with 'ashram' schools. Though the demand for changing the content and curriculum to suit the tribal context has been an old one, no serious effort has been made in this direction in any state, except for some sporadic pilot projects. The uniform structure and transaction of curriculum has put tribal children at a disadvantage. Apart from all this lack of awareness of the teachers about tribal culture and environment also force the tribal students to withdraw from education. All these issues are emerging in their primary and high school levels. These constraints force them to drop-out their education at very early levels and higher education will be only a dream for them.

Review of Literature

Review of related literature is pre-requisite to actual planning of any scientific research. It allows the researcher to acquaint himself with current knowledge in the field or area in which he is going to conduct his research.

A comparison of the traditional and modern system and tribal higher education was made by **Narmadeswer Prased (1991)** who found that the tribe's men desire an education which may enables them to fit in to the modern world. Most of the students are dropping their education because of lack of suitability of present education with the tribal culture. The author suggested that the tribe's men should concentrate more on skilled occupations. Another important suggestion was for the setting up of special schools for them where adequate attention for them is ensured.

Bairathi (1991) has examined the role of education for tribal upliftment has said that the condition of school particularly in the interior parts of tribal settlements is worse. These are not well managed and there is shortage of teachers in most of the schools at all time. Primary level schools are managed by a single teacher. The teacher has to take care of not only the management of school, but also to teach many classes simultaneously in one big room. In such a condition a good standard of education cannot be attained. Shortage of teachers, lack of basic amenities as sitting arrangements, drinking water facilities, and high distance from home to school leads them to loose the interest in education and this force them to drop their study. He made the suggestion for improving the infrastructure facilities to improve the conditions of education and to remove Drop-out.

Gadgil and Dandekar(1991) has studied about the problem of wastages in tribal education by taking a batch of students in first standard in a given year following up in the subsequent years till the last grade are reached. i.e, fifth Drop-outs from school before completing the final grading of primary education constitutes wastes; and the incidence of wastage is computed from the proportion of Drop-out to the initial enrolment in the first grade. He reached the conclusion that attention by the teacher to a great extent can remove drop out. When the students are continuing their education in a better perspective then only they can easily get accessibility to higher education.

The National Council of educational Research and training made substantial contribution to the area of tribal education. A seminar on tribal education in India (**1993**) organized by the National council of educational research and Training discussed the various aspects of tribal education like the facilities available, coverage, wastage and stagnation, utilization of financial assistance, basic problem of tribal education, socio-economic problems, curriculum, methods and text books and the relative roles of Government and voluntary agencies in the education of tribal people. The seminar altogether has suggested a new revised curriculum for tribal education. Familiarity in tribal language by the teachers also is essential for the improvement in tribal educational attainment.

The evaluation committee on the welfare of scheduled castes scheduled tribes and other backward communities in their Report (1993), reviewed the different stages of tribal education in Kerala. Many suggestions were put forward regarding pre-primary education, primary education, higher education welfare of tribal students, improvement of tribal schools, compulsory primary education, education concession, methods to identify the drop-outs, encouragements to the drop-outs to continue in their study etc.

Bapat (1994) studied about tribal education and a well planned system of education for tribals was suggested by to remove the ignorance prevalent among tribals. After analyzing the reasons for the slow progress in tribal education and to remove increased drop-out among tribal children, the author suggested the type of education for the tribal children and adults. The educational system for them should be based on the current cultural history of the tribals. At the end a few suggestions are put forward for the improvement of tribal education by the author by focusing mainly on tribal culture. Authorities should focus mainly on their culture.

Tapse (1995) Enumerating the difficulties likely to be experienced in the field of higher education among the tribal students recommended the remedial measures by which these difficulties should be overcome. He pleaded that tribal education must conserve and develop the aboriginal culture and religion.

Srivastava (1996).The author's argument was that when the percentage of literacy among the tribal communities increased when they attained sufficiently high levels of educational development and when they properly understood their rights and privileges, the integration would automatically be achieved if proper arrangements for tribal development would be taken.

Burman (1996) has given the figures relating to tribal literacy and has revealed the then existing state of affairs in the field of education with regard to literacy. The author found out that inadequate use of tribal language always leads them to make a wrong view about tribal education. Difficulty in the use of tribal languages will force the students to drop their course at very stage of their education.

Objectives of the study

1. To examine the educational facilities available to the tribal students in higher education in Kerala.
2. To study the constraints in tribal education
3. To find out the causes of Drop-out among Tribal students in Kerala.
4. To document the policies and programmes initiated by the Government to improve the educational attainments of Tribal students.

Hypothesis

1. There is a positive relationship between the cultural factors and educational attainment among tribal students in Kerala.
2. There is an exclusionary disparity between the STs and non STs in terms of enrollment and attainment in higher education.

Table 1: Dropout rate in Attappady

Location	2008-2009		2009-2010		2010-2011	
	<i>Number of Dropouts</i>	<i>Percentage of Drop outs</i>	<i>Number of Dropouts</i>	<i>Percentage of Drop outs</i>	<i>Number of Dropouts</i>	<i>Percentage of Drop outs</i>
Agali	187	32.5	149	33.2	120	30.9
Pudhoor	190	33.1	145	32.3	124	27.6
Sholayoor	197	34.2	154	34.3	144	32.1

Source: Survey Data

Tribesfolk in Attappady

Tribal hamlets of Attappady are found in all the three panchayaths, namely, Agali, Pudhur, and Sholayoor. Irula hamlets dominate in all the three panchayaths. Kurumbas reside only in Pudhur and Sholayoor is an exclusively Irula Panchayath. Numerically, Irulas form the largest tribal community (82.25 per cent) followed by Mudugas (12.53 per cent), and Kurumbas (5.22 per cent). The annual compound growth rate of Kurumbas during the period 1961 to 1981 was 2.44 per cent as against 1.61 per cent in the case of Mudugas, and 2.41 per cent in the case of Irulas

Table 2: Reasons for dropout from the perception of teachers

Reasons	Frequency	Percent	Rank
Lack of interest in study	60	100.0	1
Economic problem	55	91.7	2
Health problem	40	66.7	5
Distance from home to school	48	80.0	4
Increases household responsibilities	51	85.0	3
Lack of awareness of parents	32	53.3	7
Crime activities in school	5	8.3	11
Language problem	24	40.0	8
Early marriage	19	31.7	9
Lack of food	5	8.3	10
Lack of proper guidance	34	56.7	6

Source: Survey Data

Reasons for Drop-out among tribal students

1. Low socio-economic status: - Tribals enjoy low socio-economic status. Miller (1988) has identified four major classes of variables such as cognitive variables, physical variables and motivational variables where disadvantaged learners show poor performance as compared with the advantaged groups.

2. Tribal concepts of pleasure:- Tribals are giving more importance for their pleasure such as dance, music and other types of entertainments prevalent in the society.

3. Existence of ethnic stereotypes: - Stereo typing is a natural and inevitable. It helps us to organize life. But such typing turns in to prejudice or stereotypes when based on little facts and it is used as a mechanism to establish the myth of racial or cultural superiority.

4. Tribal concept of learning:- In most of the tribal cultures learning is an active pleasurable event mostly carried on among peers. But the existing system of education does not take in to account their learning style.

5. Linguistic problems:-Tribal languages, except a very few, belong to Austro-Asiatic language family and are different from dominant non tribal languages of India which belong either to the Indo European or the Dravidian family. In most of the time tribals face acute problems in language.

6. Problem of learning English: - Tribals need for English is great, they face problems in learning than their non-tribal counterparts. For tribals their typical use of regional languages interferes with English. For them English are 5th or 6th languages.

7. Problems in learning to read:-Tribals have long oral tradition. Their culture is oral. Their history, myths and traditions are orally handed down from generation to generation. Most of the language does not have scripts of their own; their oral tradition still continues to exist.

8. Psychological problems: - Financial problems of the tribals always make the tribals in a very depressed condition. They have lots of wants and but the means to satisfying them is very less. It leads to many psychological issues

9. Academic and administrative problems: - Even though the number of programmes for the upliftment of tribal education is many, the percentage of people receiving these benefits is very less. Administrative authorities are always showing very neutral attitude towards the education of the tribals.

10. Indifferent attitude of tribal parents: - Tribal parents are mostly illiterate. They always show a very indifferent attitude towards the education of their children. They are interested in providing household responsibilities to their children a very early stage of their education. “The parents of these students do not have

any relationship with the society outside and are unaware of the importance of education. All teachers are talented. Teaching such children is a herculean task”.

11. Indifferent attitude of tribal teachers: Teachers do not take much effort to improve the educational level of the tribal students. Lack of communication, high level of absenteeism in the class, bad result in study, lack of attention in classroom by the tribals are some of the factors that has increased the indifferent attitude of the teachers towards the tribal students.

12. Indifferent attitude of tribal students: Students clearly said don't like someone forcing me to get up early in the morning. So, I was unhappy to go to school... Subjects like Malayalam and Science are good for me, but, English, Hindi and Mathematics are very tough. I could not follow English and Hindi classes. Whenever I commit mistakes, in front of others, teachers used to scold me, beat and pinch my ears. You ask others; almost 90% of the children have similar experiences. See, their beating caused swelling on my legs. Moreover, the staffs ridicule us by calling , adivasi Fed up with all these, my two friends and I decided to run away from the school. One day, we climbed on the compound wall and got on to the branch of a tree outside that was almost touching the compound wall, climbed down, and somehow or other managed to reach our settlement”.

In addition to all the above causes some other causes can also be cited as the background for the reasons for Drop-out. They are:

1. Extreme level of poverty, deprivation and vulnerability
2. High levels of exclusion, developmental, social and economic
3. Extremely low level of empowerment-political, social and economic
4. Low level of access to entitlement
5. Practically zero participation in development matters with no autonomy in any form of decision-making
6. Poor human development with low level of literacy and access to health care
7. Rapid alienation of assets like land
8. Alarming depletion of social capital especially traditional forms of organization and leadership.
9. Quick deterioration of traditional knowledge system and cultural attainment.
10. Fast increasing tendency to use tribal people as ‘cat’s –paws in criminal activities like illicit distillation, cultivation of narcotic plants, stealing of forest wealth etc.

11. Dependency-inducing developmental programmes relying on distribution of benefits rather than building up of capabilities.
12. Implementation of ad hoc and stereotyped developmental programmes in the absence of proper planning.
13. Weak delivery system of public services.
14. Very weak monitoring system.
15. High level of exploitation of women by out-side

Change in curriculum would remain incomplete unless patterns of teacher-student interaction also change in the direction of coercion-free involvement of the ST students. The knowledge of social reality that teachers bring to the classroom, and their perception of the role of education are among the key determinants of teacher's behavior. To a great extent, the norms of teacher-student interaction are shaped by the training that teachers receive prior to employment. Knowledge of social reality and role of education under prevailing social conditions do form a part of present training curricula, but like much else in teacher training, these segments receive a ritualistic observance. Teachers cannot be oriented towards new types of classroom interactions without being exposed to specific issues of social reality and functioning of school.

Tribal child's days in usual days inside their habitat A child's day in a settlement begins with a choice: whether to get up early or laze around is his/her own choice and not forced upon. It is not unusual to see many children sleeping in the open with their pet dogs even during the noon-time. When compared to boys, girls get up early and they help their parents and grandparents in daily chores like fetching water from the nearby river, cleaning utensils, washing clothes, collecting fire-wood, cooking and serving food, looking after younger siblings, cleaning rooms, yard, etc. When parents go for work, a girl child takes care of the home along with her grandparents (if they stay back) and her younger siblings till her parents come back home. The boys usually move inside the forest, either with their parents or with their friends, for collection of forest produce. While roaming inside the forests, they eat whatever edible items they get on their way and whenever they come across a river, they never miss a chance to take a bath and do fishing. They also help their parents in the transaction of collected n.w.f.p (non-wood forest products) item with tribal co-operative society/agents/non-tribes and buy provisions. In addition to these, they help their parents in house construction. Bringing bamboo from the forests, cutting and shaping them for making walls and doors for house, making hearth etc., are some of their jobs in the settlement. Both boys and girls do various activities in their settlements such as climbing on trees, swimming, fishing, making *poonikotta* (bamboo basket used for the collection of forest resources), singing etc. Small children, irrespective of gender, play kitchen activities by imitating their parents. There is no hard and fast rule or appropriate timing for any of their daily activities. Moreover, they are

not controlled by the elders. Punishments in the form of scolding, abusing, beating etc., are usually very rare. They do not even abuse their children for any wrong they commit. If they commit any wrong, it is taken easily and the elders very patiently and politely teach the young ones and advise them not to repeat it again. In any tribal settlement inside the forests, a common scene that one can notice is that of children playing, fishing and swimming in the river nearby. Children are free birds' in their habitat and have unrestricted freedom to move around and enjoy their life. —They learn through participation in economic production and other activities organized by adults, beginning as voluntary participants who perform simple and repetitive tasks while having observational access to the mature practices of elders. It may be that no one pays attention unless one does something wrong; they receive instruction only as a corrective feedback and guidance. Gradually they progress to more advanced tasks they see others perform. In short, a typical day in the forest habitat of a tribal child is care free and uncontrolled.

Relevance of the finding for policy formulation

In a broad sense, the socio-economic and cultural factors among tribals can be outlined as poverty and poor economic conditions, social customs, cultural ethos, lack of awareness and understanding of the value of formal education, conflict and gap between the home and school, etc. Studies on educational deprivation of tribals have inevitably linked it to their poor economic condition and poverty.

Education of tribals cannot be left to short-term Plan strategies. It is important that planners take a long-term view which is embedded in a meaningful policy framework. The most important need to improve the educational status of STs is to improve the strength of the students in school levels. Following are some important findings on tribal education for policy framework.

- Emphasis should be on quality and equity rather than quantity as has been the case in the past. The prime focus should be on provision of quality education that makes tribal communities economically effective and independent.
- In the tribal context, it is essential that the school schedule be prepared as per local requirement rather than following a directive from the state.
- Though it has been highlighted time and again, non concrete step has been taken to provide locally relevant material to tribal students. Availability of locally relevant materials will not only facilitate faster learning but also help children develop a sense of affiliation to school.
- In order to make education effective and sustainable, building partnership between the community and the government is important
- Environment building is of immense importance in the context of educational development among tribal communities. Community awareness and community mobilization, which are its core elements, should received equate importance and attention.

- The level of motivation for education is very low among drop out students. . Age factor is influencing drop out to a great extent. Stagnation is common among and high among the drop outs and is a contributing factor to become dropout. Irregular attendance in the class is the route for drop out. Most of the drop outs are from very poor and low income families. Many dropouts are daily wagers. The unawareness about the importance of education is a contributing factor for drop out. Peer group influence also influences the students to stop their education at very early stages. Drop out rat among boys and girls are same in all area.
- Decentralization of education management is another aspect that needs special consideration in the context of tribal areas.
- Skill development, competency building, and teacher's motivation also need to be strengthened for sustaining educational development. The teacher should be made the centre of educational transformation, and therefore, must remain the primary facilitator.
- .Historical injustice toward tribals should be removed. STs who are studying for higher education are very low. Even in UG and PG courses their strength is very low.
- .in a broader level the first step to improve and to increase tribal's participation in Higher education is to improve their interest in study even from the primary level. Motivation classes, awareness programmes, special incentives, more number of schools in tribal areas, more flexible teachers etc. has to be included in the educational streams. Automatically the pass percentage ratio of the STs will increase. That will produce more Ts in higher education.

REFERNCES

- (1)N.K Ambasht, “ *Impact of education on tribal cultures*”, ‘Indian science Congress,New Delhi,199,pp.34-45
- (2)Alaxander, K.C, Prasad R.R and Jahagirdar, M.P. Tribal Education andTribal Development”, *Tribal culture in India*. Rawat publications, New Delhi. (1984), pp.23-29’
- (3)Bapat, N.V, “ *A few thoughts on Tribal Education*”, Vanyajathi Journal,(1994), pp.54-49’
- (4)Budhadeb chaudhari.,Contemporary Society in Tribal Studies, *Tribals in Meghalaya*, Concept publishing company, (1987).
- (5)Chaudhari. (1992). “ *Socio-Economic and Educational development*”, India Publications, New Delhi, pp.22-34.

- (6) Christoph Von Haimendorf, The problems of Tribal education, *Tribes of India, the struggle for survival*, Oxford University Press, Walton street, Oxford OX26DP, pp.67-74.
- (7) Shashi Bairathi, Status of education among tribals, *Tribal culture, economy and health*, Rawat publications, New Delhi, (1992).
- (8) Gardner, P. M, (1966), "Symmetric Respect and Memorated Knowledge, the Structure and Ecology of Individualistic Culture", *South Western Journal of Anthropology*, Volume 2, PP.389-415.
- (9) Gosh, and Das, "*Forest and the Tribals- A study of Inter relation ship in the Tribal Development in India*", Inter India publications, New Delhi, (1982), P.24.
- (10) Govind Kelkar Nath, "Gender and Tribes", *Forest Economy*, Crescent publishers(1991),, P.87
- (11) Haimendorf, The problems of Tribal education, *Tribes of India, the struggle for survival*, Oxford University Press, Walton street, Oxford OX26DP, (1990).
- (12) Majumdar D.N "The *affairs of a Tribe*", Lucknow, Universal publishers, Lucknow , (1995).
- (13) Nayar, P.K.B,(1995). "*Evaluation of the educational facilities of Scheduled caste and Scheduled tribe students in Kerala State*". Tribal empowerment conference, Trivandrum, Kerala
- (14) Roy Burman, B.K, "*problems of tribal language in education-A supplement to the special problems of tribes*", vanyajathi, (1996)
- (15) Srikanth, L.M. "*Measures proposed for the spread of education among the Scheduled Tribes*". Indian tribes, serials publishers, New Delhi, (1997), pp.90-96
- (16) Srivastava, L.R.N "*The problem of integration of the tribal people*", 'The Indian journal of Social work' .Kurukshethra,(1996) pp.67-76.

Phytochemical screening and evaluation of genotoxicity and acute toxicity of aqueous extract of *Croton tiglium* L.

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Abstract- Extensive and indiscriminate use of synthetic compounds and natural compounds obtained from plant sources have resulted into serious threats to not only the aquatic ecosystem but also to human health. Aqueous seed extract of the plant *Croton tiglium* L. is used in many traditional medicines to treat various ailments in many developing countries. The extract is also used for killing fishes for consumption in Manipur, India. However, the side effects and safety measures are not well studied and evaluated. The present study aims to investigate major phytochemical constituents, acute toxicity and genotoxicity of the aqueous extract. The phytochemical screening was carried out using chemical methods; acute toxicity test was performed using zebrafish as a model organism and genotoxicity potential was evaluated by *in vitro* plasmid DNA fragmentation analysis. Our results show that the exposure of aqueous extract of *Croton tiglium* cause increase plasmid DNA strand breakage in a dose dependent manner. The aqueous extract of *Croton tiglium* also showed piscicidal activity. So, the plant extract need to be evaluated for its long term human health hazards and safety thoroughly before it could be used for therapeutic medicinal interventions.

Index Terms- Phytochemical screening, Genotoxicity, Acute toxicity, Zebrafish, *Croton tiglium*.

I. INTRODUCTION

Treatment of various ailments using medicinal plants has been practiced from prehistoric times. Their use has been considerably increased among the populations of developing countries because of their beneficial and having few significant side effects [1, 2]. However, there is limited report of the proper evaluations of the toxicity of these medicinal plants. Thus, proper phytochemical screening of the plant is necessary because plants can synthesize toxic substances to protect themselves against infections, insects and other organisms which feed on them. Various groups of compounds are responsible for the toxic effects of these plants. Major bioactive compounds responsible for these toxic effects include alkaloids, cardiac glycosides, phorbol esters, lectins and cynogenic glycosides. Previous studies had reported the cases of acute poisoning of patients admitted to hospitals and resulted into death mainly due to ingestion of toxic medicinal plants [3, 4, 5]. Recent investigations have also revealed the presence of genotoxic, mutagenic and carcinogenic compounds in many plants used as traditional medicine or food both *in vitro* and *in vivo* assays [2, 6, 7]. However, some toxic plants are used by doctors for the treatment of diseases [8]. Assessment of the potential

genotoxicity of the traditional medicines is very important as damage to the genetic material may lead to mutagenesis and carcinogenesis as well as other toxic effects [9, 10, 11].

Croton tiglium L. is a shrub native to South East Asia and belongs to the family Euphorbiaceae. It is indigenous to India and widely distributed in North-Eastern part of India. In the state of Manipur, it is used as folk medicine for treating gastrointestinal disorders. The seeds and young leaves of this plant are extremely toxic to fishes, as a result it has been extensively used as a source for killing fishes for consumption. The oil obtained from the seeds of *Croton tiglium* has been shown to act as a potent tumour-promoting agent in mouse skin and a potent mitogenic agent in contact inhibited tissue cultures [12, 13]. Phorbol esters extracted from the seeds of *Croton tiglium* showed inhibitory effect on HIV-induced cytopathic effect (CPE) on MT-4 cells and a potent inhibitory effect on the proliferation of HIV-1 [14]. In Ayurvedic system of medicine, the croton seed and oil has been used in minute doses in dropsy, constipation, cold, cough, asthma and fevers. From ancient times, Chinese people have been using this plant to treat gastrointestinal disorders, intestinal inflammation, rheumatism, headache, peptic ulcer and visceral pain [15, 16, 17, 18]. Previous reports also have shown that the oil of *Croton tiglium* has purgative, analgesic, antimicrobial and anti-inflammatory properties [15, 18]. Moreover, this plant is used as a piscicidal plant in North Eastern part of India. The piscicidal and molluscicidal effects of this plant had also been reported [19, 20, 21].

Despite the popular use of this plant as folk medicine and as a fish poison, there is no scientific data available for phytochemical screening, acute toxicity and genotoxicity of the aqueous extract of *Croton tiglium* L. The present study aims to investigate the genotoxicity of this plant extract by *in vitro* DNA strand breakage analysis using plasmid DNA and acute toxicity test using zebrafish as model organism. Moreover, the major phytochemical constituents of the aqueous extract of *Croton tiglium* are being reported for the first time.

II. MATERIALS AND METHODS

Plant extract preparation

The seeds of *Croton tiglium* were collected from Nambol, Manipur state, India in September 2011. The seeds were washed with tap water and cut into small pieces and subjected to shade dry at 28°C. Then the seed-pieces were crushed into fine powder with mortar and pestle. 40gm of the powder was mixed with 80mL of distilled water and then after proper maceration, the suspensions were kept for 24hours at 28°C. The resultant suspension was filtered with nylon cloth. The filtrate so obtained

was centrifuged at 6000 rpm for 10 minutes. The clear supernatant was subjected to lyophilization, and then the dried aqueous extract of *Croton tiglium* (AECT) were kept at -20°C until further use.

Phytochemical screening

Phytochemical screening was performed for the detection of various bioactive compounds from the aqueous extract of *Croton tiglium* using chemical methods. The following major classes of bioactive compounds were screened: phenolic compounds (ferric chloride test and lead acetate test); alkaloids (Mayer's test, Wagner's test, Hager's test and Dragendorff's test); saponins (Foam test); terpenoids (Liebermann-Burchard test); cardiac glycosides (Keller-Killani test); anthraquinone glycosides (Borntrager test); flavonoids (Alkaline reagent test, Shinoda's test) and carbohydrates (Molisch's test, Fehling's test, Brafoed's test and Benedict's test). Among the phenolic compounds the presence of tannin was screened using the gelatin test and the presence of flavonoids using the NH₄OH-test. These entire tests were carried out using the protocol given elsewhere [22, 23, 24].

Experimental animal

Wild type Zebrafish (*Danio rerio*) were obtained from local vendors, India. The fish were acclimatised for one month in a glass aquarium of 50 litre capacity and kept in continuously well aerated water containing 2mg/L Instant ocean salt at approximately 28°C under a 14h:10h light-dark photoperiod. Zebrafish were fed with commercial food twice a day with flakes in the morning and live artemia in the evening. The pH, dissolved oxygen content and total hardness of the aquarium water were analysed by standard methods [25].

Acute toxicity testing of AECT

A 48 hour acute toxicity (LC₅₀) test of the AECT was conducted using adult zebrafish (length 2.6-2.8cm and weighed 0.2-0.3 g) in a static water renewal experiment, according to the Organisation for Economic Cooperation and Development (OCED) guideline for testing of chemicals [26]. Ten randomly selected zebrafish of both sexes were exposed to a particular dose in a 5 litre capacity rectangular glass tank containing different concentrations of the AECT. Five different concentration of AECT (4, 8, 12, 16, 20, 24mg/L), each with two replicates along with one control were used for this test. The selections of the test concentration of AECT were based from the result obtained from the range finding experiment. Mortality was monitored continuously and the fish were considered dead when operculum movement was no longer detected and the fishes could not response when contacted with a glass rod. The dead fish were immediately removed from the tank. After 24 hours the fish were transferred to new tanks containing their respective concentrations of the AECT. The fish were not fed prior to or during the experimental period. During the experiment, the behaviour of the experimental fish was monitored regularly.

Plasmid DNA fragmentation analysis

pTZ57R/T plasmids were isolated from the transformed DH5-Alpha *E. coli* cultures following the protocol given in GeneJET Plasmid Miniprep Kit (Thermoscientific). Agarose gel electrophoresis (0.8%) was performed in order to evaluate

plasmid DNA treated with different concentrations of AECT. Here the electrophoresis assay was performed to separate different conformational form of plasmid DNA in order to analyse strand breaks in the plasmid DNA treated with different concentrations of AECT. A comparison between the plant extracts treated DNA bands and the positive and negative control DNA bands was used to access any possible genotoxic effects of the plant extracts. In this experiment pTZ57R/T plasmid DNA aliquots (1µg) were incubated with different concentrations of the AECT (300µg/mL, 225µg/mL, 150µg/mL and 75µg/mL), at 37°C for 40 min. Negative control was performed using ultrapure Milli-Q water and positive control with SnCl₂ solution (200µg/mL) with the same incubation temperature and time period. After incubation, each sample was mixed with loading buffer (0.2% xylene cyanol FF; bromophenol blue; 30% glycerol in water), loaded in a horizontal 0.8% agarose gel electrophoresis chamber in Tris acetate-EDTA buffer at pH 8 and run at 6V/cm. Then the DNA bands were visualised in the agarose gel coupled with ethidium bromide staining (0.5µg/mL) by fluorescence using an ultraviolet trans-illuminator system [6]. The assay was repeated three times and the best image was documented using the gel documentation system, JH Bio AlphaDigiDocRT2.

III. RESULTS AND DISCUSSIONS

In the present study, we investigate the acute toxicity and genotoxicity of the AECT. Moreover, we also perform the phytochemical investigation of the AECT for the first time. Phytochemical analysis of AECT using chemical methods showed the presence of saponins, alkaloids, phenolic compounds, tannins, triterpenoids and carbohydrates (Table 1). We have used the crude aqueous extract for all our experiments. We presume that studying the crude aqueous extract form is the most appropriate as people have been found using the crude aqueous extract only for folk medicine and/or for killing fishes. Working with crude extracts, means working with complex mixtures of biologically active compounds, some of the compounds in such a mixture can be genotoxic or antigenotoxic. So, screening of the genotoxic and antigenotoxic properties is important to predict the potential health hazards of using the plant for medicinal purposes.

In order to fully understand the genotoxic potential of the AECT, we performed *in vitro* plasmid DNA fragmentation analysis. From the *in vitro* DNA fragmentation analysis, we observed that exposure of AECT caused increased plasmid DNA breakage in a concentration dependent manner. The untreated control pTZ57R/T plasmid consists of the supercoil form (SC) and open circular form (OC). After treatment with different concentrations of AECT, we observed that some part of the super coiled form (SC) changed to linear form (L) and open circular form (OC) which is not observed in the control plasmid. Same effect is also observed in case of the positive control experiment also. This showed that AECT contain some compounds which can damage the plasmid DNA. The open circular form results from single strand breaks and the linear form results from double strand breaks. In addition to this observation, we showed DNA smear formation and this effect was more pronounced in the plasmid DNA treated with higher concentration of the AECT. This also showed that AECT also contains other compounds

which act on the plasmid DNA but with different mechanisms. Our *in vitro* plasmid DNA fragmentation analysis assay clearly showed that AECT has the ability to mediate DNA strand breaks and damage in the plasmid pTZ57R/T DNA, in a concentration dependent manner. The plasmid strand breakage after treating with AECT is shown in Fig. 1. Previous study had also reported the genotoxicity of the plant extracts in plasmid DNA [6, 27]. But no single test is enough to predict the genotoxic potential of a compound. So, we performed the *in vivo* assay using the micronucleus test and comet assay in zebrafish. We observed the genotoxic effects after treating the zebrafish with AECT (Data unpublished). The results obtained in our study are in agreement with the reports of Lopes et al., [28]. It is difficult to speculate on the compounds responsible for the genotoxic response detected with this extract but we speculate that certain saponin mixture and alkaloids might be responsible for the genotoxic effects of AECT to plasmid DNA. Previous study had also reported that certain group of bioactive compound like alkaloids and saponin mixtures are associated with DNA damage [29]. But further studies with other test system are required for confirming the genotoxic potential of AECT.

In order to evaluate the acute toxicity test of the AECT, we used zebrafish as a test model organism. The fundamental similarities in cell structure and biochemistry between animals and humans facilitate the use of this model animal for the early prediction of the likely effects of chemicals and complex mixtures on human populations. From acute toxicity test, we observed that AECT has piscicidal activity and also observed that fish mortality rate increased with increasing concentration of AECT. But we observed a negative correlation between LC values and exposure period. The LC₅₀ value exhibited a decrease from 11.883mg/L for 24h to 8.159mg/L for 48h. The LC₅₀ values of the AECT for two different time periods are shown in Table 2. Previous studies had reported the compounds mainly responsible for most of the ichthyotoxic properties of plants; these include rotenoids, phorbol esters and saponin etc. [30, 19]. As the AECT contains a mixture of compounds, we can't predict which bioactive compounds are responsible for fish death but as per our expectations it may be mainly due to the presence of a saponin mixture and phorbol esters. After exposure of the extracts, the fish behaviour was also assessed. After some minutes of the exposure of AECT to the zebrafish, the zebrafish showed the signs of stress. The behaviour observed after exposure include increased respiratory rate, loss of equilibrium, jerky movements and circular swimming just before they lose equilibrium. After long exposure they cannot move and finally sank to the bottom. No such behaviour was observed in the control fishes. There are reports that genotoxicity can be correlated with gametic loss, embryonic mortality and heritable mutation, thereby affecting survival at the individual and population level [31, 32, 33]. As the AECT contains genotoxic compounds and also have piscicidal activity, the extensive and indiscriminate use of this piscicidal plant for killing fish might cause loss of aquatic bio resources. It had also reported that used of higher quantities of piscicidal plants to catch fish resulted in the loss of biodiversity in natural aquatic ecosystem [34].

IV. CONCLUSION

The present study clearly illustrates that aqueous seed extract of *Croton tiglium* have the potential to cause piscicidal activity as well as genotoxic activity. However, there is evidence that specific genotoxins can induce different responses in prokaryotic and eukaryotic organism. So, further *in vivo* study is required to identify the active compounds responsible for causing genotoxicity to ensure the safe use of using *Croton tiglium* for medicinal purposes. The present finding may help to predict the ecotoxicity assessment and potential health risk of using *Croton tiglium* as fish poison and traditional medicine.

Bioactive compounds	Aqueous extract of <i>C. tiglium</i>
Phenolic compounds	+
Alkaloids	+
Saponins	+
Terpenoids	+
Cardiac glycosides	-
Anthraquinone	-
Flavonoids	-
Carbohydrates	+
Tannins	+

+: Present; - : Absent.

Table1. Qualitative analysis of phytochemicals present in aqueous extract of *Croton tiglium*

Exposure period	Estimates (mg/L)	Limits (mg/L)	
		LCL	UCL
24h	LC ₁₀ =5.210	3.127	6.852
24h	LC ₅₀ =11.883	9.807	14.049
24h	LC ₉₀ =27.099	21.421	41.362
48h	LC ₁₀ =3.062	1.501	4.429
48h	LC ₅₀ =8.159	6.169	9.978
48h	LC ₉₀ =21.742	16.923	33.683

Table2. Acute toxicity (LC₅₀) for the aqueous extract of *Croton tiglium* at different intervals against zebrafish. LCL: Lower confidence limit; UCL: Upper confidence limit.

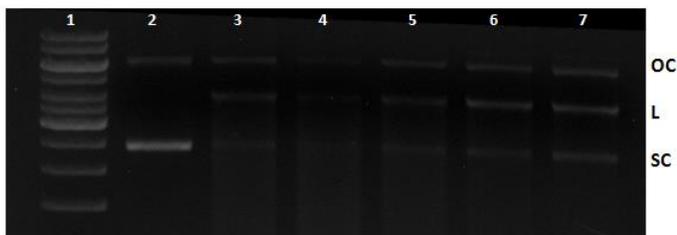


Fig.1. Agarose gel electrophoresis of pTZ57R/T plasmid exposed to aqueous extract of Croton tiglium or with SnCl₂. Lanes: 1: 500bp ladder; 2: pTZ57R/T; 3: SnCl₂ (200µg/mL); 4: 300µg/mL; 5: 225µg/mL; 6: 150µg/mL and 7: 75µg/mL; OC: Open circular; L: Linear; SC: Super coil.

REFERENCES

[1] Ishii, R., Yoshikawa, H., Minakata, N.T., Komura, K. and Kada, Y. (1984). Specificity of bio-antimutagens in the plant kingdom. *Agric. Biol. Chem.*, 48: 2587-2591.

[2] Hoyos, L.S., Au, W.W., Heo, M.Y., Morris, D.L., Legator, M.S. (1992). Evaluation of the genotoxic effects of a folk medicine, *Petiveria alliacea* (Anamu). *Mutation Research*, 280: 29–34.

[3] Van Wyk, B.E., Van Heerden, F.R., Van Oudtshoorn, B. (2002). *Poisonous Plants of South Africa*. Briza Publications, Pretoria.

[4] Joubert, P., Sebata, B. (1982). The role of prospective epidemiology in the establishment of a toxicology service for a developing community. *S. Afr. Med. J.*, 62: 853–854.

[5] Papat, A., Sheara, N.H., Malkiewicz, I., Stewart, M.J., Steenkamp, V., Thomson, S., Neuman, M.G. (2001). The toxicity of *Callilepis laureola*, a South African traditional herbal medicine. *Clin. Biochem.*, 34: 229–236.

[6] Ferreira-Machado, S. C., Rodrigues, M. P., Nunes, A. P. M., et al. (2004). Genotoxic potentiality of aqueous extract prepared from *Chrysobalanus icaco* L. leaves. *Toxicology Letters*, 151(3): 481–487.

[7] Demma, J., Engidawork, E. & Hellman, B. (2009). Potential genotoxicity of plant extracts used in Ethiopian traditional medicine. *Journal of Ethnopharmacology*, 122(1): 136-142.

[8] Botha, C.J., Penrith, M.L. (2008). Poisonous plants of veterinary and human importance in southern Africa. *Journal of Ethnopharmacology*, 119: 549–558.

[9] Umbuzeiro-Valent G, Roubiecek DA, Haebisch EM. (1999). Mutagenic and antimutagenic evaluation of the juice of leaves of *Bryophyllum calycinum* (*Kalanchoe pinnata*), a plant with antihistamine activity. *Environ Mol Mutag*, 33: 325–327.

[10] Lopes D, Oliveira RR, Kaplan MAC, Lage CS, Leitao AC. (2001). Photosensitization and mutation induced in *Escherichia coli* and *Saccharomyces cerevisiae* strains by dorstenin, a psoralen analog isolated from *Dorstenia bahiensis*. *Planta Med.*, 67: 820–824.

[11] Ramos A, Piloto J, Visozo A, Garcia A, Lastra H, de Leon HP. (2001). Mutagenicity and antioxidant assessment of *Stachytarpheta jamaicensis* (L.) Vahl. *Phytother Res*, 15: 360–363.

[12] Van Duuren, B. L., and Orris, L. (1965). The Tumor-enhancing Principles of *Croton tiglium* L. *Cancer Res.*, 25: 1871-1875.

[13] Sivak, A. and Van Duuren, B. L. (1967). Phenotypic Expression of Transformation: Induction in Cell Culture by a Phorbol Ester. *Science*, 157: 1443-1444.

[14] El-Mekkawy S, Meselhy MR, Nakamura N, Hattori M, Kawahata T and Otake T. (2000). Anti-HIV phorbol esters from the seeds of *Croton tiglium*. *Phytochem.*, 53: 457-464.

[15] Qiu, HX. (1996). *Flora of China*. Science Press, Beijing, p. 133.

[16] Wang, X., Lan, M., Wu, H.P., Shi, Y.Q., Lu, J., Ding, J., Wu, K.C., Jin, J.P., Fan, D.M. (2002a). Direct effect of croton oil on intestinal epithelial cells and colonic smooth muscle cells. *World Journal of Gastroenterology*, 8: 103–107.

[17] Morimura, K. (2003). The role of special group article in ancient Chinese medical prescription. *Historia Scientiarum* (Tokyo), 13: 1–12.

[18] Tsai, J.C., Tsai, S., Chang, W.C. (2004). Effect of ethanol extracts of three Chinese medicinal plants with laxative properties on ion transport of the rat intestinal epithelia. *Biological & Pharmaceutical Bulletin*, 27: 162–165.

[19] Hecker, E. (1968). Cocarcinogenic Principles from the Seed Oil of *Croton tiglium* and from Other Euphorbiaceae. *Cancer Res*, 28: 2338-2348.

[20] Yadav, R.P. and Singh, A. (2001). Environmentally safe molluscicides from two common euphorbiales. *Iberus*, 19(2): 65-73.

[21] Yadav, R.P., Singh, D., Singh, S.K., Singh, A. (2003). Metabolic changes in Freshwater Fish *Channa punctatus* due to Stem-bark Extract of *Croton tiglium*. *Pakistan Journal of Biological Sciences*, 6(14): 1223-1228.

[22] Clarke, E.G.C. (1975). *Isolation and Identification of Drugs*, Pharmaceutical Press, London.

[23] [23] Trease GE, Evans W. (1989). *Pharmacognosy*, 11th ed. BrailliarTiridel Can. Macmillian publishers.

[24] Raman N. (2006). *Phytochemical Techniques*, New Delhi: New Indian Publishing Agencies, p. 19.

[25] APHA, AWWA, and WEF (2005). *Standard Methods for the Examination of Waste and Waste water* 21st ed. American Public Health Association, Washington, D.C.

[26] OCED Guidelines for Testing Of Chemicals, 1992 (OCED, 1992)

[27] Silva, C.R., Monteiro, M.R., Rocha, H.M., Ribeiro, A.F., Caldeira-de-Araujo, A., Leitao, A.C., Bezerra, R.J.A.C., Padula, M. (2008). Assessment of antimutagenic and genotoxic potential of senna (*Cassia angustifolia* Vahl.) aqueous extract using in vitro assays. *Toxicol. In Vitro*, 22: 212-218.

[28] Lopes, M.I.L., Saffi, J., Echeverrigaray, S., Henriques, J.A.P., Salvador, M. (2004). Mutagenic and antioxidant activities of *Croton lecheri* sap in biological systems. *Journal of Ethnopharmacology*, 95: 437-445.

[29] Liu, W., Di Giorgio, C., Lamidi, M., Elias, R., Ollivier, E., De Meo, M.P. (2011). Genotoxic and clastogenic activity of saponins extracted from *Nuclea* bark as assessed by the micronucleus and the comet assays in Chinese Hamster Ovary cells. *Journal of Ethnopharmacology*, 137: 176-183.

[30] Neuwinger, H.D. (2004). Plants used for poison fishing in tropical Africa. *Toxicon*, 44: 417-430.

[31] Anderson, S.L., Wild, G.C. (1994). Linking genotoxic responses and reproductive success in ecotoxicology. *Environ Health Perspect*, 102 (Suppl. 12): 9-12.

[32] Depledge, M.H. (1998). The ecotoxicological significance of genotoxicity in marine invertebrates. *Mutat Res*, 399 (1): 109-122.

[33] Bickham, J.W., Sandhu, S., Hebert, P.D., Chikhi, L., Athwal, R. (2000). Effects of chemical contaminants on genetic diversity in natural populations: implications for biomonitoring and ecotoxicology. *Mutat Res*, 463 (1): 33-51.

[34] Ramanujam, S.N. and Dominic, R. (2012). Median Lethal concentration (LC50) of Pesticidal Plants and Their Utilization in Aquaculture. *Journal of applied Aquaculture*, 24(4): 326-333.

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NONHOLONOMIC FRAMES FOR FINSLER SPACE WITH SPECIAL (α, β) -METRICS

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Abstract: The main aim of this paper is to, first we determine the two Finsler deformations to the special Finsler (α, β) -metrics. Consequently, we obtain the nonholonomic frame for the special (α, β) -metrics, such as $L = \alpha + \beta + \frac{\beta^2}{\alpha}$ (1st Approximate Matsumoto metric) and $L = \frac{\beta^2}{\beta - \alpha}$ (Infinite series (α, β) -metric).

Key Words: *Finsler Space, (α, β) -metrics, GL-metric, Nonholonomic Finsler frame.*

1. INTRODUCTION

In 1982, P.R. Holland ([1][2]), studies a unified formalism that uses a nonholonomic frame on space-time arising from consideration of a charged particle moving in an external electromagnetic field. In fact, R.S. Ingarden [3] was first to point out that the Lorentz force law can be written in this case as geodesic equation on a Finsler space called Randers space. The author Beil R.G. ([5][6]), have studied a gauge transformation viewed as a nonholonomic frame on the tangent bundle of a four dimensional base manifold. The geometry that follows from these considerations gives a unified approach to gravitation and gauge symmetries. The above authors used the common Finsler idea to study the existence of a nonholonomic frame on the vertical subbundle $V TM$ of the tangent bundle of a base manifold M .

In this paper, the fundamental tensor field might be taught as the result of two Finsler deformation. Then we can determine a corresponding frame for each of these two Finsler deformations. Consequently, a nonholonomic frame for a Finsler space with special (α, β) -metrics such as Ist Approximate Matsumoto metric and Infinite series (α, β) -metrics will appear as a product of two Finsler frames formerly determined. This is an extension work of Ioan Bucataru and Radu Miron [10].

Consider $a_{ij}(x)$, the components of a Riemannian metric on the base manifold M , $a(x, y) > 0$ and $b(x, y) \geq 0$ two functions on TM and $B(x, y) = B_i(x, y)dx^i$ a vertical 1-form on TM . Then

$$g_{ij}(x, y) = a(x, y)a_{ij}(x) + b(x, y)B_i(x, y)B_j(x, y) \quad (1.1)$$

is a generalized Lagrange metric, called the *Beil metric*. We say also that the metric tensor g_{ij} is a *Beil deformation* of the Riemannian metric a_{ij} . It has been studied and applied by R.Miron and R.K. Tavakol in

General Relativity for $a(x, y) = \exp(2\sigma(x, y))$ and $b = 0$. The case $a(x, y) = 1$ with various choices of b and B_i was introduced and studied by R.G. Beil for constructing a new unified field theory [6].

2. PRELIMINARIES

An important class of Finsler spaces is the class of Finsler spaces with (α, β) -metrics [11]. The first Finsler spaces with (α, β) -metrics were introduced by the physicist G.Randers in 1940, are called Randers spaces [4]. Recently, R.G. Beil suggested to consider a more general case, the class of Lagrange spaces with (α, β) -metric, which was discussed in [12]. A unified formalism which uses a nonholonomic frame on space time, a sort of plastic deformation, arising from consideration of a charged particle moving in an external electromagnetic field in the background space time viewed as a strained mechanism studied by P.R.Holland [1][2]. If we do not ask for the function L to be homogeneous of order two with respect to the (α, β) variables, then we have a *Lagrange space with (α, β) -metric*. Next we look for some different Finsler space with (α, β) -metrics.

Definition 2.1: A Finsler space $F^n = (M, F(x, y))$ is called with (α, β) -metric if there exists a 2-homogeneous function L of two variables such that the Finsler metric $F: TM \rightarrow R$ is given by,

$$F^2(x, y) = L(\alpha(x, y), \beta(x, y)),$$

Where $\alpha^2(x, y) = a_{ij}(x)y^i y^j$, α is a Riemannian metric on M , and (2.1)

$\beta(x, y) = b_i(x)y^i$ is a 1-form on M .

Consider $g_{ij} = \frac{1}{2} \frac{\partial^2 F^2}{\partial y^i \partial y^j}$ the fundamental tensor of the Randers space (M, F) . Taking into account the homogeneity of α and F we have the following formulae:

$$\begin{aligned} p^i &= \frac{1}{\alpha} y^i = a^{ij} \frac{\partial \alpha}{\partial y^j} ; & p_i &= a_{ij} p^j = \frac{\partial \alpha}{\partial y^i} ; \\ l^i &= \frac{1}{L} y^i = g^{ij} \frac{\partial L}{\partial y^j} ; & l_i &= g_{ij} l^j = \frac{\partial L}{\partial y^i} = P_i + b_i ; \\ l^i &= \frac{1}{L} p^i ; & l^i l_i &= P^i p_i = 1 ; & l^i p_i &= \frac{\alpha}{L} ; & p^i l_i &= \frac{L}{\alpha} ; \\ b_i P^i &= \frac{\beta}{\alpha} ; & b_i l^i &= \frac{\beta}{L} . \end{aligned} \tag{2.2}$$

With respect to these notations, the metric tensors (a_{ij}) and (g_{ij}) are related by [13],

$$g_{ij}(x, y) = \frac{L}{\alpha} a_{ij} + b_i P_j + P_i b_j + b_i b_j - \frac{\beta}{\alpha} p_i p_j = \frac{L}{\alpha} (a_{ij} - p_i p_j) + l_i l_j. \tag{2.3}$$

Theorem 2.1[10]: For a Finsler space (M, F) consider the matrix with the entries:

$$Y_j^i = \sqrt{\frac{\alpha}{L}} \left(\delta_j^i - l^i l_j + \sqrt{\frac{\alpha}{L}} p^i p_j \right) \tag{2.4}$$

defined on TM . Then $Y_j = Y_j^i \left(\frac{\partial}{\partial y^i} \right)$, $j \in \{1, 2, \dots, n\}$ is an nonholonomic frame.

Theorem 2.2 [7]: With respect to frame the holonomic components of the Finsler metric tensor $(\alpha_{\alpha\beta})$ is the Randers metric (g_{ij}) , i.e,

$$g_{ij} = Y_i^\alpha Y_j^\beta \alpha_{\alpha\beta}. \tag{2.5}$$

Throughout this section we shall rise and lower indices only with the Riemannian metric $\alpha_{ij}(x)$ that is $y_i = \alpha_{ij} y^j$, $b^i = \alpha^{ij} b_j$, and so on. For a Finsler space with (α, β) -metric $F^2(x, y) = L(\alpha(x, y), \beta(x, y))$ we have the Finsler invariants [13].

$$\rho_1 = \frac{1}{2\alpha} \frac{\partial L}{\partial \alpha}; \quad \rho_0 = \frac{1}{2} \frac{\partial^2 L}{\partial \beta^2}; \quad \rho_{-1} = \frac{1}{2\alpha} \frac{\partial^2 L}{\partial \alpha \partial \beta}; \quad \rho_{-2} = \frac{1}{2\alpha^2} \left(\frac{\partial^2 L}{\partial \alpha^2} - \frac{1}{\alpha} \frac{\partial L}{\partial \alpha} \right) \tag{2.6}$$

where subscripts 1, 0, -1, -2 gives us the degree of homogeneity of these invariants.

For a Finsler space with (α, β) -metric we have,

$$\rho_{-1}\beta + \rho_{-2}\alpha^2 = 0 \tag{2.7}$$

with respect to the notations we have that the metric tensor g_{ij} of a Finsler space with (α, β) -metric is given by [13].

$$g_{ij}(x, y) = \rho \alpha_{ij}(x) + \rho_0 b_i(x) + \rho_{-1}(b_i(x)y_j + b_j(x)y_i) + \rho_{-2} y_i y_j. \tag{2.8}$$

From (2.8) we can see that g_{ij} is the result of two Finsler deformations:

$$\left. \begin{aligned} \text{i)} \quad & \alpha_{ij} \rightarrow h_{ij} = \rho \alpha_{ij} + \frac{1}{\rho_{-2}} (\rho_{-1} b_i + \rho_{-2} y_i)(\rho_{-1} b_j + \rho_{-2} y_j) \\ \text{ii)} \quad & h_{ij} \rightarrow g_{ij} = h_{ij} + \frac{1}{\rho_{-2}} (\rho_0 \rho_{-2} - \rho_{-1}^2) b_i b_j. \end{aligned} \right\} \tag{2.9}$$

The nonholonomic Finsler frame that corresponding to the 1st deformation (2.9) is according to the theorem (7.9.1) in [10], given by,

$$X_j^i = \sqrt{\rho} \delta_j^i - \frac{1}{\beta^2} \left(\sqrt{\rho} + \sqrt{\rho + \frac{\beta^2}{\rho_{-2}}} \right) (\rho_{-1} b^i + \rho_{-2} y^i)(\rho_{-1} b^i + \rho_{-2} y^j) \tag{2.10}$$

where $B^2 = \alpha_{ij}(\rho_{-1} b^i + \rho_{-2} y^i)(\rho_{-1} b^i + \rho_{-2} y^j) = \rho_{-1}^2 b^2 + \beta \rho_{-1} \rho_{-2}$

This metric tensor α_{ij} and h_{ij} are related by,

$$h_{ij} = X_i^k X_j^l \alpha_{kl} \tag{2.11}$$

again the frame that corresponds to the IInd deformation (2.9) given by,

$$Y_j^i = \delta_j^i - \frac{1}{c^2} \left(1 \pm \sqrt{1 + \left(\frac{\rho_{-2} c^2}{\rho_0 \rho_{-2} - \rho_{-1}^2} \right)} \right) b^i b_j, \tag{2.12}$$

where $C^2 = h_{ij} b^i b^j = \rho b^2 + \frac{1}{\rho_{-2}} (\rho_{-1} b^2 + \rho_{-2} \beta)^2$.

The metric tensor h_{ij} and g_{ij} are related by the formula;

$$g_{mn} = Y_m^i Y_n^j h_{ij}. \tag{2.13}$$

Theorem 2.3: [10] Let $F^2(x, y) = L(\alpha(x, y), \beta(x, y))$ be the metric function of a Finsler space with (α, β) -metric for which the condition (2.7) is true. Then

$$V_j^i = X_k^i Y_j^k$$

is a nonholonomic Finsler frame with X_k^i and Y_j^k are given by (2.10) and (2.12) respectively.

3. NONHOLONOMIC FRAMES FOR FINSLER SPACE WITH SPECIAL (α, β) -METRICS

In this section we consider two Finsler space with special (α, β) -metrics, such as Ist Approximate Matusmoto metric and Infinite series (α, β) -metric, then we construct nonholonomic Finsler frames.

3.1. NONHOLONOMIC FRAME FOR $L = \left(\alpha + \beta + \frac{\beta^2}{\alpha}\right)^2$:

In the first case, for a Finsler space with the fundamental function $L = \left(\alpha + \beta + \frac{\beta^2}{\alpha}\right)^2$, the Finsler invariants (2.6) are given by:

$$\begin{aligned} \rho_1 &= \frac{(\alpha^2 + \alpha\beta + \beta^2)(\alpha^2 - \beta^2)}{\alpha^4}, \quad \rho_0 = \frac{3(\alpha^2 + 2\alpha\beta + 2\beta^2)}{\alpha^2}, \\ \rho_{-1} &= \frac{(\alpha^3 - 3\alpha\beta^2 - 4\beta^3)}{\alpha^4}, \quad \rho_{-2} = -\frac{\beta(\alpha^3 - 3\alpha\beta^2 - 4\beta^3)}{\alpha^6}, \\ B^2 &= \frac{(\alpha^3 - 3\alpha\beta^2 - 4\beta^3)^2 (b^2 \alpha^2 - \beta^2)}{\alpha^{10}}. \end{aligned} \tag{3.1}$$

Using (3.1) in (2.10) we have,

$$\begin{aligned} X_j^i &= \sqrt{\frac{(\alpha^2 + \alpha\beta + \beta^2)(\alpha^2 - \beta^2)}{\alpha^4}} \delta_j^i \\ &\quad - \frac{\alpha^4}{b^2 \alpha^2 - \beta^2} \left\{ \sqrt{(\alpha^2 + \alpha\beta + \beta^2)(\alpha^2 - \beta^2)} \pm \sqrt{(\alpha^2 + \alpha\beta + \beta^2)(\alpha^2 - \beta^2) - \frac{\alpha^3 - 3\alpha\beta^2 - 4\beta^3}{\beta}} \right\} \\ &\quad \left(b^i - \frac{\beta y^i}{\alpha^2} \right) \left(b_j - \frac{\beta y_j}{\alpha^2} \right); \end{aligned} \tag{3.2}$$

Again using (3.1) in (2.12) we have,

$$Y_j^i = \delta_j^i - \frac{1}{c^2} \left(1 \pm \sqrt{1 + \frac{\alpha^2 \beta c^2}{\alpha^3 + 3\alpha\beta(\alpha + \beta) + 2\beta^3}} \right) b^i b_j; \tag{3.3}$$

where
$$C^2 = \frac{(\alpha^6 + \alpha\beta + \beta^2)(\alpha^2 - \beta^2)b^2}{\alpha^4} - \frac{(\alpha^3 - 3\alpha\beta^2 - 4\beta^3)(b^2 \alpha^2 - \beta^2)^2}{\alpha^6 \beta}.$$

Theorem 3.1: Consider a Finsler space $L = \left(\alpha + \beta + \frac{\beta^2}{\alpha}\right)^2$, for which the condition (2.7) is true. Then

$$V_j^i = X_k^i Y_j^k$$

is a nonholonomic Finsler frame with X_k^i and Y_j^k are given by (3.2) and (3.3) respectively.

3.2. NONHOLONOMIC FRAME FOR $L = \frac{\beta^4}{(\beta-\alpha)^2}$:

In the second case, for a Finsler space with the fundamental function $L = \frac{\beta^4}{(\beta-\alpha)^2}$, the Finsler invariants (2.6) are given by:

$$\left. \begin{aligned} \rho_1 &= \frac{\beta^4}{\alpha(\beta-\alpha)^3}, \quad \rho_0 = \frac{\beta^2(\beta^2 - 4\alpha\beta + 6\alpha^2)}{(\alpha-\beta)^4}, \\ \rho_{-1} &= \frac{\beta^3(\beta-4\alpha)}{(\alpha-\beta)^4}, \quad \rho_{-2} = \frac{\beta^4(4\alpha-\beta)}{\alpha^3(\alpha-\beta)^4}, \\ B^2 &= \frac{\beta^6(4\alpha-\beta)^2(b^2\alpha^2-\beta)}{\alpha^4(\alpha-\beta)^8}. \end{aligned} \right\} \quad (3.4)$$

Using (3.4) in (2.10) we have,

$$X_j^i = \sqrt{\frac{\beta^4}{\alpha(\beta-\alpha)^3}} \delta_j^i - \frac{\alpha^2}{b^2\alpha^2 - \beta^2} \left\{ \sqrt{\frac{\beta^4}{\alpha(\beta-\alpha)^3}} \pm \sqrt{\frac{\beta^2(2\beta^3 - 5\alpha\beta^2 + 4b^2\alpha^3 - b^2\alpha^2\beta)}{\alpha(\alpha-\beta)^4}} \right\} \left(b^i - \frac{\beta y^i}{\alpha^2} \right) \left(b_j - \frac{\beta y_j}{\alpha^2} \right); \quad (3.5)$$

Again using (3.4) in (2.12) we have,

$$Y_j^i = \delta_j^i - \frac{1}{c^2} \left(1 \pm \sqrt{1 + \frac{(\alpha-\beta)^3 c^2}{\alpha^4}} \right) b^i b_j; \quad (3.6)$$

where
$$C^2 = \frac{\alpha^2(\alpha-2\beta)b^2}{(\alpha-\beta)^3} - \frac{(\alpha-4\beta)(b^2\alpha^2-\beta^2)^2}{\beta(\alpha-\beta)^4}.$$

Theorem 3.2: Consider a Finsler space $L = \frac{\beta^4}{(\beta-\alpha)^2}$, for which the condition (2.7) is true. Then

$$V_j^i = X_k^i Y_j^k$$

is a nonholonomic Finsler frame with X_k^i and Y_j^k are given by (3.5) and (3.6) respectively.

4. CONCLUSION

Nonholonomic frame relates a semi-Riemannian metric (the Minkowski or the Lorentz metric) with an induced Finsler metric. Antonelli P.L., Bucataru I. ([7][8]), has been determined such a nonholonomic frame for two important classes of Finsler spaces that are dual in the sense of Randers and Kropina spaces [9]. As Randers and Kropina spaces are members of a bigger class of Finsler spaces, namely the Finsler spaces with (α, β) -metric, it appears a natural question: *Does how many Finsler space with (α, β) -metrics have such a nonholonomic frame? The answer is yes, there are many Finsler space with (α, β) -metrics.*

In this work, we consider the two special Finsler metrics and we determine the nonholonomic Finsler frames. Each of the frames we found here induces a Finsler connection on TM with torsion and no curvature. But, in Finsler geometry, there are many (α, β) -metrics, in future work we can determine the frames for them also.

5. REFERENCES

- 1) Holland, P.R.: *Electromagnetism, Particles and Anholonomy*. Physics Letters, 91 (6), 275-278 (1982).
- 2) Holland, P.R.: *Anholonomic deformations in the ether: a significance for the electrodynamic potentials*. In: Hiley, B.J. Peat, F.D. (eds.), *Quantum Implications*. Routledge and Kegan Paul, London and New York, 295-311 (1987).
- 3) Ingarden, R.S.: *On Physical interpretations of Finsler and Kawaguchi spaces*. Tensor N.S., 46, 354-360 (1987).
- 4) Randers, G.: *On asymmetric metric in the four space of general relativity*. Phys. Rev., 59, 195-199 (1941).
- 5) Beil, R.G.: *Comparison of unified field theories*. Tensor N.S., 56, 175-183 (1995).
- 6) Beil, R.G.: *Equations of Motion from Finsler Geometric Methods*. In: Antonelli, P.L. (ed), *Finslerian Geometries. A meeting of minds*. Kluwer Academic Publisher, FTPH, no. 109, 95-111 (2000).
- 7) Antonelli, P.L., Bucataru, I.: *On Holland's frame for Randers space and its applications in physics*. In: Kozma, L. (ed), *Steps in Differential Geometry. Proceedings of the Colloquium on Differential Geometry*, Debrecen, Hungary, July 25-30, 2000. Debrecen: Univ. Debrecen, Institute of Mathematics and Informatics, 39-54 (2001).
- 8) Antonelli, P.L., Bucataru, I.: *Finsler connections in anholonomic geometry of a Kropina space*. Nonlinear Studies, 8 (1), 171-184 (2001).
- 9) Hrimiuc, D., Shimada, H.: *On the L-duality between Lagrange and Hamilton manifolds*. Nonlinear World, 3, 613-641 (1996).
- 10) Ioan Bucataru, Radu Miron: *Finsler-Lagrange Geometry. Applications to dynamical systems* CEEX ET 3174/2005-2007 & CEEX M III 12595/2007 (2007).
- 11) Matsumoto, M.: *Theory of Finsler spaces with (α, β) -metric*. Rep. Math. Phys., 31, 43-83 (1992).
- 12) Bucataru, I.: *Nonholonomic frames on Finsler geometry*. Balkan Journal of Geometry and its Applications, 7 (1), 13-27 (2002).
- 13) Matsumoto, M.: *Foundations of Finsler geometry and special Finsler spaces*, Kaishesha Press, Otsu, Japan, 1986.

Vehicle Propulsion using Switching Magnetic(SM) Energy

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Abstract- “Today’s theories shape tomorrow’s reality” and “tomorrow’s standard of living will depend on the success of today’s theories”. These old truths, having proved themselves so many times in our history, should make us responsible for the implementation, creation, development, distribution of new scientific theories.

The idea of Switching Magnetic Energy is obtained from the principle of Electromagnetic Induction. Electromagnetic induction like in Maglev principle involves the use of electromagnets, which by changing their polarity, sets up attractive and repulsive forces on the lateral sides to propel the train forward and levitate. This magnetic push-pull principle is used in this project to propel an automobile.

This concept of mine aims at designing and fabricating a prototype model of a vehicle which runs on an alternative form of propulsion technique i.e., magnetic power. The vehicle was built, assembling of mechanical and electrical components, which perform the desired function of energy conversion from electrical to magnetic power and thus to mechanical energy of rotation. For this purpose various components were designed and were chosen accordingly to meet the requirements of the prototype vehicle and which could give satisfactory results regarding its performance parameters such as power, speed, overall efficiency, etc., which can make this concept a very feasible one.

The performance of the prototype was done by various tests conducted. These tests showed the efficiency of the prototype at the crankshaft which was between 70 to 72% sustaining 300W of input power.

I. INTRODUCTION

1.1 An Electromagnet

An electromagnet is set up with a battery (or some other source of power) and a wire. If one looks at the battery, say at a normal D cell from a flashlight, one can see that there are two ends, one marked plus (+) and the other marked minus (-). Electrons collect at the negative end of the battery, and, if you let them, they will gladly flow to the positive end. The way you "let them" flow is with a wire. If a wire is attached directly between the positive and negative terminals of a D cell, three things will happen: Electrons will flow from the negative side of the battery to the positive side as fast as they can. The battery will drain fairly quickly (in a matter of several minutes). For that reason, it is generally not a good idea to connect the two terminals of a battery to one another directly. Normally, it can be connected to some kind of load in the middle of the wire so the electrons can do useful work. The load might be a motor, a light bulb, a radio. A small magnetic field is generated in the wire. It is this small magnetic field that is the basis of an electromagnet.

The figure below shows the shape of the magnetic field around the wire. In this figure, the cross section of the wire has magnetic field around it. The green circle in the figure is the cross-section of the wire itself. A circular magnetic field develops around the wire, as shown by the circular lines. The field weakens (so the lines are farther apart as they get farther from the wire). One can see that the field is perpendicular to the wire and that the field's direction depends on which direction the current is flowing in the wire. The compass needle aligns itself with this field (perpendicular to the wire). If the battery is flipped around and repeat the experiment, one will see that the compass needle aligns itself in the opposite direction.

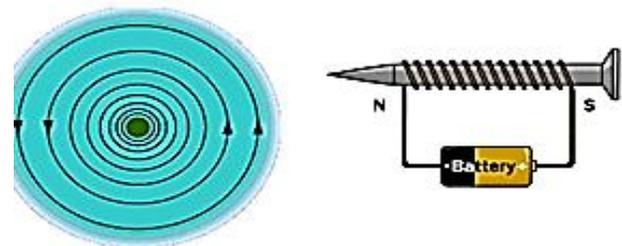


Fig.1: Electromagnet- Working phenomenon

1.2 Objective of the project

Steps have been taken to use this principle i.e. electromagnetic principle in an IC engine with modifications to run the engine and to acquire a certain speed as achieved by diesel or a petrol engine.

In this, electromagnetic coils which pull the piston to and fro and the piston rod is connected to a crank which through effective transmission powers the rear wheel. The stand model is made with the rear wheels powered by magnetic coils and the front wheels are shown idle. Legs are provided to make the stand model. The wheels are rotating with high speed and the speed control is provided to vary the speed.

Basically this project is under innovative stage. By the application of some heavy magnetized electromagnet, desired reciprocating motion can be achieved which in turn completely revolutionizes the whole automobile industry. As we know day by day the quantity of fossil fuels is degrading in ocean and earth, steps have been taken to change the concept of movement of vehicle into concept of electromagnets, which will run as engines

1.3 Implementation of the concept in the automobile industry
Magnetic propulsion technique was never implemented in automobiles till now. Hence the project aims at adopting this technology in automobiles which could be used as an alternative way of propulsion with numerous advantages such as zero emission, reduction in noise pollution, less wear of mechanical

parts and hence less maintenance which could one day revolutionize the automobile industry and thus decreasing the dependency on fossil fuels which would one day exhaust.

Upon research, it's observed that this particular technology has never found a place in automobile industry probably due to very recent invention of the maglev principle application, various other alternatives already in use such as Electric vehicles which run on electric motors, Conventional vehicles that run on petrol, diesel, etc.

1.4 Objective

Steps have been taken to use this principle i.e. electromagnetic principle in an IC engine with modifications to run the engine and to acquire a certain speed as achieved by diesel or a petrol engine. The system was designed to sustain 300W of input power.

In this, electromagnetic coils which pulls the piston to and fro and the piston rod is connected to a crank which through effective transmission powers the rear wheel. The stand model is made with the rear wheels powered by magnetic coils and the front wheels are shown idle. Legs are provided to make the stand model. The wheels are rotating with high speed and the speed control is provided to vary the speed.

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1.5 Report Organization

- Introduction
- Working principle & Methodology

This section contains information regarding the model working, its concept and principles.

- Design and Selection of Components

This section contains a detailed design of all the individual components, selection of various components based on the design calculations and verification for safe design.

- Fabrication and Assembly

This section contains fabrication of various parts which were chosen on the basis of design analysis carried out previously. It also includes the Bill of Materials which specify the materials, their price and the quantity of the various parts used. It even covers the assembly process of the vehicle which would describe the manner and the order in which the parts are assembled together.

- Performance Analysis, Testing & Experimental results

This section contains the various experimental tests conducted on the vehicle which includes recording of various performance parameters such as Power, Speed, Overall Efficiency, Power to Weight ratio, maximum payload, losses associated, etc.

Also the results of various tests conducted on the vehicle which are shown in the form of graphs are shown. These graphs indicate the variation of various performance parameters such as speed (constant and varying), load (constant and varying), overall efficiency, power output and input, etc.

- Conclusion

This section specifies whether if the set objectives are achieved based on the experimental results obtained, the future scope of the technology, benefits and its drawbacks, etc.

II. WORKING PRINCIPLE & METHODOLOGY

2.1 Topic:

For well over a century and half, electrical current and magnetic fields/forces have known to possess a corresponding relationship that can be described and predicted through mathematical formulae. One-half of this relationship is observed when the movement of electricity, electrical current, through a wire correspondingly creates a magnetic force or field around the wire. This half of the relationship or principle is the basis for the operation of many types of electric motors, pumps, etc. Conversely, the other half of the relationship is observed when the movement of a magnetic force or field over a wire correspondingly creates electrical current in that wire. This half of the principle forms the basis for the operation of many types of electrical generators and alternators. In both halves of the relationship, the strengths and properties of two fields are proportional to one another. With this understanding, various applications have been developed using electrical/magnetic forces to create various propulsion systems and methodologies for solenoid/inducer-based power trains or power apparatuses. The basic definition of a solenoid is a cylindrical coil of wire which creates a magnetic field within itself when an electric current passes through it to draw a core of iron or steel within the coil.

The solenoid generally uses electrically conductive, non-magnetic and insulated wire of specific length that is coiled or wrapped around a tube or hollow cylinder. The core, in general terms, is a magnetic object, a portion of which moves in at least a portion of the tubes interior. The passing of an electrical current through the wire coiled around the tube generates a corresponding magnetic field or force around the tube/wire coil. This effect, commonly known as the Electro Motive Force (EMF), denotes that the polarity and strength of the electrical current passing through the wire coil will correspondingly determine the polarity and strength of the resulting magnetic field or force. In this manner, the manipulation of the various attributes of the electrical current (e.g., polarity, duration and strength, etc.) respectively controls the attributes of the resulting magnetic field and the movement of the magnetic object in relation to the magnetic field. In controlling the electrical current to the solenoid or inducer, the subsequently created magnetic field draws, holds or expels the magnetic or polar object in relation to the interior of the wire wrapped tube.

For the magnetic force to be able act upon an object, the object generally is required to be magnetic: e.g., have those properties that are responsive to magnetic forces or fields. The incorporation of ferromagnetic material, such as an iron-based alloy, can also provide these magnetic/polar properties. The object can also obtain these properties through the incorporation of a wire coil set that can be energized to create an electromagnetic field or force (i.e., a solenoid inside a solenoid). Correspondingly, the Counter EMF (CEMF) occurs when a magnetic object, by passing near an electrically conductive wire coil, generates a corresponding electrical current within that wire coil set. This CEMF occurs within a solenoid when a magnetic

object moves within a non-energized wire coil set of a solenoid, creating an electrical current in the otherwise non-energized wire coil set.

Another manifestation of the Counter EMF (CEMF) starts when the electrical current is first sent through a wire coil set which has some form of built in resistance. The majority of the kinetic energy of the electrical current is stored as energy in the resulting magnetic field (the remainder of the kinetic energy is lost as heat). When the electrical current no longer passes through from the wire, the magnetic field collapses and returns its kinetic energy as electrical current or a voltage spike to the otherwise de-energized wire coil set.

2.2 Scope:

Two solenoid coils have been held one after the other and a shaft is being housed between them. The basic definition of a solenoid is a cylindrical coil of wire which creates a magnetic field within itself when an electric current passes through it to draw a core of iron or steel or any ferromagnetic material within the coil. The solenoid generally uses electrically conductive, non-magnetic and insulated wire of specific length that is coiled or wrapped around a tube or hollow cylinder. The core, in general terms, is a magnetic object, a portion of which moves in at least a portion of the tube's interior. The passing of an electrical current through the wire coiled around the tube generates a corresponding magnetic field or force around the tube/wire coil. This effect, commonly known as the Electro Motive Force (EMF), denotes that the polarity and strength of the electrical current passing through the wire coil will correspondingly determine the polarity and strength of the resulting magnetic field or force. In this manner, the manipulation of the various attributes of the electrical current (e.g., polarity, duration and strength, etc.) respectively controls the attributes of the resulting magnetic field and the movement of the magnetic object in relation to the magnetic field. In controlling the electrical current to the solenoid or inducer, the subsequently created magnetic field draws, holds or expels the magnetic or polar object in relation to the interior of the wire wrapped tube.

In the first half of the cycle, the first coil is energized it will pull the shaft which in turn makes half rotation of the crank wheel.

In the second cycle, the coil is energized which in turn makes another half rotation of the crank wheel and hence completes one full rotation. The speed is controlled by the accelerator through the circuit. The timing of energizing the coil is done by control circuit, which is activated by accelerator sector which governs the speed of spindle. The spindle is coupled on the rear axle of the vehicle, which drives the axle resulting in the forward motion/movement. The chassis is made of mild steel flat and two wheels are fixed on the hub of the front axle and two wheels are fixed to the rear axle..

There is no steering mechanism in this model since it is at the initial stage of the technology. The vehicle has to be pushed for the starting momentum and for this we are using DC motor which acts like the starter when the particular momentum is reached, the motor can be disconnected, it will continue the drive by magnetic propulsion. The batteries for the DC motor is inbuilt in the vehicle and the battery used to drive the energizing of coils is external connected through the wires.

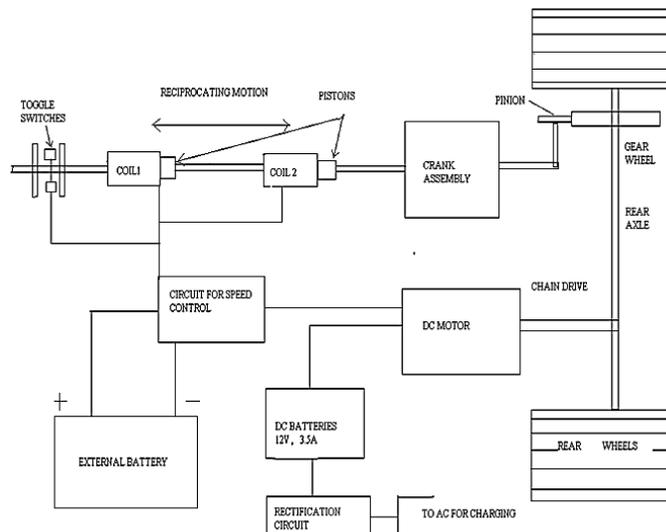


Figure2: Block Diagram of the working.

III. DESIGN & SELECTION OF COMPONENTS

For the vehicle to perform its desired functions various parts have to be designed so that we can get to know values of various physical quantities such as working stress, torque, power, force, velocity etc.

- 3.1 Selection of D.C. motor
- 3.2 Selection of solenoid coils
- 3.3 Spur gears
- 3.4 Rear axle
- 3.5 Rectifier circuit
- 3.6 Speed control circuit

3.1 Selection of the starter motor to drive the vehicle for starting torque.

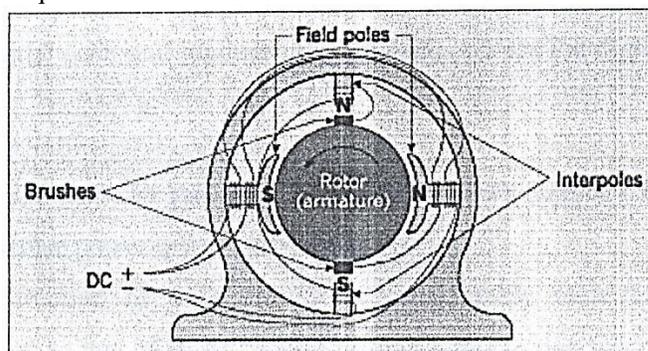


Figure3: Simple Brushed DC motor construction

DC motors consist of rotor-mounted windings (armature) and stationary windings (field poles). In all DC motors, current must be conducted to the armature windings by passing current through carbon brushes that slide over a set of copper surfaces called a commutator, which is mounted on the rotor. The commutator bars are soldered to armature coils. The brush/commutator combination makes a sliding switch that energizes particular portions of the armature, based on the position of the rotor. This process creates north and south magnetic poles on the rotor that are attracted to or repelled by

north and south poles on the stator, which are formed by passing direct current through the field windings. It's this magnetic attraction and repulsion that causes the rotor to rotate.[2]

Selection of DC motor was primarily done based on the initial power requirements. The power was determined based on the initial velocity of the vehicle.

After the power requirement for the initial velocity was known, the torque needed to generate the speed was obtained. After the torque in kg-cm was known a DC motor was selected of the required capacity and RPM. DC motor speed was chosen based on the assumption that the vehicle should propel at 0.5m/s. In order to select the DC motor for the specific application the following procedure is adopted.

Assuming the following data:

Speed at which the DC motor should run the vehicle = 1.8-2.0 Kmph

Total weight of the vehicle = 25 Kgs.

Thus we know that power required to propel the vehicle is given by,

$$P = \frac{(F_t \times v)}{(3600 \times \eta_t)} [4]$$

F_t = Tractive effort in Newtons.

v = Velocity of the vehicle in m/s.

η_t = Transmission efficiency.

But $F_t = R = K_t \times W$ Newtons where,

K_t = Coefficient of road resistance.

For smooth surfaces $K_t = 0.0059$;

Assuming $\eta_t = 90\%$ we get $F_t = 0.0059 \times 250 = 1.475$ Newtons.

$$\begin{aligned} \text{Now power required } P &= \frac{(F_t \times v)}{(3600 \times \eta_t)} \\ &= \frac{1.475 \times 2000}{3600 \times 0.9} = 0.91W \end{aligned}$$

The Torque transmitted is obtained from the Equation

$$T = \frac{(60 \times P)}{(2\pi \times N)} \text{ where } P = \text{power transmitted in watts}$$

N = speed in RPM

The circumference of the wheel (πD) = 70.5 cms

Then the linear velocity v & rpm ' N ' are related by;

$$v = \frac{(\pi D N)}{60}$$

Let $v = 2$ kmph (Required speed of the vehicle) then the value of N obtained from the above formula = 47.28rpm;

$$\begin{aligned} \text{Torque transmitted, } T &= \frac{(60 \times P)}{(2\pi \times N)} \\ &= \frac{(60 \times 0.91)}{(2\pi \times 47.2)} \end{aligned}$$

= 0.184 N-m (approx. 2kg-cm)

But a 2 Kg-cm D.C. motor produces only $N = 10-15$ RPM. Hence a 6 kg-cm D.C. motor is selected which produces 35-40 RPM which can propel the vehicle with velocity of 2 kmph.

3.2 Selection of coils to generate electromagnetic force to pull the piston.

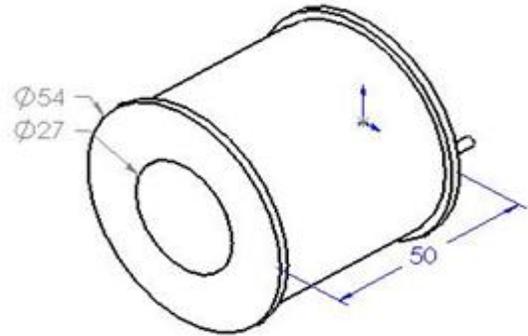


Figure 4: Solenoid coil

Coils were bought based on the strength of the magnetic field needed. Each coil of specified number of turns exhibits varying force depending on the ferromagnetic material used. Force exerted by the coils on the piston is far greater which by reduction gear gives the required speed.

Since the piston was made up of mild steel material a coil of 240 turns was chosen which could exert force at a range of 50 to 90 kN which would obviously vary due to a varying electric field as per the variations done in the speed control circuit.

Specifications of the coil:

No. of turns in the coil = 230

Piston radius = 14mm.

Clearance = 1mm.

Thickness of the coil = 10mm.

Inner diameter of the coil = 30mm.

Outer diameter of the coil = 40mm.

Length of the coil = 50mm.

Piston material used is C30 steel.

Magnetic field generated by the solenoid:

$$B = \frac{(\mu NI)}{L}; \text{ where } \frac{N}{L} \text{ is the turn density} = \frac{230}{0.05} = 4600/\text{m.}$$

B = Magnetic field in teslas.

μ = Permeability of the material.

I = Current in Amperes.

N = No. of turns.

L = Length of the coil.

But $\mu = K * \mu_0$ where μ_0 = Absolute permeability = $4\pi \times 10^{-7}$ T/mA.

K = Relative permeability for steel = 100

Therefore $\mu = K * \mu_0 = 100 \times 4\pi \times 10^{-7} = 4\pi \times 10^{-5}$ T/mA.

$$\begin{aligned} \text{Hence } B &= \frac{(\mu NI)}{L} \\ &= 4\pi \times 10^{-5} \times 4600 \times 25 \\ &= 14.45 \text{ Teslas.} \end{aligned}$$

3.3 Design of the drive gear which drives the driven gear mounted on the drive axle

Designing of gears was done after knowing the power requirements i.e after knowing the desired speed in which the vehicle should accelerate. Based on this gear of required number of teeth and module was chosen. With knowledge of Machine Design it was conclusive that the design was safe.

Gears of cast steel material was chosen for the power transmission process and the working stress was obtained knowing the pitch line velocity with which the gear should transmit power. The no. of teeth on the gear wheel was chosen on the assumption that the vehicle should propel at 2.5-3.0 m/s.

1) GEAR WHEEL:

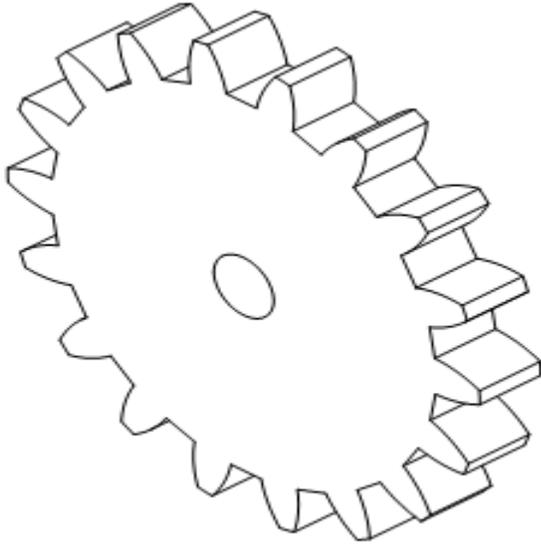


Figure 5: Gear wheel[3]

Gear wheel is designed on the basis that the rear axle should be producing an angular speed of 320 to 330 RPM, which is enough to propel the vehicle at 3.5 to 4 m/s.

The gears are of module (m) = 1.75mm and are 20° full depth involute.

For 20° full depth involute ;

Addendum = module(m) = 1.75mm (from design data hand book)[5]

Dedendum = (1.25)module = 2.1875mm.

Material of the gear = Cast Steel (0.3%C)

Addendum circumference = 288mm.

Therefore addendum diameter = 91.67mm.

Hence pitch circle diameter = 91.67 - (2*1.75)
 = 88.17mm.

Allowable static stress for C30 Steel = 220.6 N/mm²

Pitch line velocity (v) is given by $v = \frac{\pi DN}{60}$

$$\text{Therefore } v = \frac{\pi \times 0.08817 \times 330}{60} = 1.523 \text{ m/s.}$$

Velocity factor (C_v) is chosen on the value of Pitch line velocity, Hence for a velocity of 1.523m/s which is less than 8m/s the

$$\text{formula for velocity factor } C_v = \frac{3.05}{3.05 + v} = \frac{3.05}{3.05 + 1.523} = 0.6669$$

$$\begin{aligned} \text{Working stress} &= C_v \times \sigma_a \\ &= 0.6669 \times 220.6 \\ &= 147.115 \text{ N/mm}^2 \end{aligned}$$

Since the working stress = 147.115 N/mm² is less than allowable static stress = 220.6 N/mm².

Hence the gear wheel is designed safe.

No. of teeth on the gear wheel = 49.

No. of teeth on the pinion = 22.

It is chosen such that we have speed reduction to 330 RPM from the speed of the pinion which is calculated as follows

$$\frac{N_{\text{pinion}}}{N_{\text{gear}}} = \frac{T_{\text{gear}}}{T_{\text{pinion}}} \quad [4]$$

$$\text{Therefore } \frac{N_{\text{pinion}}}{330} = \frac{49}{22}$$

$$N_{\text{pinion}} = 735 \text{ RPM}$$

Beam strength of the gear wheel is given by the Lewis equation as follows:

$$W_T = f_w \times b \times p_c \times yN \quad [5]$$

f_w = Working stress

b = Width of the gear face

p_c = π × m = Circular pitch

y = Tooth form factor (From design data hand book for a gear of 49 teeth and 20 degree full depth involute) = 0.13

$$W_T = 147.115 \times 10 \times \pi \times 1.75 \times 0.13$$

$$= 1051.44 \text{ N}$$

Power produced by the crankshaft (P)

$$P = F \times v$$

Where F = Force acting on the reciprocating parts such as the piston, crankshaft, connecting rod etc.

V = Maximum velocity of the piston during its stroke.

Maximum velocity of the piston $V_{Pmax} = (\omega_{\text{crankshaft}} \times r) (\sin \theta + \frac{\sin 2\theta}{2n})$ [4]

Where $n = \frac{L}{r}$; L = Length of the connecting rod = 62mm

r = Radius of the crank = 25mm

$$\text{Therefore } n = \frac{62}{25} = 2.48$$

θ = Angle of the crank at the maximum velocity of the piston = 90°

$$\omega_{\text{crankshaft}} = \omega_{\text{pinion}} = \frac{2\pi \times N}{60} = \frac{2\pi \times 735}{60} = 76.96 \text{ rad/sec}$$

$$V_{Pmax} = (76.96 \times 0.025) (\sin 90 + \frac{\sin 180}{2 \times 2.48}) = 1.924 \text{ m/s.}$$

But,

Force (F) = m × a_p; where

m = mass of the reciprocating parts such as the piston, crankshaft, connecting rod etc = 1800gms.

$$a_p = \text{Piston acceleration} = (\omega_{\text{crankshaft}}^2 \times r) \left(\cos \theta + \frac{\cos 2\theta}{n} \right)$$

$$= (76.96^2 \times 0.025) \left(\cos 90 + \frac{\cos 180}{2.48} \right)$$

$$= 59.7 \text{ m/s}^2$$

Therefore power, $P = m \times a_p \times v_{p\text{max}}$

$$= 1.8 \times 59.7 \times 1.924$$

$$= 206.75 \text{ Watts}$$

Assuming a transmission efficiency of 95% the power produced at the gear wheel

$$P = 80.4 \times 0.95$$

$$= 196.415 \text{ Watts.}$$

Torque at the gear wheel is given by,

$$T = \frac{60 \times P}{2\pi \times N} = \frac{60 \times 76}{2\pi \times 330} = 2.22 \text{ N-m}$$

Tangential tooth load $F_t = \frac{P \times C_s}{v}$, where C_s = service factor (From design data hand book for medium shocks and for an intermittent operation) = 1.25

v = Pitch line velocity of the gear wheel,

$$F_t = \frac{76 \times 1.25}{1.523}$$

$$= 62.37 \text{ N}$$

2) PINION:

Pinion is designed on the basis that the rear axle should be producing an angular speed of 720 to 740 RPM, which is enough to propel the vehicle at 3.5 to 4 m/s.

The pinion are of module (m) = 1.75mm and are 20° full depth involute.

For 20° full depth involute ;

Addendum = module(m) = 1.75mm (from design data hand book and Kurmi /Gupta)

Dedendum = (1.25)module = 2.1875mm.

Material of the pinion = Cast Steel (0.3%C)

Addendum circumference = 136.47mm.

Therefore addendum diameter = 43.44mm.

Hence pitch circle diameter = 43.44 - (2*1.75)

$$= 39.94\text{mm.}$$

Allowable static stress for C30 Steel = 220.6 N/mm²

Pitch line velocity (v) is given by $v = \frac{\pi D N}{60}$

$$\text{Therefore } v = \frac{\pi \times 0.03994 \times 735}{60}$$

$$= 1.537 \text{ m/s.}$$

Velocity factor (C_v) is chosen on the value of Pitch line velocity,

Hence for a velocity of 1.537m/s which is less than 8m/s the

formula for velocity factor $C_v = \frac{3.05}{3.05 + v}$ [5]

$$= \frac{3.05}{3.05 + 1.537}$$

$$= 0.664$$

Working stress = $C_v \times \sigma_d$

$$= 0.664 \times 220.6$$

$$= 146.68 \text{ N/mm}^2$$

Since the working stress = 146.68 N/mm² is less than allowable static stress = 220.6 N/mm².

Hence the pinion is designed safe

Beam strength of the pinion is given by the Lewis equation as follows:

$$W_T = f_w \times b \times p_c \times y N$$

f_w = Working stress

b = Width of the gear face

$p_c = \pi \times m$ = Circular pitch

y = Tooth form factor (From design data hand book for a pinion of 22 teeth and 20 degree full depth involute) = 0.105

$$W_T = 146.68 \times 8 \times \pi \times 1.75 \times 0.105$$

$$= 387.07 \text{ N}$$

The power produced at the pinion = Power at the crankshaft which is given by

$$P = m \times a_p \times v_{p\text{max}}$$

$$= 1.8 \times 59.7 \times 1.924$$

$$= 206.75 \text{ Watts}$$

Torque at the gear wheel is given by,

$$T = \frac{60 \times P}{2\pi \times N} = \frac{60 \times 80.4}{2\pi \times 330} = 1.044 \text{ N-m}$$

Tangential tooth load $F_t = \frac{P \times C_s}{v}$, where C_s = service factor (From design data hand book for medium shocks and for an intermittent operation) = 1.25

v = Pitch line velocity of the gear wheel,

$$F_t = \frac{80.4 \times 1.25}{1.537}$$

$$= 65.38 \text{ N}$$

3.3 Design of the rear axle

After obtaining the values of torque and power the axle design was taken to consideration. It was calculated for its combined bending and torsional strengths based on max. shear stress theory.

The axle is made up of carbon annealed steel and knowing its material properties its working stress was compared with the yield strength of the material and on this basis it was pretty conclusive that the design was safe.

Shaft diameter = 20mm

Shaft material = Carbon-Steel-Annealed

Yield stress of the material (τ_y) = 131 N/mm²

The material is ductile and the specimen is subjected to combined bending and twisting load. According to maximum shear stress theory, the maximum stress induced should be less than yield value of the shear stress.

Twisting moment (T) is given by the torsional equation as follows:

$$\frac{T}{J} = \frac{\tau}{R} = \frac{G\theta}{l}$$

Where T = Torque in N-m,

J = Polar moment of inertia in Kg m²

τ = Torsional shear stress in N/m²

R = Radius of Curvature in m,

G = Rigidity modulus in N/m²

θ = Angle of twist in radians,

l = Length of the shaft in m.

$$\therefore \frac{T}{J} = \frac{\tau}{R}$$

$$\therefore \tau_{\text{shear}} = \frac{TR}{J} [4]$$

Power produced at the output shaft (rear axle) P = 208 W

Torque produced at the output shaft (Rear axle) T = 2.22 N-m

Bending moment equation is given by,

$$\frac{M}{I} = \frac{\sigma}{y} = \frac{E}{R} \quad [4]$$

where M = Bending moment in N-mm,

I = Moment of inertia in Kg-mm²

σ = Bending stress in N/mm²

y = distance of the outermost fibre from the neutral axis in mm,

E = Young's Modulus of the material in N/mm²

R = The radius of curvature in mm

$$\therefore M = \frac{I \times \sigma_{\text{bending}}}{y}$$

The vehicle produces a power of 76 W

$$\therefore M = \frac{P}{N} \text{ where } P = \text{Power in W}$$

N = Speed of the axle in rpm.

$$= \frac{76 \times 60}{330}$$

$$= 37.818 \text{ N-m.}$$

$$\text{Equivalent Twisting moment} = \sqrt{M^2 + T^2}$$

$$\sqrt{37.818^2 + 2.22^2}$$

$$= 37.883 \text{ N-m}$$

According to Maximum shear stress theory,

$$\text{Maximum shear stress } f_{s_{\text{max}}} = \frac{1}{2} \sqrt{f_b^2 + 4f_s^2} \quad [5]$$

Where f_b = Bending stress in N/m²

f_s = Shear stress in N/m²

$$\frac{\pi}{16} (f_{s_{\text{max}}}) d^3 = \sqrt{M^2 + T^2}$$

$$\therefore f_{s_{\text{max}}} = \frac{\sqrt{M^2 + T^2}}{\frac{\pi}{16} \times d^3}$$

$$= \frac{14}{\frac{\pi}{16} \times 0.02^3}$$

$$= 24.117 \text{ N/mm}^2$$

Hence, $f_{s_{\text{max}}} = 24.117 \text{ N/mm}^2$ is less than Yield stress of the material (τ_y) = 131 N/mm² [4]

Hence the shaft design is safe.

3.4 Design of circuit for rectification

It will involve a suitable transformer to step down the current from the AC to charge the batteries. It will also involve a 4 bridge diode for proper rectification from AC to DC.

A transformer unit is used to step down the voltage required to charge the DC batteries which powers the DC motors for the initial torque

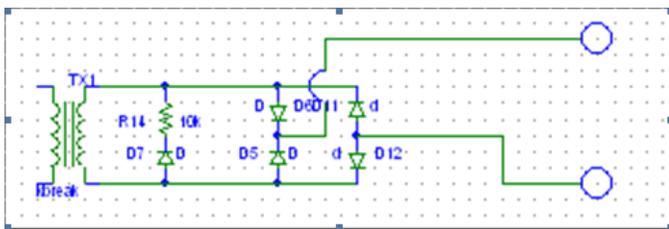


Figure 5: Transformer circuit

3.4 Design of circuit for speed control

Speed control circuit will be built using relays, transmitter, resistors and an IC. An LED is used to indicate the charging of the DC batteries and also to indicate the current flow in the circuit.

Relays are used mainly to protect the circuit and the toggle switches from any surge in voltage which could result due to the sudden switch of power to the external main batteries whenever there is a DC motor cut off. The motor is cut off with the help of a switch in the speed control circuit and the power is automatically directed to the external batteries which has a capacity about 12V and 25amps. A second Relay is used for motor cut off.

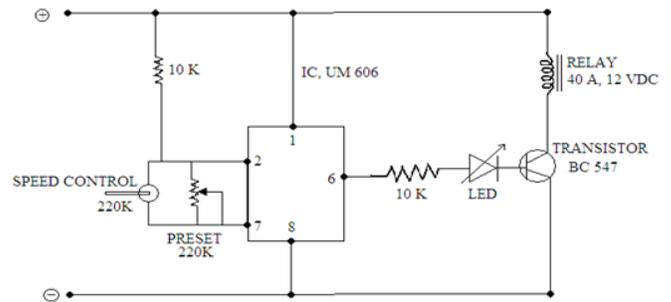


Figure 6: Speed control circuit

Use of Relay in the circuit:

The core of the electromagnetic relay, naturally, is an electromagnet, formed by winding a coil around an iron core. When the coil is energized by passing current through it, the core in turn becomes magnetized, attracting a pivoting iron armature. As the armature pivots, it operates one or more sets of contacts, thus affecting the circuit. When the magnetic charge is lost, the armature and contacts are released. Demagnetization can cause a leap of voltage across the coil, damaging other components of the device when turned off. Therefore, the electromagnetic relay usually makes use of a diode to restrict the flow of the charge, with the cathode connected at the most positive end of the coil.

Contacts on an electromagnetic relay can take three forms. Normally opened contacts connect the circuit when the device is activated and disconnect it when the device is not active, like a light switch. Normally closed contacts disconnect the circuit when the relay is magnetized, and a change-over incorporates one of each type of contact. The configuration of the contacts is dependent upon the intended application of the device.

The electromagnetic relay is capable of controlling an output of higher power than the input, and it is often used as a buffer to isolate circuits of varying energy potentials as a result. When a low current is applied to the electromagnet, throwing the switch, the device is capable of allowing a higher current to flow through it. This is advantageous in some applications, such as tripping alarms and other safety devices, because a safer low current can be used to activate an application requiring more energy. [1]

Power utilization:

The electromagnetic coils are supplied by 12VDC, may draw 25amps current.

Lead acid battery is used to give power to the DC motor and this battery can be recharged when connected directly to AC supply.

IV. FABRICATION & ASSEMBLY

The parts fabricated are:

- 4.1 Magnetic coil set:
- 4.2 Moving Shaft:
- 4.3 Crank lever:
- 4.4 Shaft Guides:
- 4.5 Crank shaft:
- 4.6 Crank wheel:
- 4.7 Crank pin:
- 4.8 Crank housing
- 4.9 Crank lever
- 4.10 Base frame
- 4.11 Coil holder
- 4.12 Battery box
- 4.13 Circuit holder
- 4.14 Switch activating bushes
- 4.15 Drive Gear & Pinion

After the fabrication of the individual components upon design and their selection, they were then assembled. The order of the assembly is given below:

- 1) Chassis: The chassis frame was made of many different mild steel components that were welded together. This forms the skeleton of the vehicle.
- 2) Stand: The stand was then bolted under the chassis to support the weight of the vehicle. Two stands are provided, one below the rear axle and one below the front axle.
- 3) Front axles with wheels and Bearing: Front axle was welded onto the chassis frame with the bearings and the wheels.
- 4) Base Plate: The base plate was welded onto the chassis frame. This forms a support structure for the crank assembly.
- 5) Supports frames for Coils, Switches and Shaft: The support frames of various dimensions were welded/bolted on top of the chassis frame.
- 6) Crank Housing: Crank housing is welded onto the base plate which supports the crank assembly.
- 7) Crankshaft: Crankshaft was installed on the crank housing along with the bearings.
- 8) Piston with coils: Shaft is passed through the shaft guides and through the coils and with the help of a L-nut, the piston is fixed onto the shaft.
- 9) Crank Assembly: The Crank assembly consists of the connecting rod and the cam plate. This assembly was taken from a two-wheeler and installed.
- 10) Pinion: The pinion was bolted onto the crankshaft which overhangs from the cam plate and the Crank housing.
- 11) Rear axle assembly: The Rear axle assembly consists of Gear wheel, Sprocket, Rear wheels and bearings.
- 12) DC motor with Sprocket and Chain: The DC motor was mounted onto the Crank housing and then the Sprocket was bolted to the output shaft of the motor. The sprockets were then connected using the chain.
- 13) Battery with Transformer Circuits: DC batteries that run the DC motor are fixed onto the Battery Box which are welded onto the chassis frame. The rectifier circuits are built and soldered to the DC batteries. The batteries are connected to a transformer is bolted onto the chassis frame. Connections from the transformer is given through the wires for external charging.
- 14) Electronic Circuitry: The circuit components required for speed control are IC, Transistor, Resistor, Capacitor, Regulator,

Preset which are soldered onto the PCB(Printed Circuit Board). Relays, LEDs, Toggle switches, etc. are also added along with wiring.

15) Switch actuators: These are a pair of mild steel strips bolted over the moving shaft at preset positions firmly. When the moving shaft reciprocates, the actuators operate the toggle switches thereby alternating the current to the coils.

V. PERFORMANCE ANALYSIS, TESTING & EXPERIMENTAL RESULTS

The various parameters involved in the performance testing of the vehicle is listed below:

- 1) Rotational speed of the Rear axle
- 2) Force exerted by the piston
- 3) Power generated
- 4) Load on the engine
- 5) Efficiency:
 - a) Coil efficiency
 - b) Piston efficiency
 - c) Crank & Transmission efficiency
 - d) Overall efficiency.

5.1 Rotational speed of the rear axle:

The speed of the rear axle 'N' is measured in rotations per minute (RPM) which is measured using a digital tachometer by which the power at the rear axle is measured. As per the readings by the tachometer the rear axle rotates at 330 RPM and the pinion or the crank shaft with a speed of 750 RPM. Varying speed can be obtained by the speed control circuit which varies the speed by a range of 80 RPM.

5.2 Force exerted by the piston:

The piston is subjected to magnetic force which acts tangential to the surface of the piston and the piston in turn exerts a force on the crank assembly and the other reciprocating parts. The force exerted by the piston is measured using the formula,

$$F = \text{Mass} * \text{Acceleration}$$

Where the mass of the reciprocating parts is expressed in terms of Kg

Acceleration in terms of m/s² and is given by the formula

$$a_p = \text{Piston acceleration} = (\omega_{\text{crankshaft}}^2 \times r) (\cos \theta + \frac{\cos 2\theta}{n})$$

Force in terms of Newtons (N).

5.3 Power Output:

The power generated at the rear axle was found out taking into account the transmission and the crank efficiency. The input power generated by the piston before the cranking and the transmission is given by

$$P = m \times a_p \times v_{p\text{max}}$$

where $v_{p\text{max}} = (\omega_{\text{crankshaft}} \times r) (\sin \theta + \frac{\sin 2\theta}{2n})$ [4]

5.4 Load on the engine:

Various performance tests were conducted on the vehicle in varying conditions such as constant load- varying speed, constant speed-varying load. The load applied were in an interval of 2kg and parameters like speed, efficiency, power input were measured. The vehicle was tested with a minimum load of 5kgs and a maximum of 11kg.

5.5 Efficiency:

a) Coil efficiency:

Coil efficiency is defined as the amount of DC power transmitted by the coils to the power input by the batteries. This parameter was almost negligible since the losses associated with the dissipation of the power was very low and this was calculated knowing the resistance exerted by the supply wires and the wires in the coil.

b) Piston efficiency:

Piston efficiency is defined as the amount of power generated by the piston to the power input by the coils. This was calculated by knowing the power exerted by the piston on the crank assembly and the power input by the coils taking into account the dissipation factors due to the resistance exerted by the coil.

c) Crank & Transmission efficiency :

Transmission efficiency is defined as the power generated by the gear wheel to the power input by the pinion. For a standard pinion and gear assembly, the transmission efficiency is assumed to 95 %.

Crank efficiency is defined as the power generated by the crankshaft to the power input by the piston. For a standard crank assembly, the efficiency is assumed to be 96%.

d) Overall efficiency:

Overall efficiency is defined as the power generated at the output shaft to the power input by the DC batteries. This efficiency is the product of the all the efficiencies i.e., Coil efficiency, Piston efficiency, Crank and Transmission efficiency.

EXPERIMENTAL RESULTS:

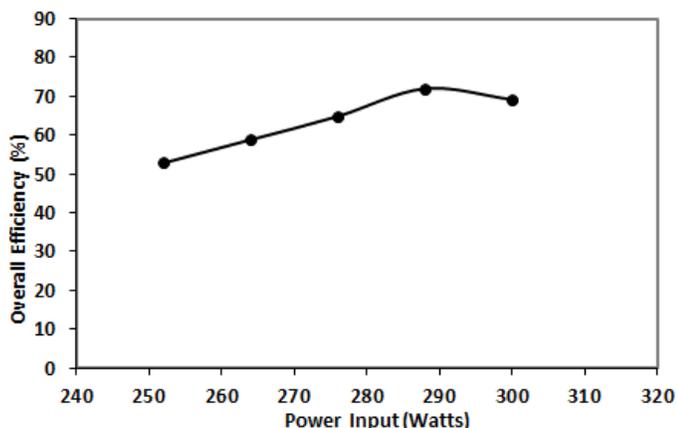


Figure 7: Overall Efficiency vs. Power input

1. This test was conducted to know the overall efficiency of the vehicle at varying power input. It can be concluded from the graph that the overall efficiency of the vehicle is low at a lesser power input due to the resistance offered by the reciprocating mass(inertia force) and this force decreases with the increasing power input. Hence the efficiency increases at a range of 285 to 290 W, with a peak efficiency of 70 to 72% percent. The decrease in efficiency after 290W was due to the increase in frictional losses & heating of coils.

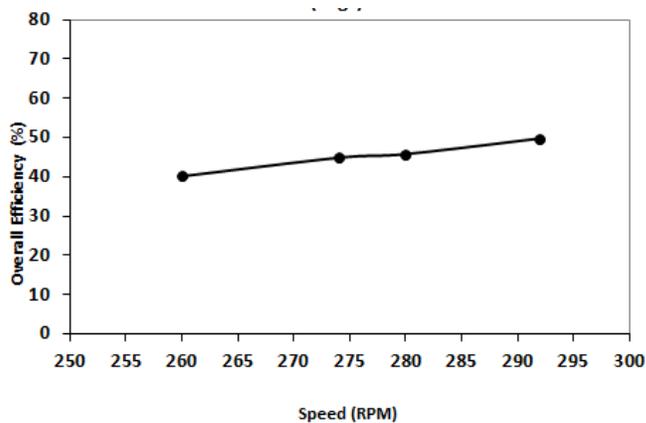


Figure 8: Overall efficiency vs. RPM

2. This test was conducted to know the overall efficiency at varying speed .The overall efficiency was found to be maximum at a speed of 290RPM due to the increase in power input and the reason for this is same as graph showing the overall efficiency Vs power input. Further test was not conducted since I had to risk overheating of coils.

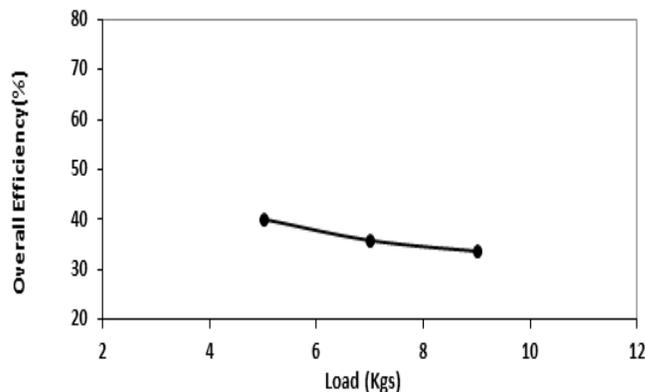


Figure 9: Overall efficiency vs. Load

3. This test was conducted to know the variation of overall efficiency with increasing load at a constant speed of 260RPM. It was found that the input power required to keep the vehicle running at 260RPM drastically increased, thus decreasing the overall efficiency. The load was increased by 2Kg for the 3 trials conducted.

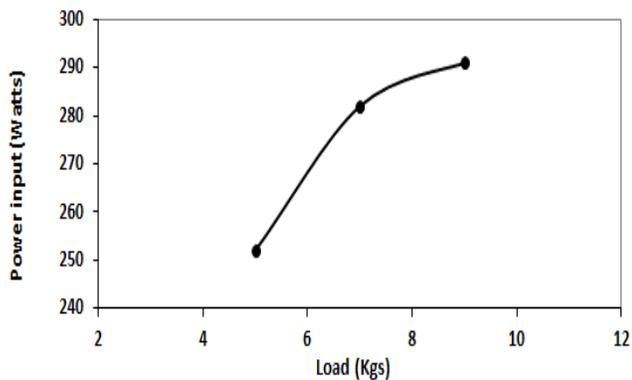


Figure 10: Power input vs. Load

- This test was conducted to know the power input with the increasing load at a constant speed of 260RPM. As load was increased it was observed that the power input required increased drastically to keep the vehicle running at 260RPM thus decreasing the efficiency.

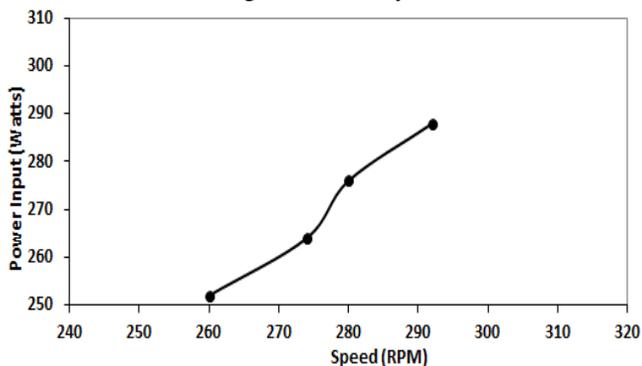


Figure 11: Power input vs. Speed

- This test was conducted to know the variation of power input with increasing speed at constant load of 5Kg. The power input required increased with increase in speed.

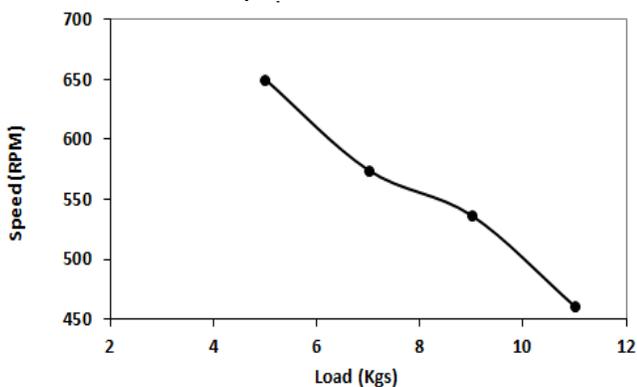


Figure 12: Speed vs. Load

- This test was conducted to know the variation of speed with increase in load. The speed recorded in this case is the speed of the pinion which varied due to the increase in resistance offered by the rear axle due to the increase in load. The load was increased with an increment of 2kg for every trial.

ATTAINMENT OF OBJECTIVES:

- The prototype was aimed at obtaining an alternative method for propulsion technique in automobiles. With the help of this prototype model, it could be shown that it is possible to use magnetic power efficiently for transportation in automobiles. The prototype could produce an overall efficiency of 72% which could be improved with further research on this concept.
- The project was also aimed at using electrical energy to propel the vehicle which obviously results in zero emission. With the increase in Carbon emission from automobiles and due to the fast depletion of fossil fuels, this technology will find its place soon in the market.
- This technology is very efficient because it involves few number of moving parts and there is no mechanical contact and friction taking place between the piston and the coils unlike IC engines wherein the piston slide inside the cylinder. Hence there is not much of lubrication involved.

VI. SUMMARY/CONCLUSION

Scope for Improvement:

- The efficiency could be increased significantly by using bigger and more efficient design of coils, installation of flywheels, cooling systems for the coils, etc.,.
- Efficiency of the prototype could be increased further by efficient design of coils so that the magnetic flux induced by the solenoid coils could be utilized to the fullest
- By reversing polarity using polarity timer & using permanent magnets as the piston material, by inducing repulsion simultaneously in the other coil the efficiency could be further enhanced.
- By using a piston enhancer (an electromagnetic coil at the dead center) the reciprocation could be improved
- An AC generator in the crankshaft can be used to appropriately rectify & charge the batteries thus improving the efficiency.
- 2n no. of pistons & solenoid pairs can be used with n of pistons and solenoids at each end to see if better efficiency is achieved.
- Parallel connecting rods could be introduced with the similar set up thus to power a common crankshaft & try to achieve a better efficiency.

Actual Model:

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CONCLUSION:

- Switching Magnetic Energy can be the technology for the future. At this forefront of new inventions and discoveries man is always in a quest for moving faster and more efficient ways of energy utilization.
- This technology is very efficient because it involves few no. of moving parts and there is no mechanical contact and friction taking place between the piston and the coils unlike IC engines wherein the piston has a sliding contact with the cylinder. Hence there is not much of lubrication involved in the prototype.
- This principle can revolutionize our modes of transport. Due to an increase in carbon emission or greenhouse gases people in the future will be resorted in using electricity as a primary fuel for automobiles which will be the obvious result of the disadvantages faced by us due to dependency on fossil fuels.
- If this technology is implemented it will cut off the carbon emission and thereby facilitate a greener, cleaner environment which can ultimately give a cure for global warming.

REFERENCES

- [1] Robotics Technology and Flexible Automation by S.R. DEB.[1]
- [2] Industrial Robotics by Mikell P. Groover[2]
- [3] Computer Aided Manufacturing by P.N. Rao, N K Tewari[3]
- [4] Text Book of Machine Design, by R.S.Khurmi & J.K. Gupta[4]
- [5] Design data hand book by Mahadevan and Reddy.[5]

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How to Detect Failure Node in a Selected Network?

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Abstract- We focus only how to recognize a failure node in selected network. In autonomous system a queue is playing important role for node to node communication with the knowledge of node to its neighbour node.

Index Terms- Queue, Autonomous system, router protocol

I. INTRODUCTION

In an autonomous system, communicate to each other by using router protocol the parameter like time, queue length are major role play to detect the failure node in an selected network

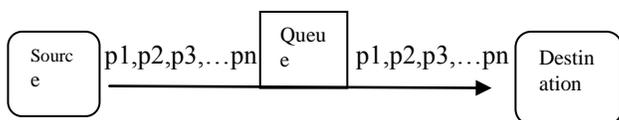


Fig-1 showing communication path established using queue

In this figure from source to destination a queue is for stored packet and depart the packet to particular destination. here queue play a role like a router. Having information about arriving node and departing node before stored packet means that stored the status about the packets

Timing factor- when queue established the time is main factor to communicate to each other.

Queue length-Queue length having no of packets to arrived for processing and ready for departing from queue but there is time limits for all departing and arriving packets like m/s per packets.

Reason-

If the error rates occur in transmit a packet, retransmit the packets and allotted time is finished, then retransmit take double time to transmit packets or delay time, means that one node is failure and not participating in communicate path from source to destination

For Autonomous system

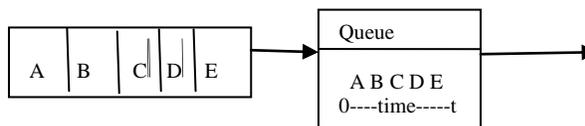
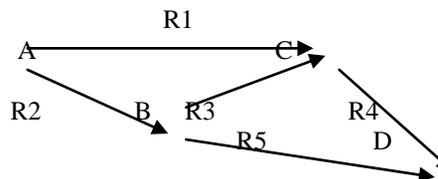


Fig-2 Packet transmission, either depart or not to destination

In fig-2,the autonomous system having five nodes A,B,C,D,E communicate to each other and these belongs to selected network. Suppose that packets A B C D E are coming into queue in FIFO order. timing for A is 1 m/s ,for B 2m/s ,for C 3 m/s,for D and E 4m/s and 5 m/s respectively, A came and depart at proper time but B having delay to departing from queue ,then delay occur in communication, But question is that how to detect failure node in selected network?



A-R1-C, A -R2- B, B-R3-C, B-R5-D, C-R4-D
 (R1, R2, R3, R4, R5 are routers between nodes)

Fig-3 Selected path but change the route because of failure node

Router R1 having information about A and its neighbour C, R2 having information about A and its neighbour B, R3 having information about B and C, R4 having information about C and D, R5 having information about B and D. all this network router having information about all nodes, whose established communication path.

If node B failed then router R2 having knowledge about fail then router R2 inform to node A. node A change the path from A to C and then C to D through router R4.

Note-router having some distance from node to node and choose shortest path using shortest path algorithm from source to destination for successfully path.

II. BROADCASTING FOR FURTHER COMMUNICATION

Broadcasting using multipath is alternate approach for communication from source to destination node .if intermediate node failed then announced to all other node to inform about the failure. It is also helpful process for communication.

For point to point communication there is node to node sequence from source to destination for communication, it is also helpful for established path.

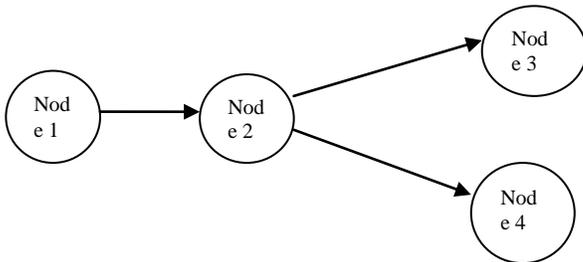


Fig-4 Refer to count to infinity problem.

In this figure node 1 communicate to node 2 and node 2 again communicate to node 3 and node 4,if node node is failed then there are communication gap arise.

III. NETWORK FAILURE DETECTION THROUGH GRAPH THEORY

As we know that the complete network build by the nodes and intermediate nodes and here we represent by the graph theory, in graph theory the edges represent the communication path/link between nodes and the nodes are connected by the link,

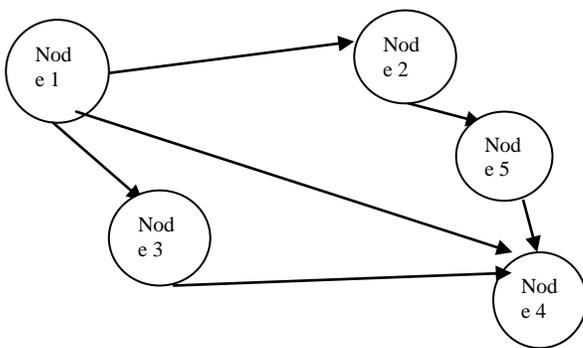


Fig-5 communication network

In this fig, selected network node 1 communicate with node 2, node 3 and node 4 and our source is node 1 and destination is node 5, if node 1 failure then broadcast the message to node 3 node 2 and node 4, but here time delay is possible .suppose node 1 communicate to node 2 in 20 m/s but after failure node 2 have no message from node 1 then delay is possible.

IV. RELATED WORK

In future we use sensor with each node to detect node is failure or not. This sensor intimate to next node with less delay and inform about failure node, this is helpful to successful communication with time factor from source to destination.

ACKNOWLEDGMENT

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REFERENCES

- [1] Mumin Imamoglu, Mehmet Keskinöz , ‘Node Failure Handling for Serial Distributed Detection in Wireless Sensor Networks’, 21st Annual IEEE International Symposium on Personal, Indoor and Mobile Radio Communications.
- [2] S. Liu, K.-H. Cheng, and X. Liu, “Network reliability with node failures,” *Networks*, vol. 35, no. 2, pp. 109–117, Mar. 2000.
- [3] M. K. Aguilera, W. Chen, and S. Toueg. Heartbeat: A timeout-free failure detector for quiescent reliable communication. In *WDAG ’97*, pages 126–140, London, UK, 1997.
- [4] M. K. Aguilera, W. Chen, and S. Toueg. Using the heartbeat failure detector for quiescent reliable communication and consensus in partitionable networks. *Theor. Comput. Sci.*, 220(1):3–30, 1999.
- [5] C. Almeida and P. Ver’issimo. Timing failure detection and real-time group communication in real-time systems. In *8th Euromicro Wksp. on Real-Time Systems*, June 1996.
- [6] R. Boichat, P. Dutta, and R. Guerraoui. Asynchronous leasing. In *7th IEEE Intl. Wksp. on Object-Oriented Real-Time Dependable Systems (WORDS ’02)*, pages 180–187, 2002.
- [7] T. D. Chandra and S. Toueg. Unreliable failure detectors for reliable distributed systems. *J. ACM*, 43(2):225–267, 1996.
- [8] W. Chen, S. Toueg, and M. K. Aguilera. On the quality of service of failure detectors. *IEEE ToC*, 51(1):13–32, 2002.
- [9] M. Choy and A. K. Singh. Efficient fault tolerant algorithms for resource allocation in distributed systems. In *ACM Symposium on Theory of Computing*, pages 593–602, 1992.

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Particle Swarm Optimization Based Automatic Generation Control of Two Area Interconnected Power System

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Abstract- Due to the continuous change in load, the frequency and tie-line power of control areas get disturbed from their scheduled value which is undesirable. Automatic Generation Control (AGC) is an essential mechanism in electric power systems which balance generated power and demand in each control area in order to maintain the system frequency at nominal value and tie-line power at its scheduled value. This necessitates an accurate and fast acting controller to maintain constant nominal frequency. The limitations of conventional controllers i.e. Integral (I), Proportional Integral (PI) are slow and lack of efficiency in handling system errors. This paper proposes Particle Swarm Optimization (PSO) technique for AGC of two-area interconnected power system. Firstly, the conventional controllers i.e. Integral (I), Proportional Integral (PI) are used for AGC of two-area interconnected power system. Then PSO based controllers are used and various responses due to various controllers have been compared. The responses of the proposed methods are demonstrated by MATLAB simulations.

Index Terms- automatic generation control (AGC), conventional integral (CI) and proportional integral (PI) controller, particle swarm optimization (PSO)

I. INTRODUCTION

The main requirement in operation of interconnected power systems is the control of the frequency and the tie-line power flow. This can be achieved by the use of automatic generation control (AGC). The aim of the proposed controller is to restore the change in error to its nominal value in the smallest possible time whenever there is any change in the load demand etc. This work presents the automatic generation control (AGC) of an interconnected two area system with the use of particle swarm optimization (PSO) technique. Here AGC for the two areas system is done by the use of conventional controllers and particle swarm optimization (PSO) technique and change in overall error of the system is examined by using MATLAB SIMULINK.

II. PROBLEM FORMULATION

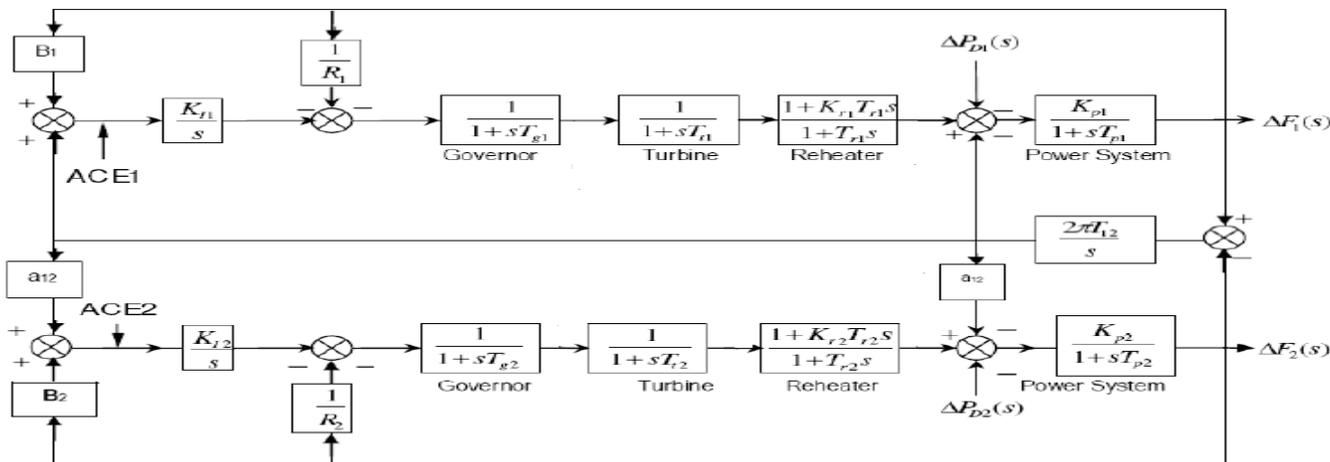
We have taking the concept of area control error which is produced by comparing the feedback and reference signal and provide to particular controller which we used in the model of interconnected power system. So the problem formulate in automatic generation control is that we have first calculate the area control error by integral square error or by integral time absolute error techniques and then taking the gain of particular controller at which the system error reduced and frequency is balanced according to load.

III. PLANT MODEL DESCRIPTION

(A) LINEARIZED MODEL

Study of automatic generation control (AGC) problem of a large interconnected power system is necessitated by the importance of maintenance of frequency and tie line flows at their scheduled values. A large widespread electric power system can be divided into a large number of control areas interconnected by means of several tie lines.

The control objective is to regulate the frequency of each area and tie line power contracts simultaneously. As in the case of frequency regulation, proportional plus integral controller will be installed so as to give zero steady error in tie line power flow. It is conveniently assumed that each control area can be represented by an equivalent turbine, generator and governor system. In an isolated control area case the incremental power $\Delta P_G - \Delta P_D$ was accounted for by the rate of increase of stored kinetic energy and increase in area load caused by increase in frequency. Since a tie line transports power in or out of area, this fact must be accounted for the incremental power balance equation of each area.



MODEL OF TWO AREA INTERCONNECTED POWER SYSTEM

- ΔP_{D1} Incremental load change in area 1
- ΔP_{D2} Incremental load change in area 2
- R_i Governor speed regulation parameter
- T_{sg} Governor Speed time constant
- T_t Turbine time constant
- B_1 Frequency bias constant for area 1
- B_2 Frequency bias constant for area 2
- T_p $2H/fD$
- K_p $1/D$
- D Load damping constant
- K_i Integral gain
- Δf_1 Change in frequency for area 1
- Δf_2 Change in frequency for area 2

IV. OPTIMIZATION OF CONTROLLER PARAMETERS, FREQUENCY BIAS FACTOR & SPEED REGULATION CONSTANT

In this study we have considered all pi controller gains ie $K_{i1}=K_{i2}=K_i, K_{p1}=K_{p2}=K_p,$ and frequency bias factors $B_1=B_2=B$ and speed regulation constants $R_1=R_2=R.$ we need to optimize K_i, K_p, B, R in order to obtain good dynamic response of the agc system. In this study K_i, K_p, B, R values are optimized using the particle swarm optimization technique by minimizing the quadratic performance index (PI) for 0.01 p.u. step load change in area-1 .where w_1 and w_2 are the weight factor .

Let the step changes in loads $\Delta P_{D1}(s)$ and $\Delta P_{D2}(s)$ be simultaneously applied in control areas 1 and 2, respectively. When steady conditions are reached, the output signals of all integrating blocks will become constant and in order for this to be so, their input signals must become zero.

(B) CONVENTIONAL AGC SYSTEM

Automatic control system of close loop system means minimizing the area control error (ACE) to maintain system frequency and tie-line deviation are set at nominal value. Block diagram of two area system is shown in fig above. The ACE of each area is linear combination of biased frequency and tie-line error.

$$ACE_i = \Delta p_{tie,ij} + \beta_i \Delta f_i \quad (1)$$

Where, ACE_i is the area control error of the i th area

Δf_i = frequency error of i th area

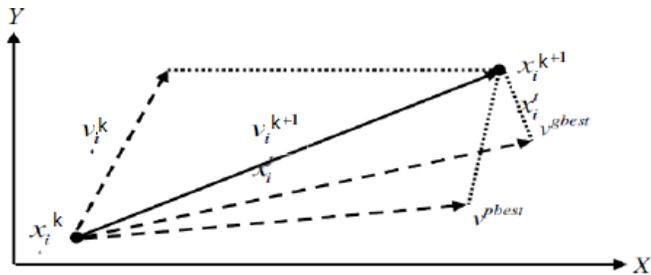
$\Delta p_{tie,ij}$ = tie- line power flow error between i th and j th area

B_i = frequency bias coefficient of i th area.

V. OVERVIEW OF PARTICLE SWARM OPTIMIZATION

PSO is a population based optimization technique based on intelligent scheme developed by Kennedy and Eberhart (1995) (Kennedy et al., 2007). PSO has emerged as one of the most assuring optimizing schemes for effectively dealing near to global optimization tests. The inspiration of the mechanism is established by the social and cooperative nature represented by flying birds. The algorithm simulates a simplified social milieu in capable solutions of a swarm which means that a single particle bases its search on its own experience and information given by its neighbors in the specified region. Particles are flown in the solution region with their

randomized assigned velocity. Among these particles, each particle keeps track of its coordinates in the solution region which are associated with the best fitness it has achieved so far. This value is known as „pbest“. Another „best“ value that is tracked by the particle is the best value, obtained so far by any particle in the group of the particles. This best value is also known as a global best, „gbest“ and the pattern is forwards to successful solutions. PSO technique using equation (5) is known as the *gbest* structure. PSO is a population based EA that has many primitive benefits over other optimization techniques. A most attractive quality of the PSO approach is its simplicity as it involves only two main reference equations. Each particle coordinates represent a possible solution assisted with two real vectors.



Each particle coordinates represent a possible solution assisted with two real vectors. And $v_i = [v_{i1}, v_{i2}, v_{i3} \dots v_{iN}]$ are the two vectors assisted with each particle „i“ in N-dimensional search space. Number of particles or possible solutions of a swarm can go forward through the feasible solution place to explore optimal solutions. Each particle modifies its position based on its own best exploration, and overall experience of best particles (Beielstein et al., 2003). This particle also considers its previous velocity vector according to the following reference equations,

Velocity modifications

Each particle velocity can be modified by the following equation:

$$V_i^{k+1} = C * (W * V_i^k + C_1 \text{rand} \times (pbest_i - S_i^k) + C_2 \text{rand} \times (gbest_i - S_i^k)) \quad (2)$$

Position modifications

Positions of the particles are modified at each interval of the flying time. The position of the particle may be change or not change, depending on the solution value.

$$S_i^{k+1} = S_i^k + V_i^{k+1} \quad (3)$$

Where, v_i is velocity of particle „i“ at iteration k .

$$V_i^{k+1} = (W * V_i^k + C_1 \text{rand} \times (pbest_i - S_i^k) + C_2 \text{rand} \times (gbest_i - S_i^k)) \quad (4)$$

Typical values for the inertia parameter are in the range [0, 2]. On the other side several different approaches using a construction factor s , which increase the algorithm’s capability to converge to a better solution and the equation used to modify the particle’s velocity

$$V_i^{k+1} = s * (V_i^k + C_1 \text{rand} \times (pbest_i - S_i^k) + C_2 \text{rand} \times (gbest_i - S_i^k)) \quad (5)$$

VI. PSO BASED CONTROLLER DESIGN

Step1. The minimum and maximum gain limits of PI controllers are specified from the conventional PI controller. The initial Particle matrix of (N X 8) is generated by selecting a value with a uniform probability over the search space ($K_{min}=0, K_{max}=2$).

Step2. Set the population size and the initial Particle velocities are set to zero.

Step3. Assume the initial value of K and enter the maximum no. Of iterations/generations required.

Step4. Evaluate the initial population by simulating the Load frequency Control block model with each particle row value as the PI controller gain value and calculate Performance index (ISE/ITAE) for each particle.

Step5. Initialize local minimum (P_{best}) for each particle.

Step6. Find the best particle (G_{best}) in initial particle matrix based on the minimum performance index.

Step7. Start the iteration $iter=1$

Step8. Update the velocity of the particle using the equation shown below,

$$\text{Velocity } V_i^{k+1} = C * (W * V_i^k + C_1 \text{rand} \times (pbest_i - S_i^k) + C_2 \text{rand} \times (gbest_i - S_i^k))$$

Where Constriction factor $C=1$
Cognitive parameter $c1 = 2$
Social parameter $c2 = 4-c1$
Inertia weight

$$W = W_{max} - \frac{W_{max} - W_{min}}{iter_{max}} * iter$$

$\text{rand1}, \text{rand2}$ are the random numbers between 0 and 1

Step9. Create new particle from the updated velocity.

Step10. If any of the new Particles violate the search space limit then choose the particle and generate new values Within the particle search space.

Step11. Evaluate the performance index value for each new particle by simulating the LFC block model.

Step12. Update the best local position (P_{best}) for each particle based on the minimum value comparison between new Particle performance index and old P_{best} performance index.

Step13. Update Gbest Global minimum particle and its performance index.

step14. $gen=gen+1$

step15. If $gen>maxgen$ go to step 7, otherwise go to next step.

step16. Print the global best PID controller gain values and its performance index value.

V11SIMULATION RESULT AND DISCUSSION

In this chapter different control strategies for supplementary control are implemented through MATLAB simulink model. Integral (I) controller, Proportional Integral (PI) controllers, and Particle Swarm Optimization (PSO) based controllers are implemented and the results are compared.

Case 1

First we apply the integral control gains K_{i1} & K_{i2} in pid controller in simulink model of two area interconnected power system and result waveform is shown in scope and study the variation of settling time and overshoot time of load frequency control of area-1 & area-2 resp.as shown in fig 1&2 as well as tie line power is also studied and also show the variation in fig3.

Case 2

Secondly we apply the proportional integral control gains K_{p1}, K_{p2} & K_{i1}, K_{i2} in PID controller in simulink model of two area interconnected power system and same factor of load frequency control is studied and shown in fig.4&5 which shows that the settling time and overshoot time is reduced as compared to previous case of area-1 & area-2.also tie line power is compared as shown in fig.6

Case 3

Thirdly we apply the particle swarm optimization technique to automatically select and optimized the controller parameters through the number of populations of particle best and group best. And compared the result of both previous controller with this technique as shown in fig 7.also tie line power is observe and shown in fig . 8

And the reading of all considering parameter is tabulate in table 1&2 respectively.

Area-1	B1	Ki1	Kp1	R1	F1 Settling time	P tie-settling time
Pso	0	1.4204	1.1210	0.6747	11.3	12.3
Integral Controller	0.0001	0.09	0	0.3333	23.8	21.2
Prop. Integral controller	0.0001	0.09	0.8	0.3333	18.1	15.6

TABLE-1

Area-2	B2	Ki2	Kp2	R2	F2 Settling time	P tie-settling time
Pso	0.2911	1.4609	1.3687	1.4023	11.7	12.3
Integral Controller	0.0001	0.09	0	0.3333	22.2	21.2
Prop. Integral controller	0.0001	0.09	0.8	0.3333	18.7	15.6

TABLE-2

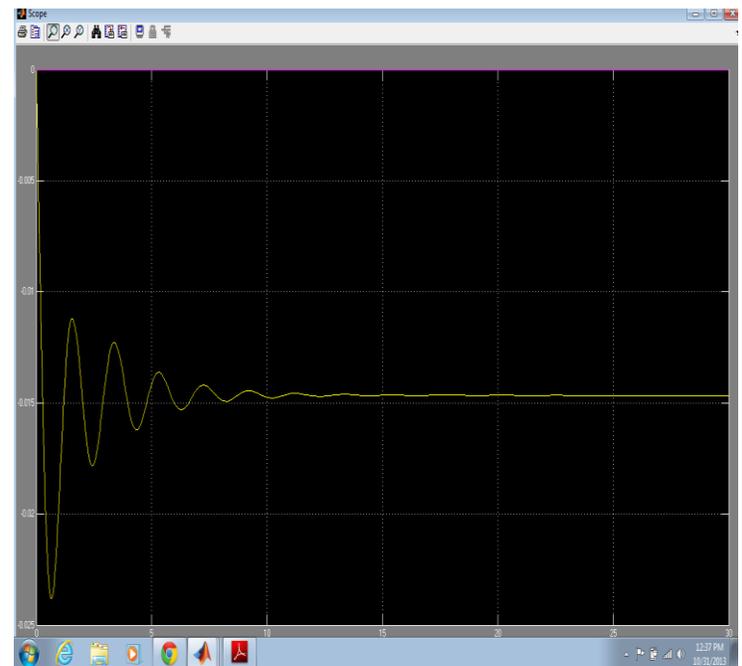


Fig1 Frequency deviation in area-1 of thermal reheats power system with integral controller

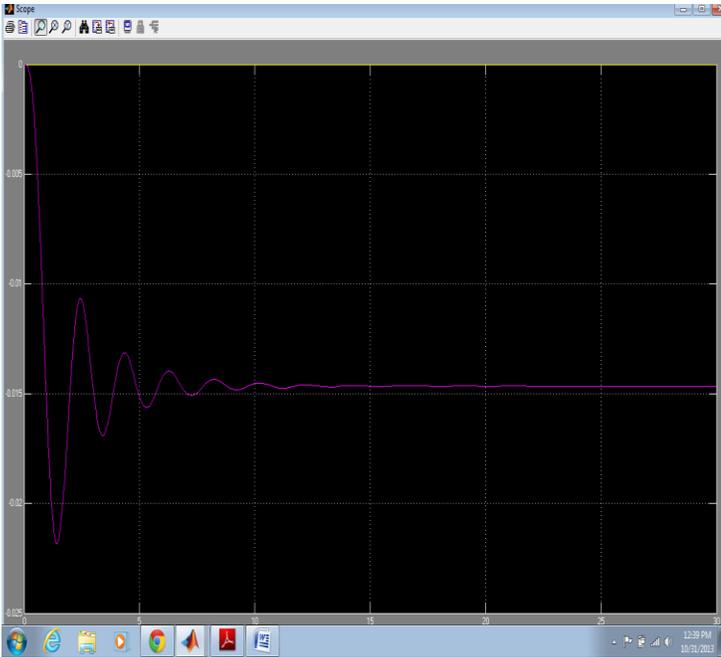


Fig2 Frequency deviations in area-2 of thermal reheat power system with integral controller

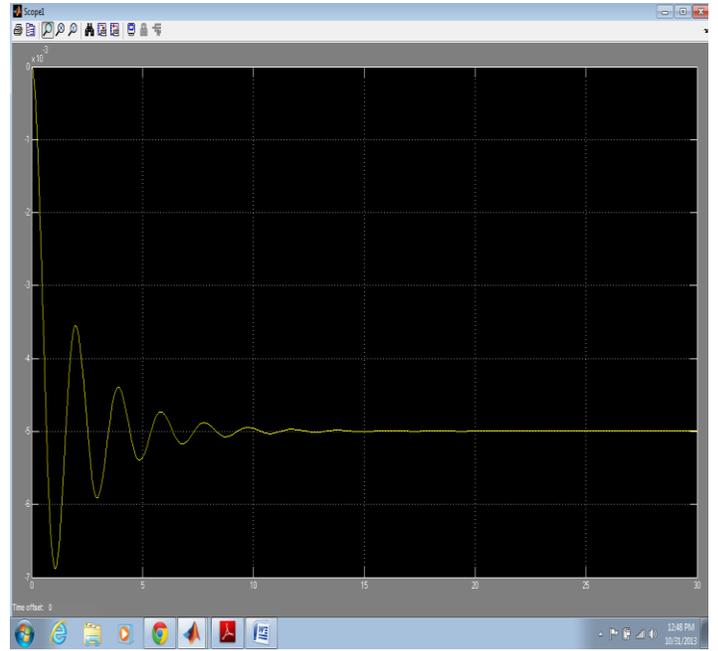


Fig 3 Tie line power deviation in two area interconnected thermal reheat power system with integral controller.

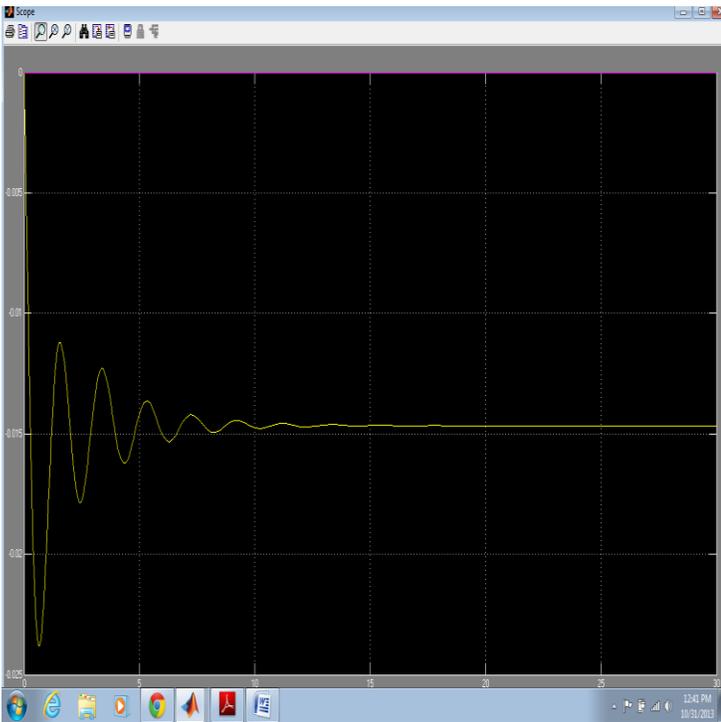


Fig 4 Frequency deviations in area-1 of thermal reheat power system with proportional integral controller

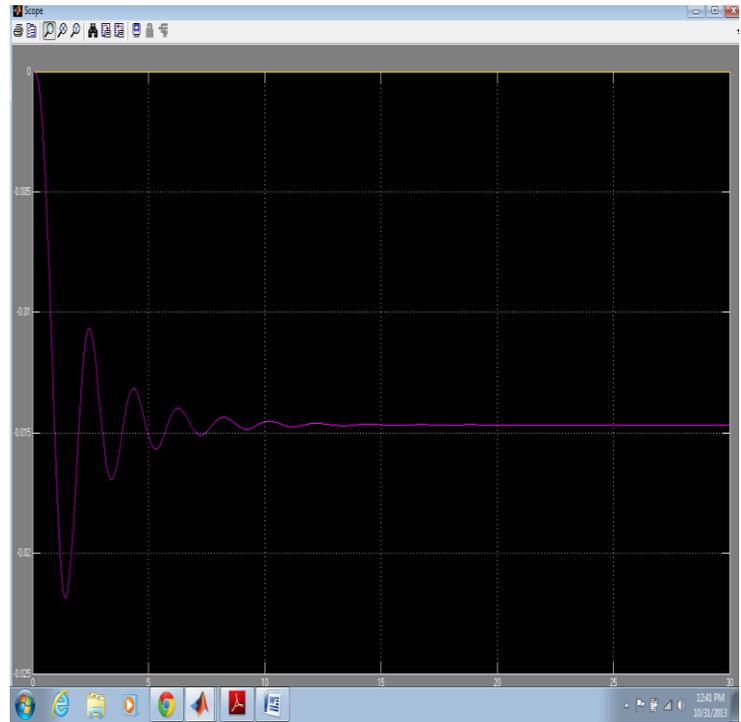


Fig 5 Frequency deviations in area-2 of thermal reheat power system with proportional integral controller

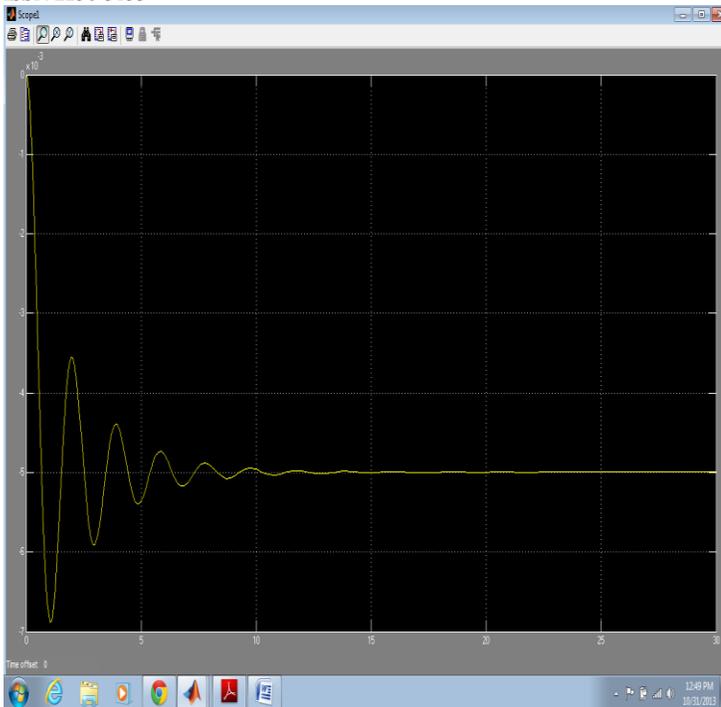


Fig 6 Tie line power deviation in two area interconnected thermal reheat power system with proportional integral controller

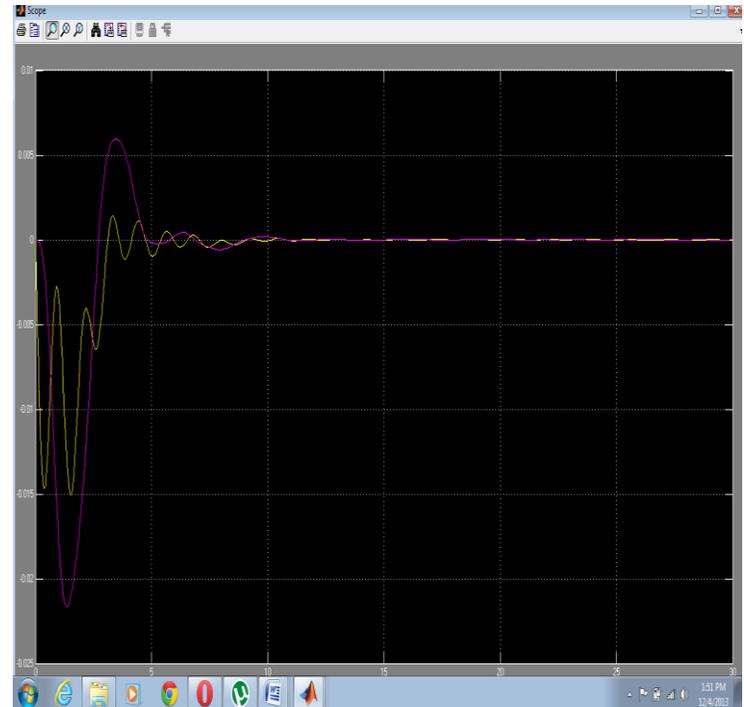


Fig7 frequency deviation in area-1&2 of interconnected thermal reheat power system with PI controller with particle swarm optimization

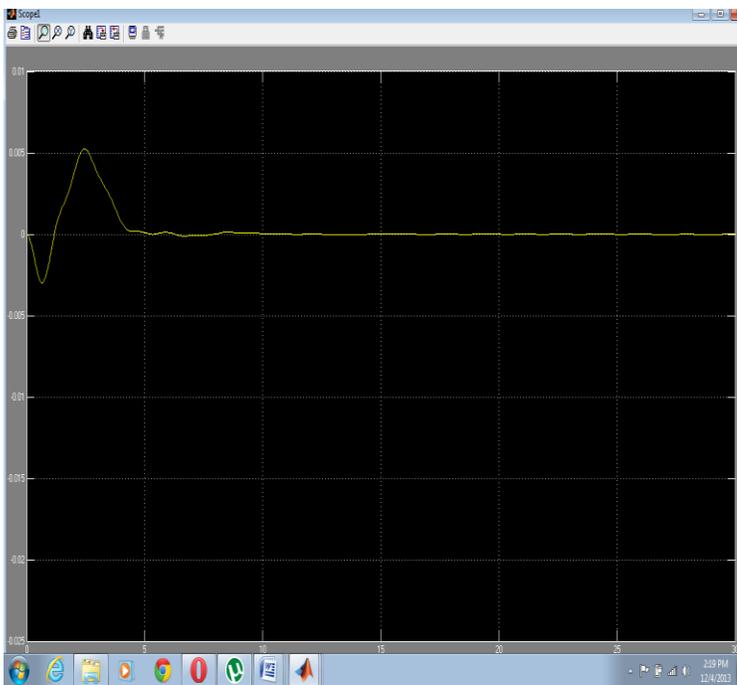


Fig 8Tie line power deviation in two area interconnected thermal reheat power system with particle swarm optimization

VIII CONCLUSION

In the present work, a control scheme for AGC of two area interconnected power system by using Particle Swarm Optimization technique is implemented. It is clear from the results that the performance of PI controller is better than I . In case of PI with PSO controller settling time of frequency and tie line power is smaller as compared to I and PI controller. For a two-area power system various parameters are calculated by PSO technique. The results show that the performance of PSO based controllers is better than the performance of conventional controllers. The peak overshoot and settling time is reduced in case of PSO based controllers.

REFERENCES

- (A) Naimul Hasan, Ibraheem and Shuaib Farooq, “ Real time Simulation of Automatic Generation Control for Interconnected Power System”, International Journal of Electrical Engineering and Informatics, Vol. 4, Number 1, March 2012.
- (B) Akanksha Sharma, K.P. Singh Parmar and Dr. S.K. Gupta, “Automatic Generation Control of Multi Area Power System using ANN Controller”, International Journal of Computer Science and Telecommunication, Vol. 3, Issue 3, March 2012.
- (C) AKHILESH SWARUP, “Automatic Generation Control of Two Area Power System with and without SMES”, International Journal of Engineering Science and Technology, Vol. 3, no. 5, May 2011.
- (D) Rajesh Joseph Abraham, D. Das and Amit Patra, “Automatic Generation Control of Interconnected Power System with Capacitive Energy Storage”, International Journal of Electrical and Electronics Engineering 4:5, 2010.
- (E) K. S. S. Ramakrishna, Pawan Sharma and T. S. Bhatti, “Automatic Generation Control of an Interconnected Hydro-thermal system in Deregulated Environment Considering Generation Rate Constraints”, International Journal of Engineering Science and Technology, Vol. 2, no. 5, 2010, pp. 51-65.
- (F) Panna Ram and A.N Jha, “Automatic Generation Control of an Interconnected Power System with diverse sources of Power Generation”, International Conference on Industrial Electronics, Control and Robotics, 2010.
- (G) A.Soundarrajan, Dr. S.Sumathi and C.Sundar, “Particle Swarm Optimization Based LFC and AVR of Autonomous Power Generating System”, International Journal of Computer Science, 37:1, IJCS_37_1_10.
- (H) Dr. K. Ramasudha, V.S. Vakula and R. Vijaya Shanthi, “PSO based Design of Robust Controller for Two area Load Frequency Control with Non Linearities”, International Journal of Engineering Science and Technology, Vol. 2(5), 2010, 1311-1324.
- (I) Gayadhar Panda, Sidhartha Panda and Cemal Ardil, “ Automatic Generation Control of Interconnected Power System with Generation Rate Constraints by Hybrid Neuro Fuzzy Approach”, World Academy of Science Engineering and Technology 52, 2009.
- (J) Lin Chen, Jin Zhong and Deqiang Gan, “Optimal Automatic Generation Control (AGC) Dispatching and its Control Performance Analysis for the Distribution Systems with DGs”, IEEE, 2007.
- (K) R.Poli, W.B. Langdon and O.Holland, “Extending Particle Swarm Optimization via Genetic Programming”, University of Essex, 2005.
- (L) J.Nanda and A. Mangla, “Automatic Generation Control of Interconnected Hydro-thermal System using Conventional Integral and Fuzzy Logic Controller”, IEEE, 2004.
- (M) Hossein Shayeghi and Heidar Ali Shyanfar, “Automatic Generation Control of an Interconnected Power System using ANN Technique based on μ - Synthesis”, Journal of Electrical Engineering, Vol. 55, no. 11-12, 2004, 306-313
- (N) José Luis Rodríguez-Amenedo, Santiago Arnalte, and Juan Carlos Burgos, “Automatic Generation Control of a Wind Farm with variable speed wind Turbines”, IEEE Transactions On Energy Conversion, Vol. 17, no. 2, June 2002.
- (O) Hirotaka Yoshida, Kenichi Kawata, Yoshikazu Fukuyama, Shinichi Takayama and Yosuke Nakanishi, “A Particle Swarm Optimization for Reactive Power and Voltage Control Considering Voltage Security Assessment”. IEEE transactions on power systems, Vol. 15, No. 4, November 2000.
- (P) R. K. Green, “Transformed Automatic Generation Control”, IEEE Transactions on Power System, Vol. 11, no. 4, November 1996, P-1799-1804.
- (Q) O.I. Elgerd and C.E.Fosha, “Optimum megawatt-frequency control of multiarea electric energy systems”, IEEE Trans. Power App. Syst., vol. PAS-89, no. 4, pp. 556–563, 1970.

- (R) N. Jaleeli, D. N. Ewart, L. H. Fink, “ Understanding automatic generation control”, IEEE Trans. Power Syst. 7(3) (1992) 1106-112
- (S) S. K. Gupta, Power System Engineering (With Computer Applications), Umesh Publications, New Delhi 2009, pp. 313-327.
- (T) B. R. Gupta, Generation of Electric Energy, Eurasia publishing house LTD.2002. pp 279-296.
- (U) S. H. Hosseini, A. H. Etemadi, “Adaptive Neuro-Fuzzy Based Automatic Generation Control”, Science Direct, Electric Power System Research 78 (2008) 1230-1239.
- (V) J. Kennedy and R. Eberhart, “Particle swarm optimization,” in Proc. IEEE Int. Conf. NeuralNetworks, vol. IV, Perth, Australia, 1995, pp.1942–1948.
- (W) P. J. Angeline, “Using selection to improve particle swarm optimization,” in Proc. IEEE Int. Conf. Evol. Comput. Anchorage, AK, May 1998, pp. 84–89.
- (X) D.P. Iracleous, A.T. Alexandridis, “A multitask Automatic Generation Control for Power Regulation”, Electrical Power System Research 73(2005) 275-285.
- (Y) R. A. Krohling, H. Jaschek, and J. P. Rey, “Designing PI/PID controller for a motion control system based on Particle Swarm Optimization,” in Proc. 12thIEEE Int. Symp. Intell. Contr., Istanbul, Turkey, July 1997, pp. 125–130.

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Heart attack detection and Medical attention using Motion Sensing Device-Kinect

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Abstract- The main aim of this research paper is to illustrate the use of a device which can perform the dual function of detecting a heart attack without the intervention of any specialist for potential victim and also notify the emergency services. Stroke can be tackled if it is detected and appropriate measures are taken instantly. The research paper illustrates how a device called '**Kinect**' can be used to detect a heart attack and the symptoms experienced along with it. A step by step guide to its working in an event of heart attack and the how the use of GSM system and Skype feature can be used for sending an alert sms to relatives and emergency services. As well as, provides video conferencing option with doctor. Which is explained in the paper. In all the best chance for survival of a patient who experiences a heart attack and quickest medical attention can be ensured.

Index Terms- Kinect, Xbox one, Heart attack, Myocardial infarction, Heart attack detection.

I. INTRODUCTION

Heart attack is a serious threat in today's world. Myocardial infarction (from Latin: *Infarctus myocardi*, MI) or acute myocardial infarction (AMI) is the medical term for an event commonly known as a heart attack. A heart attack is a serious medical emergency in which the blood supply to the heart is suddenly blocked, usually by a blood clot.

Heart disease is the number one cause of death for both men and women in the United States. About 600,000 people die of heart disease in the United States every year—that's 1 in every 4 deaths. Every year about 715,000 Americans have a heart attack. Of these, 525,000 are a first heart attack and 190,000 happen in people who have already had a heart attack.

Therefore this research is based on finding the method which can track heart attack in case it occurs at home. . As well as, the research gives a rough idea of the method for detecting heart attack and automatically informing the emergency services about the critical situation.^[3]

II. Objective of the device

2.1 Review Stage

This research aims at illustrating the advantages of device Kinect, which is a gaming device. By utilizing few features of this gaming device we can implement this system to life saver equipment in the situation of heart attack. This device can be installed in indoor areas like office and workplace, at living places or any indoor places where any heart patients would be present. And if the heart stroke occurs, then system will get alerted and will send sms to the relatives and will call the ambulance. Another aspect of this device is to collect data like

heart beat, live video recording of the patient and sending it directly to the doctor, and if any person is present around the victim, he can have video conferencing with doctor by built-in Skype feature and can take relevant action as directed by doctor till the emergency services reach.

2.2 Significance of the method

- 1) This method will measure the heart rate of a person continuously without any need of interaction with any other device.
- 2) The heart attack detection will be confirmed by following methods
 1. By sudden drop down in heartbeat.
 2. Tracking the position of hand and matched with predefined skeleton position of chest pain or arm pain
 3. At the end the sudden fall of patient on the ground will track by Kinect by tracking position of legs and head.
- 3) When heart attack occurs, by monitoring the data and the watching the situation of patient, doctor can guide the victim or person around the patient for appropriate action (like aspirin tablet), till the ambulance is reached to the patient.
- 4) In addition this system will alert the friends/relatives by sending sms by using sms trigger circuit which will be connected to the Kinect device through controller.

III. Previous study of device

A. Kinect System:

Xbox one is a gaming console developed by Microsoft. The Console includes a newly upgraded Kinect 2.0 motion sensing peripheral. Kinect is a motion sensing device which can interact with users by tracking their gesture and spoken commands. Kinect 2.0 has a new additional feature of detecting heart rate of a person, individual joints in form of skeleton and moment of such joints precisely.^[5] Figure gives a brief view about the working of Kinect.



Kinect tracks human body and joints in the form of skeleton. There are 25 individual joints used in tracking. The precision is taken very deeply by tracking even joints of thumbs. Figure shows skeleton tracking of individual joints in Kinect. [5]

Figure 3

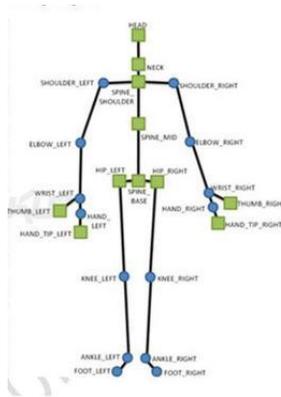


Figure 2

B. These features can be further extended for detecting heart attack:

Kinect 2.0 has an extraordinary feature of measuring heart beat of a person. Microsoft's Kinect sensor uses changes in skin color to monitor heart rate. The new Kinect camera can recognize slight changes in skin color as blood passes through a person's body. By knowing the speed of the blood, the camera can then determine how many beats per minute the heart needs to make in order to reach that speed. [4] This feature of measuring heartbeat can be used in detecting heart attack. Kinect will keep on monitoring the heart rate of victim continuously. If a sudden fall in heartbeat is measured then it can be thought that it is a sign of heart attack. After detecting this sudden change in heart rate, Kinect will further search for common symptom which are more likely to occur during heart attack. The rough idea can be taken from the figure 3.

C. Some of the common symptoms of heart attack can also be tracked with the help of Kinect:

The most common symptom is chest pain. It is likely to occur to 89.7% of the stroke victim during the attack. [1] It could be made possible for Kinect to detect this symptom by the help of motion sensing feature through individual joints. The position of the skeleton for the chest pain can be predefined in the system. The posture of body during chest pain would be as shown in fig. 4 i.e. the hand would be on the left side of chest. The position of the skeleton will be as such the joint of hands/hand would be approximately below the joint of the left shoulder (Fig. 5). As Kinect can track motion of the joints, if such a posture is tracked in addition to heart rate drop. It can be concluded as a heart



attack.

Figure 4

Figure 5



Figure 5



Figure 5

Another symptom is, the pain in the upper part of the left arm. Around 67.3% people face this symptom. [1] The detection is similar as that of chest pain and it can be used for arm pain symptom also. The normal position of the person facing arm pain is likely to be the same as shown in fig. 6. The device can be programmed as such that when a gesture is made like the joint of hand/hands is between the left shoulder and elbow, can help in concluding a heart attack along with the heart rate drop.

In special cases where the heart is on the right side or at the middle, the positions are fed accordingly to program.



Figure 6

The immediate falling down of the person after pulse rate drops and not getting up to the standing position in a certain time period is an indication of medical emergency. (Similar to position shown in fig. 7) Kinect can track that the body is not getting up and lying on the floor by detecting two parts of the skeleton- 'skull and foot' of the victim. At this point also the message will be triggered to the relatives/friends and emergency services.

All afore mentioned symptoms are the most commonly occurring symptoms at the time of heart attack. So in addition to the immediate drop in heart rate, such symptoms can be helpful in concluding a heart attack.

C. Significance of GSM system in research:

The significance of GSM is that when Kinect detects a heart attack, an alert will be sent to relatives/friends and to ambulance by using external attachment to the Kinect called SMS triggering circuit. This circuit will send alert notes to relatives and the address of the location of the patient to the ambulance service.

D. Significance of built-in Skype system in research

Instant action taken by the person around the victim in case of heart attack can many times be a life saver act to a patient till the ambulance is reached. In most of the situation because of instant shock and fear a person around patient can't take decision perfectly and instantly. For solving this problem an approach of live video conference with doctor or health care centre can be done to guide the person near to victim for taking immediate action till emergency service arrives.

Kinect has capability to distinguish between a patient and other person present at the spot as shown in figure 8. Another special feature of the system is live video conference by using Skype, which is built in feature of Kinect. The video conferencing can be established by using Skype and it can be done as it is connected via. Wi-Fi or Ethernet. By this doctor or health care expert can communicate and can give instructions for immediate action or advice some protective measures to the person around the victim by seeing the situation of victim till the ambulance has reached.



Figure 8

IV. METHODOLOGY

We learned about the device and features of device which we are using for this concept. Now we are going to discuss how the device will work? Simple steps are given below which will give knowledge about working of device.

- 1) The device will detect heartbeat of person continuously in given premises. If any sudden fluctuation in heartbeat below some level is detected then the system will start working
- 2) After system detects low heart rate it will check the symptoms like chest pain, falling down and arm pain. These symptoms are detected by methods discussed above.
- 3) The following checks will be performed in step 3:
 - a) If the symptoms are detected then step 4 will be followed.
 - b) If the symptoms are not detected then the system will monitor heart beat for next few minutes. After monitoring the heart beats, following two possibilities may occur:
 - i).Heart rate becomes normal-in this case the system stops.
 - ii).Heart rate persists to be low- in this case step 4 will be followed.
- 4) The system will activate the sms trigger circuit by using controller, which is connected with Kinect. And the address location of the device or patient is send to the ambulance service. At the same time the friends and relatives of the patient are also notified about this.
- 5) After sending alerts, Kinect will try to detect other person in the given premises. If anyone is detected then the system will call the doctor or healthcare expert automatically through Skype. By using the inbuilt skype feature of Kinect, the video conferencing can also be done.

V. CONCLUSION

It is likely that next hour after heart stroke is very crucial for the victim. He can be saved if attention and medical help is given within an hour and in order to accomplish this requirement the described method and system can be installed which can detect heart attack instantly and after following the algorithm and the necessary treatment can be given in the intermediate time. In this way a gaming device can also be used as a life saver equipment. This idea can be of a great help, if implemented in real life.

VI. FUTURE ENHANCEMENT

The stroke can be identified more precisely if few more tests are added in detecting. Shortness in breathing is noted to be about 50.8%.^[1] Lalit Mestha a principal scientist at the Xerox

Research Center Webster, discussed in a recent interview how the Kinect's ability to detect the movements of 3D objects in a room can be used to detect the rise and fall of a patient's chest, calculate lung capacity, and tell whether a patient's respiratory status is improving or worsening. According to an article in Venture Beat, the affordable Kinect could also be programmed to act as an early warning system for breathing-shortening in heart attack.^[2]

REFERENCES

- [1] David C. Goff, Jr, MD, PhD; Deborah E. Sellers, PhD; Paul G. McGovern, PhD; Hendrika Meischke, PhD; Robert J. Goldberg, PhD; Vera Bittner, MD, MSPH; Jerris R. Hedges, MD, MS; P. Scott Allender, MD; Milton Z. Nichaman, MD, S. for the R.S.G. & Background., 1998. Knowledge of Heart Attack Symptoms in a Population Survey in the United States. *ARCH INTERN MED*, 158, pp.2329–2338.
- [2] Dean Takahashi, 2013. Researcher uses Xbox 360's Kinect game sensor to measure your breathing. Available at: <http://venturebeat.com/2013/03/07/researcher-uses-Kinect-game-sensor-to-measure-your-breathing/>.
- [3] Go, A.S. et al., 2013. Heart disease and stroke statistics--2013 update: a report from the American Heart Association. *Circulation*, 127(1), pp.e6–e245. Available at: <http://www.ncbi.nlm.nih.gov/pubmed/23239837> [Accessed December 11, 2013].
- [4] WOOLLASTON, V., 2013. The sensor that reads your heartbeat from four feet away WITHOUT touching you. Available at: <http://www.dailymail.co.uk/sciencetech/article-2408748/The-sensor-reads-heartbeat-feet-away-WITHOUT-touching-you.html>.
- [5] Kinect and Xbox One Privacy FAQ General information about Kinect and Xbox One is available at: <http://ww.Xbox.com/enUS/Kinect/privacyandonlinesafety>

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Demographic Profile of Selected Irular Tribes of Coimbatore District – Tamil Nadu

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Abstract- India is a country which is best known for its culture and tradition. Tribal groups are homogeneous, culturally firm and they wish to survive in their own style. Irular tribes of Tamil Nadu occupy the second largest groups of tribes after the Badgas. They are situated at the base of the western ghat. The road which takes us to the village is undeveloped and rocky. The huts are little developed into houses with cement sheet. Unlike the earlier tribal people, 21st century tribes have normal dress code like other people. The major occupation of these tribal people is field work as farmers. Neither hospital nor any other medical facility is available within 15 Kms. There is a government school situated about three to four kilometers away from the village premises. When the girls attain their puberty, there will be seven days celebration at their houses. The marriage is not considered as an important custom of the villagers. Death is considered as an important ritual in this community. The irular tribes are mostly non vegetarians. It can be concluded that the tribal people of India need still more improvement in all walks of their lives.

Index Terms- Irular tribes, tribes, occupation, custom.

I. INTRODUCTION

India is the home to a large number of indigenous people (tribal), who are still unaware of the lifestyle of the modern world. With more than 84.4 million tribes in the world, India has the largest population of the tribal people in the world. The tribal people constitute 8 percent of the total population of India. The term “tribe” means, a group of people who live at a particular place from time immemorial. Anthropologically the tribe is a system of social organization which includes several local groups- villages, districts on lineage and normally includes a common territory, a common language and a common culture, a common name, political system, simple economy, religion and belief, primitive law and own education system (India tribal belt, en.Wikipedia.org).

Irulars are one of the tribal groups of India. The second largest tribal group of Tamil Nadu is irulars. They are mainly situated in the lower slopes of Western ghat mountains which cover the states of Tamil Nadu and Kerala present in South India. Their main occupations were snake and rat catching. They also work as labourers or coolies in the fields of the landlords during the sowing and harvesting seasons or in the rice mills. Irular is a Dravidian language spoken by irular tribes.

Methods and materials

Irular tribes are the ancient tribal group living in the lower slopes of Western ghat mountain. The present study was conducted in the four irular tribal blocks of Western ghat mountain situated in Coimbatore district. The four tribal blocks selected were, namely Karamadai, Madhukkarai, Perianayakan palayam and Thondamuthur. The demographic profile of these tribal blocks were assessed through an interview cum personal observation by the investigator. The infra structures available for the tribals like network of roads, water and electricity, drainage facilities, hospital and school facilities were observed and recorded by the investigator during her visits to these tribal areas. Apart from the observation, she created a rapport with the local tribal heads and women and gathered information through personal interview regarding their customs and traditions followed during various occasions in their life cycle.

Results and discussions

Village condition

The Western Ghat mountain ranges cover a part of Coimbatore District, Tamil Nadu, South India, which is situated on Western Ghat's eastern slopes. Mullankkad, Madakkad, Anaikatti, Sadivayal, Thanikandi and Mutathuvayal are some of the villages in these forest slopes. In these villages ancient tribal people are living in small groups. They belong to Irular tribal community which is listed under “Scheduled Tribe (ST)” by the Government of India.

The road connected to the village was undeveloped and rocky. It was very difficult for two wheelers and four wheelers to move on this road. The tribes used to walk within the villages to carry out their day to day activities and they have to come to the outskirts of the villages to board the buses which connects to nearest town. The buses were flying for every one hour. The following photograph shows the road from bus stop to the village.



Figure 1: Road from bus stop to the village

II. HOUSING PATTERN

In the olden days, these tribes possessed *thatched house with a roof made of straw or reeds with narrow entrance*. The side



Figure 2 : Old thatched house of tribes and present view of the developed streets and houses

There was no provision for keeping the cooking gas, accommodate the cooking vessels and provisions in the kitchen. Similarly, there was no provision for washrooms and toilets inside the houses. Among the surveyed families 11.7 percent were using the common toilets provided by the Government and the remaining 88.3 percent of families were using open forest

walls of the houses were made of palm groove and in the present phenomena, among the surveyed samples 51.6 percent had tiled houses, 24.3 percent had huts, 12.4 percent possessed cement sheets and 11.7 percent had reinforced cement houses. As indicated above 11.7 percent possessed reinforced cement houses, allotted by the Government of Tamil Nadu. These houses had a proper ceiling, but inside the houses were not planned properly and had only one partition wall to separate the kitchen from the main front portion. The following table and photograph depicts the types of houses of irular tribes.

Table 1: Types of houses

Types of houses	Number	Percentage
Tiled house	270	51.6
Cement sheets	65	12.4
Huts	127	24.3
Reinforced cement	61	11.7
Total	523	100



areas for their toilet routines. These tribes used stagnant rain waters or forest river waters for cleaning after their toilet routines. Similarly, there was no provision for washing clothes except a small enclosed area outside the houses.



Figure 3: Overview of the houses and kitchen



Figure 4:View of the place used for washing clothes and open gutter used as toilets

III. SOURCE OF INCOME

The ancestors of the tribal families survived as a professional snake and rat catchers. But over these years of existence these tribes were unable to find sustainable occupation for themselves because they are unskilled in doing any kind of job. They earn their living by doing “coolie work”, as agricultural labourers in the field of the land lords.

The major occupation of surveyed tribes were farming. They cultivate maize, corn, ragi and ground nuts. There were one or two petty shops through which they earned a small income. Apart from these petty shops, one Government ration shop was available for the tribes to buy their grocery items at the subsidized rates. The cattle and poultry rearing were common among irular tribes. Among the surveyed samples, 70 percent of the tribal family were rearing cows, goats and hen in their houses and earning extra income through selling milk, milk products, eggs and meat.



Figure 5 :Agricultural Fields



Figure 6: Glimpse of petty shop and ration store in the irular tribal villages

IV. WATER AND ELECTRICITY FACILITIES

There were normally four to five drinking water taps available for the whole village consisting of 170 – 200 families. These families had to collect their water for drinking and cooking from these taps only. The drinking water from these taps was available for three to four hours once in three days. Majority (94.3 percent) of irular tribal families were using this above said

tap water for drinking. Water from other forest rivers was used for bathing and washing clothes. During monsoon seasons forest rivers will normally be flooded and the survey revealed that 3.6 percent of irular tribes use forest river water for drinking and 36 percent of people collect rain water in vessels for various purposes. Table explains the usage of rain water by the irular tribal families.



Figure 7 :Drinking water tap and Forest river

Table 2 : Mode of usage of rain water by the irular tribal families

Usage	Number	Percentage
Drinking	11	2.4
Cooking	12	2.6
Bathing	19	4.2
Washing vessels	176	38.9
Washing clothes	92	20.3
Watering plants	143	31.6
Total	453	100

Among the 523 irular tribal families surveyed, only 453 families were collecting rain water. In that, 38.9 percent of the families were using rain water for washing vessels followed by 31.6 percent were using rain water for plants and 20.3 percent for washing clothes. A few families were using rain water for drinking, cooking, and bathing purposes.

As for as the supply of electricity to these irular tribal villages were concerned, there was no proper provision for electricity in these tribes' houses. The main electrical posts were normally installed at the fringes of villages to safe guard their agricultural fields and house holds from the entry of elephants from forest areas.



Figure 8 :Electrical posts installed at the fringes of villages

V. HOSPITAL AND OTHER HEALTH CARE FACILITIES

As far as the irulars were concerned, they believe in natural medical herbs and they consume fresh specific herbs or herbal medicines prepared at home using combination of herbs for

treating their illness and diseases. They also had certain traditional methods of curing their illness based on certain superstitious beliefs. There was no private hospitals, health care centers in the irular tribal villages. The tribal families had to travel 10 – 15 Kms to reach the Primary Health Care centers run by the government. The private trusts and foundations were used to conduct medical camps occasionally in these irular tribal areas as a part of their community welfare activities.

VI. EDUCATIONAL FACILITIES

Literacy is universally identified as a powerful instrument of social change. The level of literacy is one of the most important indicators of social change. Among the surveyed irular tribal families irrespective of the sex, elderly were illiterates, and adults had their education up to primary school level. But younger age groups (both boys and girls) were sent to tribal residential schools (plate) located at a distance of three to five kilometers from the tribal hamlets. The tribal schools had from 1st to 10th standards and mid-day meal programme. Apart from mid-day meals, the tribal children were provided with break fast and dinner. The tribal children were provided with uniforms, books, notebooks, scales, pens and pencils. They were also provided with toiletries like soap, paste, toothpaste, tooth brush, slippers and sanitary napkins for adolescent girls. All these were provided by the tribal welfare department of Tamil Nadu government, to motivate tribal boys and girls to complete their school education till 10th standard. The tribal children have to join government schools in the neighboring city normally 7 kilometers away from their hamlets, if they are interested to complete 11th and 12th standard education.



Figure 9 : View of the tribal school

VII. CUSTOM AND CULTURE

As a part of the demographic profile of the tribes, it was thought of interest to collect information on the custom and culture of the irular tribes.

a. Dress code

The tribal men wear cotton dhoti and shirts, women wear sarees but tied in their customary way with palloos tucked at the pleats, tucked in the front. Adolescent girls residing in the tribal schools wear salwars and half sarees.



Figure 10 : Investigator along with the tribal girls wearing saree tied in their customary way

b. Puberty function

The women in any community reflects the custom and culture of that community. It is applicable to tribes like irulars. When a girl in the family attains her puberty, the family plans seven days celebrations. For the first 5 days, the girl was made to sit inside a small hut with a roof which was temporarily built by her maternal uncle. On the top of the roof there was a picture of clown to protect the girl from other evil eyes. On the 6th day midnight, the roof would be burnt and the girl would be made to jump outside. In this event, the burning of the roof signifies - the burning of evil and the jumping out signifies that the girl should jump out of all her evils and become as pure as the Goddess "Mother Sita".



Figure 11 : View of the hut, clown and girl inside the hut

c. Marriage function

Marriage is considered as a sacred and an important event in the life of any individual. Among the irular tribes, men or women were allowed to marry according to their wish and marrying more than one man or woman was not considered as a crime. Irular married women used to wear mangal sutra (two black beads) in yellow thread. The married women were not allowed to participate in any of their community function if they were not wearing mangal sutras and along with the family members these women will be thrown out of their community and village. Dowry system (money given to the bride groom during the time of marriage by the bride's parents) was common among the irular tribes from the ancient times. During the earlier days, the dowry amount used to be Rs. 1.50 / -. But at the present time, the amount had increased to Rs. 1500 - 2000 /-.

d. Delivery pattern

Normally, delivery is considered to be the second birth for any woman. But as far as irular tribes were considered, deliveries were conducted at home with the help of a local old lady who had attended a number of deliveries in their tribal villages. The expectant mothers were allowed to under go labour pain and deliver their babies with heavy blood loss. The local lady, delivery attendant, would be called when the labor pain develops. She would pour little amount of castor oil in her left palm and touch it with the right hand fingers, at the same time uttering some words of prayers. The old lady delivery attendant would drop the castor oil and they have a superstitious belief that if the oil drops continuously, the delivery would be very easy for the expectant mother. On the other side, if the oil drops down in separate drops, the delivery would be very difficult. During the

time of data collection the irular women expressed that till today, deliveries are happening as per their belief.



Figure 12 : The old lady who attends the delivery

e. Death ceremony

Irular tribes were the people who celebrate death as one of their religious festivals. In spite of their age and sex, every one in the village would consume alcohol and they dance in front of the dead body. After that, they sing songs and would do the final rights with full happiness. As per their traditional belief, they were not supposed to cry in front of the dead body and the irular tribes strongly believe that there is life after death.



Figure 13 : Tribal instruments used during different occasions.

VIII. CONCLUSIONS

The demographic profile of the irular tribes resulted that , the irulars are virtually cut off from the main stream of society. They are totally ignorant about the happenings in the external world. This state of affair has to chane further.

REFERENCES

- [1] Gibney J., Margeth M. and Kearney M., Public health nutrition, Blackwell publishing company, Oxford.
- [2] Naganna A. and Uma Mohan C.H., Tribal development programmes and social transformation, Discovery publishing house Pvt. Ltd., New Delhi.
- [3] Nanjundaya H.V., Bhadur L.K. and Iyer L.K., The Mysore tribes and castes Vol. III, Mysore University press, Mysore.
- [4] Ogburn F. and Nimkoff F., A hand book of sociology, Eurasia publishing home Pvt. Ltd., New Delhi.

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Employing Information Security Awareness to Minimize Over-Exposure of Average Internet User on Social Networks

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ABSTRACT-Use of Online Social Networking Sites (OSNs) has become ubiquitous nowadays. In the era of a million user social networking sites throughout the world, it becomes increasingly difficult for people to control what they are exposing to whom. In this paper we analyze the influence of social media interactivity features on the exposure of personal data of average Internet user and present techniques to implement information security awareness to minimize over-exposure on OSNs.

Index Terms-Online Social Networking, Information Security Awareness, Social Network Interactivity Features

I. INTRODUCTION

Information is vital to communication and a critical resource for performing work in organizations. It is also important to individuals, and therefore the need to properly manage it well, is growing rapidly. Protecting data is as important as protecting cash as it is an asset – and requires just as much care and planning. Now more than ever, people need to understand the critical role information plays in so many aspects of business and life. It drives our communication, our decision-making, and our reactions to the entire environment.

Information has been valuable since the dawn of mankind. As access to computer stored data has increased, Information Security has become correspondingly important. In the past, most corporate assets were “hard” or physical: factories, buildings, land, raw materials, etc. Today far more assets are computer-stored information such as customer lists, proprietary formulas, marketing and sales information, and financial data. Some financial assets only exist as bits stored in various computers. Many businesses are solely based on information – the data IS the business.

Information Security (IS) is designed to protect the confidentiality, integrity and availability of computer system data from those with malicious intentions. Confidentiality, integrity and availability are sometimes referred to as the CIA Triad of information security. This triad has evolved confidentiality, possession (or control), integrity, authenticity, availability and utility [17]. Sensitive information must be kept - it cannot be changed, altered or transferred without permission. For example, a message could be modified during transmission by someone intercepting it before it reaches the intended recipient. Good cryptography tools can help mitigate this security threat.

Information Systems (IS) have a variety of important functions, ranging from allowing businesses to keep track of

customers, products, and trends, to public health organizations keeping. Therefore, information systems are crucial assets as they improve the efficiency of operations in order to achieve higher profitability and competitive advantages to the same industry competitors. They also aid in the creation of new products and services as well as improvement of the decision making process. Information systems are additionally considered an integral part of today's business [13]. All the vast data that is communicated on electronic devices is stored into these systems. Multinational organizations are globally distributed. They require a reliable infrastructure, which can handle processing requirements.

In the era of high Internet penetration, social networking sites, while not an entirely novel phenomenon, have become increasingly more popular in recent years. Networking sites such as Facebook, Twitter and Google+ have become a significant part for most of people around the globe. Facebook alone is accessed by over 23 million users [18]. There is a tension between the lucrative business side of social networking sites, where huge monetary gains can be made through online advertising, and the companies' resolve to ensure a basic level of privacy for its users. From this tension users receive privacy setting recommendations from social networking sites whose default settings are rarely altered or even questioned. The privacy problems that ensue stem from the fact that individuals are unaware of the amount of personally identifiable information they have provided to an indeterminate number of people.

As the world of social networking became more popular, Facebook increased the availability of its product, opening doors to new networks and members. What began with restricted access to students with valid university-issued e-mail addresses, spread to allow high school and corporate networks as well as users without verified e-mail addresses. These users can create profiles, and gain access to information on other members of the site (Social networking on the Internet began with a desire for people to quickly and conveniently share information with their friends and family. This form of communication blossomed rapidly and started competing in popularity with e-mail and text messaging. Entrepreneurs harnessed this technology and created various Internet sites, including Facebook and MySpace, designed to allow users to create a profile containing information about themselves that others can view. These sites also allow users to build social networks with hundreds or even thousands of people. Previously, the use of these websites posed little known threat to personal privacy and users' comfort levels changed.

The purpose of information security awareness is to enhance security by improving awareness to protect information.

In this online era, information security awareness provides the understanding of security policies to the Internet users to guide them in protecting their information assets.

The researchers in information security argued that most of the Internet users are unaware that their habits in using computer can adversely impact the security and privacy of their own personal data [15]. According to Johansson and Riley (2005) [16], "Helping people to understand their own security vulnerabilities and how to, well, 'patch' them is the most effective way we know of to help educate people about computer vulnerabilities and to protect personal information".

In short, the Internet users have to be aware of their vulnerabilities in order to protect their assets.

II. LITERATURE REVIEW

A. Information Leakage on Online Social Networks

In the era of Internet technology, online social networks (OSNs) becomes a wide-ranging used over the world, more and more third-party enterprises take this opportunity to exploit data from OSN websites, which have been collected from social media users [16]. The information that is available in the users' profile can be searched based upon different criteria and thus can also be accessed by the strangers. Most of the people tend to expose real identity information; so that it raises privacy and security issues [11]. Nonetheless, there are a large number of OSN's users who are not aware of the personal data revelation, as their information tends to bring to public. Consequently, Feizy (2007) finds that social media users reveal their information widely on their pages. Although a large number of them expose that appears to be real identity information. He also demonstrates the overall network of participants' identity exposure as we can see from the figure 1 below. As the quality and quantity of information illustrated by different size and patterns whereby a large set of identity combination was collected to find some relation in peoples' behavior [10].

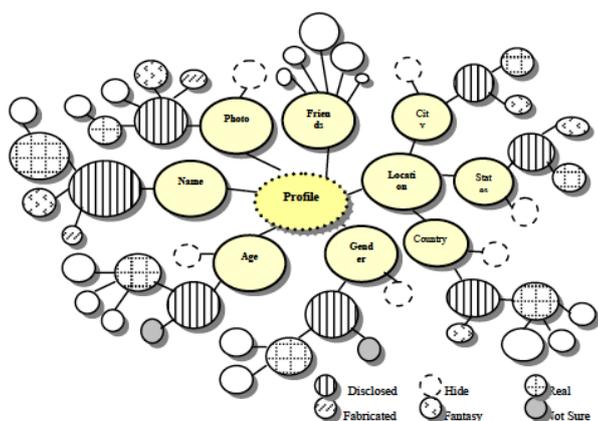


Figure 9: An Overview of Personal Information Disclosure [10]

According to Koehorst (2013), people have to reveal personal information such as name, date of birth and contacts in their OSN-profiles in order to be effective, and adolescents just have to do this to sound out their maturing identities". In fact, communication on the Internet can lead to more disclosure compared to face-to-face communication and the other ways. Despite that the personal information-related behavior of people can be conceptualized as a continuum. This

continuum can be described as "information privacy protection behaviors such as information withholding and incomplete and inaccurate disclosure on one side, and complete and accurate information disclosure behaviors on the other." On OSNs this means that users can still participate all whilst attempting to protect their personal information by only partly disclosing personal information [4].

B. Information Security and Online Social Networks

Since information can be leaked through OSN, face-to-face conversation and printing facilities, email, cloud computing, domain name systems and portable data devices. This is because information disclosed through OSNs creates an opportunity for cybercriminals to do surveillance and gather intelligence, sabotage organizations' networks using malware and utilize resources to launch attacks through the applications on these sites [2]. They also describe the typical functionalities of OSN sites, which are being implemented in many social media websites such as Facebook, Google+, and Twitter in order to make potential avenues of information disclosure. The table below represents OSN's capabilities as attack vectors through its available functionalities.

Table I: OSN Function and Potential Problems to Organization [2]

OSN Functionalities	Potential Security Problems	Impacts to Organisations
Post information / update status	Accessibility of OSN by anyone, anywhere at anytime, using any devices, allows users to update their status several times a day, thus, sensitive information may be revealed.	Revealed information can be deduced by attackers to obtain confidential information about the organisations in order to do cyber espionage and sabotage.
Friends' Requests	Carelessness in accepting friends' requests could result to adding 'enemies' instead of 'friends' who have more access to users' information.	These 'friends' are able to constantly monitor the employees' activities within the organisations allowing them to obtain employees' credentials for accessing the corporate network.
Upload photos and videos	Unrestricted photo albums and videos allow everyone to view the photos and videos that are potentially sensitive to organisations.	Sensitive photos and videos may cause embarrassment to the organisations and they may be useful for cybercriminals to collect information.
Third party applications and links to external sites	While using the applications or clicking on the links, malware may infect employees' computing platforms.	Compromised client platforms allow attackers to sabotage corporate networks and provide access to monitor and steal intellectual property.

Furthermore, throughout the users' information revelation, someone else can easily disclose the personal data because the users' friends can post or publish their information to other friends. Likewise, the users' information can be commonly shared or sold to marketing company for advertising practice and selling product. Recently, it has been found that there are various of social media users have been attacked by spams, phishing, and malware through OSN applications by clicking on the advertising application as some of advertisements may contain a malicious tracking to steal personal data or attack users' devices.

Additionally, security awareness on OSNs has to be very concerned among Internet users in order to avoid from malicious cyber activity. There are some of key points that recommended in any awareness program concerning social media sites[14].

- 1) **Privacy & Social Media:** Privacy does not exist on OSNs. Although, many social medias like Facebook, Google+, and Twitter provide privacy options and controls, but too much can go wrong and our sensitive information can end up being exposed such as our account being hacked, our friends' account being hacked. This means that being careful and watching what our friends post about us, including pictures. If nothing else, remember that employers now include sites like Facebook, Google+, and Twitter as part of any standard background check [14].
- 2) **Scams & Social Media:** OSNs are a breeding ground for scams. If one of our friend's posts seems odd or suspicious,

it may be an attack. For example, our friend posts that they have been mugged while on vacation in London and need us to wire them money. Or perhaps they are posting links about great ways to get rich, or some shocking incident we must see. Many of these scams or malicious links are the very same attacks that we have been receiving in e-mail for years, but now bad guys are replicating them in social media. If we see a friend posting very odd things, call or text them to verify that they really posted the information [14].

- 3) *Work & Social Media:* Working information is not recommended to be revealed on OSNs, therefore, it is better not to post anything sensitive about work such as company name, company address, or colleges' profile. Also, be sure that we understand about organization's policies as what we can and cannot post about job information [14].

C. Recent Online Social Networks Activities Statistics

Today, the number of online social networks users like Facebook, Google+, and Twitter is growing rapidly, there are still many people who are not concerned on privacy settings as they do not realize that the information that are being publicly shared will be exploited by anonymous person.

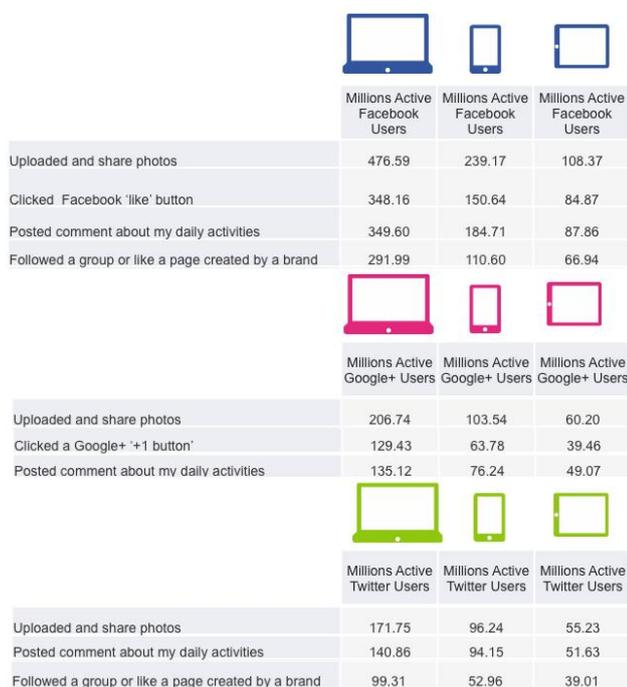


Figure 2: Recent Statistics of Social Medias Activities in Q2, 2013 [7]

Regarding the recent statistic of online social media networks usage, which has been found in the second quarter of 2013 described that.

Firstly, more than 800 million of active users in Facebook uploaded and shared photos, which is dominated among Google+ and Twitter in nowadays, about 580 million clicked Facebook 'like' button, and almost 287 million of the users posted comment about my daily activities. Approximate 469 million of users followed a group or like a page created by a brand [7]. In contrast, there is only 25 percent of Facebook users do not pay much attention on privacy settings [8].

Secondly, Google+ has about 370.48 million of active users uploaded and share photos. Performing an activity on Google+ '+1' button clicked, which is nearly 233 million of users and

posted comment about my daily activities is over 260.43 million of users [7]. Recently, following a group or like a page created by a brand activity is not yet found in Google+.

Last but not least, there are about 323.22 million of Twitter users uploaded and shared photos on Twitter website, over 280 million of users posted comment about my daily activities. Twitter users followed a group or like a page created by a brand, which has about 191 million of users [7]. On the other hand, clicking 'like' activity in Twitter was not found, as Twitter does not provide this feature.

D. Privacy Concerns with OSNs Service

Privacy is a multifaceted concept, and this results in a multitude of definitions and concepts. A widely accepted view of privacy is "the individual's right to be left alone." There has not been a consensus about the definition of privacy, stating that "perspective on privacy are thus varied, occasionally conflicting, and generally difficult to evaluate in a coherent fashion" [4]. In other word, privacy implications associated with online social networking depend on the level of identifiability of the information provided, its possible recipients, and its possible uses [5].

Social media companies like Facebook, Google, and Twitter generally have their own privacy policies that govern their use of consumer data and third-party conduct on the social media platform with respect to personal data [23]. In order to utilize third-party social media outlets, Steinman & Hawkins (2010) suggest that marketers need to ensure on their marketing campaigns, which will not persuade consumers or any other parties to engage practices that would violate the social media company's privacy policy, and marketers also need to ensure that they are abiding by the policies. Additionally, the description below represents the comparison of privacy setting in online social networks e.g., Facebook, Google+, and Twitter [23].

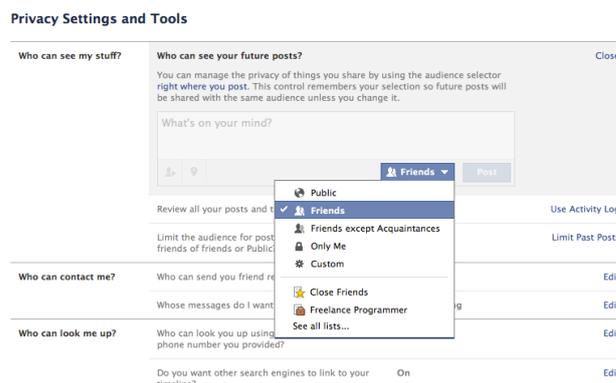


Figure 3: Privacy Settings in Facebook

Facebook: Its privacy options are generally very flexible because users can select from when they post something to their profile: "Public" and "Friends." As its name suggests, the "Public" option means that items they publish to their profile are visible to anyone who visits Facebook. Similarly, selecting "Friends" allows only their Facebook friends to see what they post. Furthermore, Facebook also offers a "Custom" setting as users can choose who gets to see that they post by either restricting it to any networks they are part of or so that only people only selected "lists" (a way to organize their friends into groups). In addition, users can also prevent specific people from seeing items they post [6].

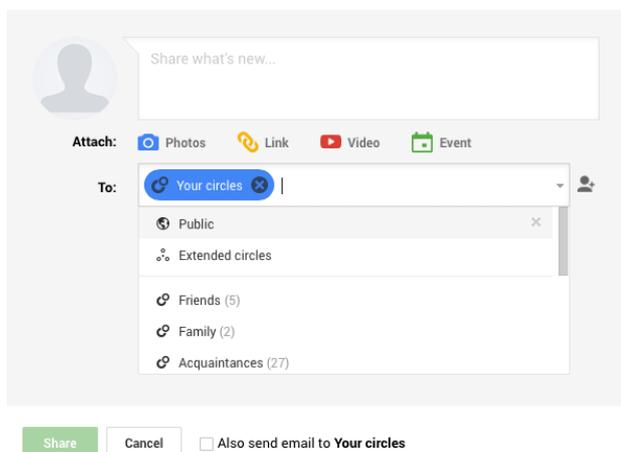


Figure 4: Privacy Settings in Google+

Google+: Its privacy is built around the concept of “Circles”, which is similar to lists on Facebook, Circles let users organize people they follow on Google+ into groups based on how they know them. For instance, users may have one Circle for friends, one for family members, one for close confidants, and one for coworkers. When users post something to Google+, they can specify which of their Circles they want to share that particular post with. Alternatively, they can make something public so that anyone can see it, pick and choose which individual Google+ other users can see their posts, or choose to share it with [6].

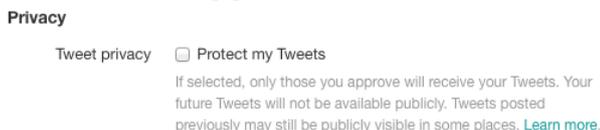


Figure 5: Privacy Setting in Twitter

Twitter: Its privacy settings are quite basic, but then again, the social network is conceptually much simpler than both Facebook and Google+. Twitter profiles can be either private or public, and users can swap back and forth between the two as they please. Selecting “Protect my Tweets.” to change account into private account. When users’ account is private, only those they approve can see their tweets, and their tweets cannot be retweeted. Users’ bio, name, and Twitter handle are always visible, though [6].

In addition, there are many of the popular OSNs, which have released web APIs to allow third-party developers and websites to implement their own services that can utilize and aggregate user information and activities in OSNs [9]. As Facebook, Google+, and Twitter provide these particular social network platforms to integrate with third-party applications in order to access cross the users’ profile. In spite of that users have to be careful on permission granted before allow them getting into their personal information so that their information will be disclosed by anonymous third-party applications.



Figure 6: Example of Request for Permission in Facebook Apps

In order to be aware of using third-party applications, users must be ensured that those applications that are requesting for permission is mostly well known among people in online social networks. This is one of the basic practices in data protection to avoid of personal information leakage to stranger.

III. THE INFLUENCE OF OSNS’ INTERACTIVITY FEATURES

Based on the static from December 2012 to May 2013 [12], Facebook is the most significant online social network that people often visit monthly while Twitter and Google+ have less amount of usage respectively. In this paper, we are going to compare the most interactivity features of OSNs that can lead to over-exposure of personal data of average Internet user

Table II: OSNs’ Interactivity Features Comparison

Facebook	Twitter	Google+
1. Facebook structure <ul style="list-style-type: none"> News Feed Friend Wall Timeline Like Messages and inbox Notifications Networks, groups, and pages 2. Applications <ul style="list-style-type: none"> Events Marketplace Notes Places Platform Questions Photos Videos 3. General features <ul style="list-style-type: none"> Credits Feature phones Graph Search IPv6 Listen with Friends Facebook Live Mood faces Phone Poke Smartphone integration Subscribe Ticker URL shortener Verified Accounts Hash tagging Feature 4. Languages 5. Security	1. Main Features <ul style="list-style-type: none"> Following/Follower Tweet/Retweet Direct Messages Photo Uploading 2. Additional Features <ul style="list-style-type: none"> Location Service Hashtaging Trending Topics 	1. Main Features <ul style="list-style-type: none"> Stream Circles Hangouts People Photo 2. Additional Features <ul style="list-style-type: none"> Messenger Instant Upload Spards Games +1 button Hashtags Ripples Google+ Badges Google+ Local Google+ Events Google+ Communities

To sum up, the above table shows that Facebook offers more interactivity features, which lead to over-exposure than others. So Facebook users expose their personal data every second to public.

IV. PROPOSED FRAMEWORK

In order to minimize the over-exposure of Internet user on OSNs, this proposed framework could be suggested as one of the existing frameworks to avoid users revealing their personal information in public. From the framework below we can see that OSNs offer many interactivity features to convince their users to reveal their personal information voluntarily. So we believe that by employing IS awareness among the OSNs users can minimize the over-exposure of their personal information.

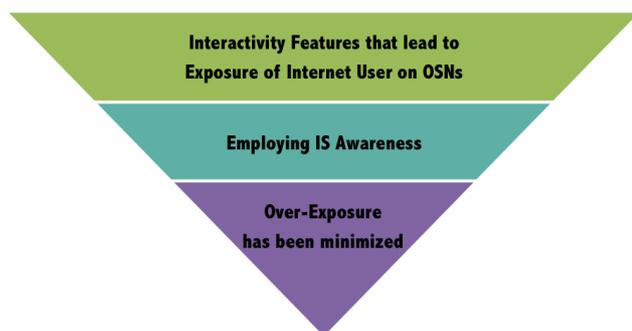


Figure 7 The Proposed Framework to Minimize Over-Exposure

Unfortunately, there is no any beneficial information security tool that can effectively reduce over-exposure of social media users in nowadays. It is only awareness of using OSNs, which can be best suggested. Since, OSNs generally provide users with a profile section, facilitate for uploading and sharing contents such as photos, music, etc., and messaging in various forms on the wall, and also enabling to put comment on friends' posts. All in all, OSN is quite new platform of interacting online where users in a virtual network are able to share information and communication with one another.

In regard with the finding that has been found in two separated studies mentioned that 79 percent of social media users do not much concern on changing of the default settings as can be obviously seen in Twitter, whereby about 99 percent of users preferred default its settings, this study was conducted by Mannan. Yet, only 1.2 percent indicated that the percentage of users who changed the default privacy setting is very small number, this was found in Gross's study [19]. Moreover, another study had been conducted in 2009 represented that there are 51% of students, 44% of employees, and 5% of the other from 144 participants. It is summarized that 76% of those participants do not notice about the risk of representing some of their information online warned by OSN providers. There is nearly 45% of students show that users are not given any list or guideline by OSN providers regarding this issue [20].

According to the study of Hasan and Hussin (2010), which has proposed awareness to minimize those activities on OSNs that could be about privacy, information security in line with the users' educational, moral, and ethical values while they are in OSNs [20].

- 1) *Awareness during sign-up in OSNs:* There are many of OSNs do not make availability of information for prospective social media users on which information to enter in any fields for user registration. Moreover, users do not have sufficient concession to customize their profile information and do not obtain any guidelines during pre-registration on the OSN site. Hence, it is required for a new user in being aware of which information needs to enter into the systems provided by OSN sites [20].
- 2) *Being aware of things, while writing on OSNs:* Regarding the study, which was conducted in 2009, out of 144 of participants had given opinion that the following kind of information in OSNs should be strictly concealed in public as represent in percentage such as passwords (92%), national identity card number or security number as personal identification information (83%), religious beliefs and political opinions (31%), e-mail address (29%), location-related information (26%) or personal pictures (13%) [21].
- 3) *Setting appropriate defaults of privacy preference:* Furthermore, according to the study of Hasib (2008) recommended that more and more social media

users are lessin paying attention on essential for setting the default privacy preference in OSNs [22]. Therefore, it is necessary to change the default privacy setting as secure as possible in order to avoid personal information leaked while using OSN sites [11].

- 4) *Building self-awareness about the information disclosure:* Hasib (2008) also emphasized that social media users have to be more concerned about their information, which are represented through personal profiles in OSNs. Also, those particular personal profile contents have to be precisely maintained to secure proper revelation of information in OSNs [11].

V. CONCLUSION

In the nutshell, information security awareness is very important to be applied in everybody's life in order to minimize the over-exposure of their personal information in online social networking, especially Facebook, Twitter and Google+. OSNs user should be fully aware about their personal details and their information are not easy to give and expose to the public. We believe that employing IS awareness among OSNs will minimize over exposure, even though OSNs provide variety of interactivity features to convince user to voluntarily expose their personal information.

REFERENCES

- [1] Li, N., N. Z., & Das, S. K. (2011, MAY/JUNE). Preserving Relation Privacy in Online Social Network Data. *Security & Privacy in Social Networks*, 35-42.
- [2] Abdul Molok, N., Chang, S., & Ahmad, A. (2010, November). Information Leakage through Online Social Networking: Opening the Doorway for Advanced Persistence Threats. *Proceedings of the 8th Australian Information Security Manangement Conference*, 70-80.
- [3] Alim, S., Neagu, D., & Ridley, M. (2012). A vulnerability evaluation framework for online social network profiles: axioms and propositions. *Int. J. Internet Technology and Secured Transactions*, 4, 198-206.
- [4] Koehorst, R. H. (2013). *Personal Information Disclosure on Online Social Networks*. University of Twente, Department of Communication Science, Enschede.
- [5] Gross, R., & Acquisti, A. (2005). Information Revelation and Privacy in Online Social Network (The Facebook case). *ACM Workshop on Privacy in the Electronic Society (WPES)*.
- [6] Mediati, N. (2012, Jun 29). *Social network privacy setting compared*. Retrieved Oct 28, 2013, from TechHive: <http://www.techhive.com/article/2000181/social-network-privacy-settings-compared.html>
- [7] Bullas, J. (2013, Sep 19). *12 Awesome Social Media Facts and Statistics for 2013*. Retrieved Oct 29, 2013, from Business 2 Community: <http://www.business2community.com/social-media/12-awesome-social-media-facts-statistics-2013-0622265>
- [8] McGrall, M. (2013, Oct 1). *Infographic - Social Media Statistics for 2013*. Retrieved Oct 27, 2013, from Velocity Digital Blog: <http://www.velocitydigital.co.uk/infographic-social-media-statistics-for-2013/>

- [9] Cheng, Y., Park, J., & Sandhu, R. (2013). Preserving User Privacy from Third-party Application in Online Social Networks. *The International World Wide Web Conference Committee (IW3C2)*, 723-728.
- [10] Feizy, R. (2007). An Evaluation of Identity on Online Social Networking: Myspace.
- [11] Al Hasib, A. (2008). Threats of Online Social Networks. *Seminar on Internetworking*.
- [12] Ray, A. (2013, Jul 23). *The Real Data on Facebook vs. Google+ (And Other Social Networks) [INFOGRAPHIC]*. Retrieved Nov 4, 2013, from Social Media Today: <http://socialmediatoday.com/augieray1/1613711/real-data-facebook-vs-google-and-other-social-networks-interactive-infographic>
- [13] Wikipedia. (2013, Oct 31). *Information Systems*. Retrieved Nov 9, 2013, from Wikipedia.com: http://en.wikipedia.org/wiki/Information_systems
- [14] Ispitzner. (2012, Oct 1). *Security Awareness on Social Media*. Retrieved Nov 8, 2013, from Educause: <http://www.educause.edu/blogs/ispitzner/security-awareness-social-media>
- [15] Anderson, C. (2005). Creating Conscientious Cybercitizen: An Examination of Home Computer User Attitudes and Intentions Towards Security. *Paper presented at the Information Systems*.
- [16] Johansson, M. J., & Riley, S. (2005). Protect your wisdom network-from perimeter to data. *Addison Wesley Professional*.
- [17] CENGAGE Learning. (2013). *CENGAGE Learning*. Retrieved Nov 8, 2013, from Introduction to Information Security: http://www.cengage.com/resource_uploads/downloads/1111138214_259146.pdf
- [18] Facebook. (2007, Apr 11). *Facebook.com*. Retrieved Nov 8, 2013, from Facebook Overview: <http://harvard.facebook.com/press.php>
- [19] Schrammel, J., Koffel, C., & Tscheligi, M. (2009). Personality traits, usage patterns and information disclosure in online communities. *23rd British HCI Group Annual Conference on People and Computers: Celebrating People and Technology*, 169-174.
- [20] Hasan, M. R., & Hussin, H. (2010). Self Awareness before Social Networking: Exploring the User Behaviour and Information Security Vulnerability in Malaysia. *Proceeding 3rd International Conference on ICT4M*, 7-12.
- [21] Aimeur, E., Gambs, S., & Ho, A. (2009). UPP: User Privacy Policy for Social Networking Sites. *Proceedings of the Fourth International Conference on Internet and Web Applications and Services*, 267-272.
- [22] Mackay, W. (1991). Triggers and barriers to customizing software. *Proceedings of CHI'91*, 153-160.
- [23] Steinman, M. L., & Hawkins, M. (2010, May). When Marketing Through Social Media, Legal Risks Can Go Viral. *VENABLE LLP ON ONLINE MARKETING LAW*.

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Decision Support System for Rapid Prototyping Process Selection

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Abstract- This paper presents a methodology for decision support system for rapid prototyping process selection. Experimentation recommends the methodology for RP process selection which is divided into three stages. First stage is to identify part requirements in terms of quality, cost and time. Second stage is generating feasible alternative processes and attributes data collection based on benchmarking. Attributes considered for evaluation are the most significant those will affect the selection of RP process. Third stage is to evaluate the data by decision making Method such as Graph Theory and Matrix Approach and TOPSIS method.

Index Terms- RP Process Selection, Graph Theory and Matrix Approach, AHP, TOPSIS, Decision Methods

I. INTRODUCTION

The competition in world market is rising tremendously day-by-day. Now, it is crucial for products to reach market as early as possible before competitors. New technology is required - compress time to market the products. Rapid Prototyping is a promising time compression technique. Rapid Prototyping technologies are energy efficient, less material wastage and can process complex shapes without tooling.

Rapid prototyping is widely used in the automotive, aerospace, medical, and consumer products industries. Rapid prototyping and manufacturing prototypes are increasingly used in the development of new products, spanning conceptual design, functional prototypes, and tooling.

There are a large number of R.P. Technologies available in the market and continuously new advancement in technologies as well as their materials are making selection problem more complex. However, it is really difficult for users with RP experience to select a suitable process because there are so many RP systems worldwide, and the best selection depends on many attributes. Furthermore, each system has its own strengths, defects, applications, utilities and limitations. It is a complex problem that cannot be solved readily using conventional statistical techniques alone. Selection of an appropriate process requires a sound understanding of the interactions between the part quality, part properties, part cost, build envelope, build time (speed) and other concerns. [3]

Since the selection of the appropriate technology addresses different process and cost attributes, it is a decision problem with many objectives implying many quantitative and qualitative factors that can be studied. So main problem with technology selection are:

- i. Multiple alternatives are available.
- ii. Wide application areas of RP parts.
- iii. Various quantitative and qualitative attributes data.
- iv. Expert judgment.

II. METHODOLOGY

II. 1 Previous Work Study

Marcello Bragalia, Alberto Petroni [1], proposes a methodology that is based on Analytic Hierarchy Process. Data have been drawn from a survey of twenty-one end-users (consisting of both firms and service bureaus) of twenty different types of RP Machines. The methodology has proved to be an effective tactical tool for selecting the technology that best fits the end-user's needs.

P.C. Smith, A. E. W. Rennie [2], studied all the processes, machine specifications, materials available in particular region and database for selector tool was developed. Relationship database was constructed detailing the types of machines available from various producers, the different types of technologies each machine used, available materials for each machine and based on this database selector tool was developed.

Rao and Padmanabhan [3], by using Diagraph method and Matrix approach, 'rapid prototyping process selection index' is proposed to evaluate and rank the RP processes for producing a given part. It defines desirable attributes of a rapid prototyping system as process

selection criteria. The interrelations between the selection criteria in terms of their relative importance are modeled in diagraph and matrix style and evaluated with permanent function.

Nagahanumaiah, K. Subburaj, B. Ravi [4], presents a computer aided rapid tooling process selection and manufacturability evaluation methodology. Analyze customer tooling requirement and pair wise comparison of attributes by AHP. Then selection of Rapid tooling process based on process capability mapping in quality function deployment (QFD) against a set of tooling requirements. Then the effect of each process variable of the selected RP process is mapped and prioritized to identify critical process parameters.

D.T.Pham, R.S.Gault [5], presented an overview of the RP technologies and further process strengths and weaknesses are detailed. Flowcharting logical technique is used for selection of RP process based on requirement of part.

Market needs a decision support system which is simple but able to manage complexity and technique should be scientific. To increase use of RP process and for proper process selection, a decision support system needs to be developed keeping in view the end use of part.

2.2 Methodology:

Step 1: Part requirements are divided into basic three categories:

- a) Quality attributes – Accuracy, Surface Finish, Strength, Heat Resistance and Percentage Elongation.
- b) Cost – RP Part Cost
- c) Time requirement – Build Time

Step 2: Data collection of RP processes for attributes relevant to part requirements data –

- a) Benchmark part fabrication through selected RP processes – SLA, SLS, 3DP and FDM.
- b) Measurements of part against parameter - quality, cost and build time.

Step 3: Apply decision making methods - Graph Theory and Matrix Approach, TOPSIS, for analyzing the data and for selection of RP process.

III. RAPID PROTOTYPING PROCESS SELECTION

1. Prototype part requirements identification

Proto part for design verification purpose, requirements were identified from three users. One is Prototype part service bureau which produces parts based on order received (A), Actual User of the part (B), and third one is RP process Machine manufacturer (C). Based on part requirement user rating obtained on scale of 1 to 10 and data is tabulated in table 1.

TABLE I
 RP DESIGN VERIFICATION PROTO PART REQUIREMENTS

User	Accuracy (A)	Surface Finish (R)	Tensile Strength (S)	Elongation (E)	Part Cost (C)	Build Time (T)	Heat Deflection Temperature (HR)
A	7	7	6	6	5	5	4
B	7	7	7	6	5	5	3
C	8	7	6	6	6	5	4

2. RP Process attributes data collection

The fabrication of the geometric benchmark part done on four widely used RP processes, which are the liquid-based Stereolithography (SLA), Fused Deposition Modeling (FDM) and powder-based Selective Laser Sintering (SLS) and 3 Dimensional Printing Machine. The RP process was set to achieve required geometric accuracy as part to be used for design verification.

Fabricated part from each process measured on CMM for geometrical accuracy and for surface roughness by Roughness Tester Taylor Hobson Talysurf Model 120. Other mechanical properties such as tensile strength, Percentage Elongation, heat resistance are taken from standard Material data sheet available from material manufacturer. Build Time measured during part production and part cost are taken as per estimation. Results are tabulated in Table 2.

TABLE 2
 RP PROCESS BENCHMARK PART ATTRIBUTE VALUES

RP Process	Machine details	Material	Accuracy (A)	Surface Finish (R)	Tensile Strength (S)	Elongation (E)	Heat Deflection Temperature (HR)	Part Cost (C)	Build Time (T)
Unit of Measurement			mm	µm	MPa	(%)	°C	Rs.	min
SLA	VIPER SI2	ACCURA 110	0.129	4	62	5	56	5500	240
SLS	Sinterstation HiQ	Duraform	0.205	12	43	8	177	5800	240
3DP	Z510	Zp150	0.319	28	14	0.2	70	2000	180
FDM	FDM 900mc	ABS P400	0.289	18	22	10	90	3200	300

3. Decision Making methods

Decision makers frequently face the problem of assessing a wide range of alternative options and selecting one based on a set of conflicting criteria. In decision making environment, need is for simple, systematic, logical and scientific method to guide decision makers in considering a number of selection criteria and their interrelations.

Graph Theory and Matrix Approach

Graph Theory and Matrix Approach, Multiple Attribute Decision Making (MADM) method require both intra- and inter-attribute comparisons and involve explicit tradeoffs that are appropriate for the problem considered.

Table 2 data values normalized for non-beneficiary attribute Value $A_i = V_j / V_i$ where in V_j - Lowest Value of Measure, V_i - Measured value of ith alternative and for beneficiary attribute $A_i = V_i / V_j$ where in V_i - Measured value of ith alternative, V_j - Highest value of jth alternative.

TABLE 3
RP PROCESS BENCHMARK PART ATTRIBUTE VALUES

RP Process	(A)	(R)	(S)	(E)	(C)	(T)	(HR)
SLA	1.000	1.000	1.000	0.500	0.273	0.510	0.316
SLS	0.627	0.333	0.694	0.800	0.259	0.510	1.000
3DP	0.403	0.143	0.226	0.020	1.000	1.000	0.395
FDM	0.444	0.222	0.355	1.000	0.500	0.432	0.508

Secondly attributes are compared pair wise for their importance and relative importance decision matrix prepared.

Attributes	(A)	(R)	(S)	(E)	(C)	(T)	(HR)
(A)		0.500	0.600	0.600	0.700	0.700	0.800
(R)	0.500		0.600	0.600	0.700	0.700	0.800
(S)	0.400	0.400		0.500	0.600	0.600	0.700
(E)	0.400	0.400	0.500		0.600	0.600	0.700
(R)	0.300	0.300	0.400	0.400		0.500	0.600
(T)	0.300	0.300	0.400	0.400	0.500		0.600
(HR)	0.200	0.200	0.300	0.300	0.400	0.400	

RP Process selection attribute function which is Permanent of attribute matrix evaluated with MATLAB and RPSI for each process obtained and arranged in descending order of RP process selection index. The RP process having the highest value of RP process selection index is the best suitable process.

TABLE 4
RPSI FOR DESIGN VERIFICATION PROTO PART (CAR TAIL LAMP HOUSING)

RP Process	RPSI
SLA	42.3577
SLS	38.5798
3DP	24.6768
FDM	29.8983



TOPSIS Method

This method is based on the concept that the chosen alternative should have the shortest Euclidean distance from the ideal solution, and the farthest from the negative ideal solution.

Step1: In this method Table 2 values are normalized by R_{ij} and the normalized decision matrix obtained as mentioned in Table 5.

$$R_{ij} = \frac{m_{ij}}{[\sum_{j=1}^M m^2_{ij}]^{\frac{1}{2}}}$$

TABLE 5
 NORMALISED RP PROCESS ATTRIBUTES R_{ij}

RP Process	(A)	(R)	(S)	(E)	(C)	(T)	(HR)
SLA	0.260	0.112	0.777	0.364	0.634	0.523	0.257
SLS	0.415	0.337	0.539	0.582	0.669	0.523	0.812
3DP	0.646	0.786	0.175	0.015	0.173	0.267	0.321
FDM	0.586	0.505	0.276	0.727	0.346	0.617	0.413

Step 2: decide the relative importance (i.e. weights) of different attributes with respect to the objective. A set of weights W_j (for $j=1, 2, \dots, M$) such that $\sum W_j = 1$. These weights are obtained by Analytic Hierarchy Process (AHP) method and are as mentioned below.

TABLE 6
 Weights W_j by AHP Method

RP Process	(A)	(R)	(S)	(E)	(C)	(T)	(HR)
W_j	0.2570	0.1990	0.1701	0.1395	0.1099	0.0586	0.0658

Step 3: Obtain the weighted normalized matrix V_{ij} . This is done by the multiplication of each element of the column of the matrix R_{ij} with its associated weight W_j . Hence, the elements of the weighted normalized matrix V_{ij} are expressed as:

$$V_{ij} = W_j \cdot R_{ij}$$

Step 4: Obtain the ideal (best) and negative ideal (worst) solutions in this step. The ideal (best) and negative ideal (worst) solutions can be expressed as:

$$V^+ = \{(\sum_i^{\max} V_{ij} / j \in J), (\sum_i^{\min} V_{ij} / j \in J') / i = 1, 2, \dots, N\}$$

$$= \{V_1^+, V_2^+, V_3^+, \dots, V_M^+\}$$

$$V^- = \{(\sum_i^{\max} V_{ij} / j \in J'), (\sum_i^{\min} V_{ij} / j \in J) / i = 1, 2, \dots, N\}$$

$$= \{V_1^-, V_2^-, V_3^-, \dots, V_M^-\}$$

Where $J = (j = 1, 2, \dots, M) / j$ is associated with beneficial attributes, and

$J' = (j = 1, 2, \dots, M) / j$ is associated with non-beneficial attributes.

V_j^+ indicates the ideal (best) value of the considered attribute among the values of the attributes for different alternatives. In case of beneficial attributes it indicates the higher value of the attribute. In case of non-beneficial attributes it indicates the lower value of the attribute and vice versa for V_j^- .

TABLE 6
 V_{ij} MATRIX

RP Process	(A)	(R)	(S)	(E)	(C)	(T)	(HR)
SLA	0.0669	0.0224	0.1321	0.0507	0.0697	0.0307	0.0169
SLS	0.1066	0.0671	0.0916	0.0812	0.0735	0.0307	0.0535
3DP	0.1660	0.1565	0.0298	0.0020	0.0190	0.0156	0.0212
FDM	0.1506	0.1006	0.0469	0.1015	0.0380	0.0362	0.0272
V_j^+	0.0669	0.0224	0.1321	0.015	0.0190	0.0156	0.0169
V_j^-	0.1660	0.1565	0.0298	0.0020	0.0735	0.0362	0.0169

Step5: The separation of each alternative from the ideal one is given by the Euclidean distance in the following equations.

$$S_i^+ = \sqrt{\{\sum_{j=1}^M (V_{ij} - V_j^+)^2\}} , \quad S_i^- = \sqrt{\{\sum_{j=1}^M (V_{ij} - V_j^-)^2\}} , \quad i=1,2,\dots,N$$

Step6: The relative closeness of a particular alternative to the ideal solution, P_i , can be expressed as below-

$$P_i = \frac{S_i^-}{(S_i^+ + S_i^-)}$$

A set of alternatives are arranged in descending order, according to the value of P_i indicating the most preferred and least preferred feasible solutions. P_i may also be called the overall or composite performance score of alternative A_i .

TABLE 7
 CPSI FOR DESIGN VERIFICATION PROTO PART (CAR TAIL LAMP HOUSING)

RP Process	S_i^+	S_i^-	P_i	
SLA	0.0819	0.2017	0.7112	
SLS	0.0939	0.1516	0.6173	
3DP	0.2218	0.0584	0.2084	
FDM	0.1479	0.1221	0.4523	

3.3 Comparison of Results:

As mentioned in below table RP Process Selection Index by Graph Theory and Matrix Approach and Composite Performance Selection Index by TOPSIS method, process ranking achieved is same. Same Calculations repeated for other applications like functional proto, Direct End use proto part and results are tabulated as below.

TABLE 8
 RESULTS COMPARISON

Design Verification Proto Part (Car Tail Lamp Housing)			
RP Process	RPSI (GTMA)	CPSI (TOPSIS)	
SLA	42.3577	0.7112	
SLS	38.5798	0.6173	
3DP	24.6768	0.2084	
FDM	29.8983	0.4523	
Functional Proto Part (Car Front Grill)			
SLA	24.5713	0.5289	
SLS	25.9885	0.7198	
3DP	17.0396	0.1544	
FDM	18.7041	0.3791	
Direct End Use Proto Part (Car Fuel Cap Assembly Gauge)			
SLA	40.0232	0.6721	 
SLS	36.0913	0.6709	
3DP	23.5863	0.1336	
FDM	28.4627	0.4889	

IV. CONCLUSION

- i. Decision making methods helps in systematic and analytical manner to address every element of selection - complexity due to interrelation of attributes, wide range of RP alternatives available, variety of RP prototype application areas, expertise requirement in process selection.
- ii. Qualitative and subjective judgments by different peoples can be included in the priority setting.
- iii. Proposed approach forms a basis for database creation for network RP processes, database creation based on variety of alternatives and evaluating part requirements for best suitable RP process.
- iv. This study demonstrates potential benefits of using structured approach to the selection of alternative rapid prototyping processes. The methodology described in this study can provide guidance not only for RP process selection but also for other areas of Decision making in manufacturing areas.

APPENDIX

Nil

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REFERENCES

- [1] Dr. Marcello Braglia, Dr. Alberto Petroni, A Management Support Technique for the selection of RapidPrototyping Technologies, Journal of Industrial Technologies; Vol.15, No. 14, pp.2-6,1999
- [2] P.C. Smith, A. E. W. Rennie Development of an additive layer manufacturing (ALM) selection Tool for direct manufacture of product, Lancaster Product Development Unit, Lancaster University, Lancaster, LA1 4YR, UK, Sep 2008 , pp.507-518.
- [3] R.Venkata Rao, K.K. Padmanabhan, Rapid Prototyping Process selection using graph theory and matrix approach, ELSEVIER Journal of Materials Processing Technology 194 (2007) 81-88
- [4] Nagahanumaiah, K. Subburaj, B.Ravi, Computer aided rapid tooling process selection and manufacturability evaluation for injection mold development, Journal Science Direct, 2008 , pp.262-276.
- [5] D.T.Pham, R.S.Gault, A Comparison of rapid prototyping technologies, International Journal of Machine Tools & Manufacture 38 (1998), pp.1257-1287

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A Study of Awareness towards Environmental Education among the Students at Secondary Level in Gurgaon District

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Abstract- Environmental crisis is real. Now the time has come when we should be careful. If human society has to endure not just for another century but thousands and thousands of years, we need to imbecile a way of life that can be sustained. The growth of human beings and plants life can only develop fully in friendly environment that is conducive to growth. Since, the present problems result largely from ignorance and different trend of continued misuse of the environment can, however, be altered by creating awareness among people of how man's activities effect the environment for good or ill. We cannot expect improvement unless attitudes of people change and unless a better generations. Our great need of today is knowledgeable citizens who are conscious of their surrounding and willing to take necessary, social, economic and political steps to assure a better environment for the fulfillment of need and wants of every citizen on the earth. Keeping in view the importance of environment the present study was undertaken to study the awareness among students towards environmental education.

Index Terms- Environment, Environmental education

I. INTRODUCTION

The dictionary meaning of the word 'Environment' a surrounding external conditions influencing development or growth of people, animals or plants, living or working conditions etc. Our environment is today on the sick bed and entire world is worried about it. We have reached this state because we have been trained to look upon nature as a resource. Therefore, in the mindless competition for industrialization and progress we have exploited the environment to the full without any thought of consequences. The attitude of our modern civilization is reflected in the criteria of development which include such parameters as the consumption oriented life style. If the trend continues the world will soon become in hospitable place for mankind.

Environmental crisis is real. Now the time has come when we should be careful. If human society has to endure not just for another century but thousands and thousands of years, we need to imbecile a way of life that can be sustained. The growth of human beings and plants life can only develop fully in friendly environment that is conducive to growth. Since, the present problems result largely from ignorance and different trend of continued misuse of the environment can, however, be altered by creating awareness among people of how man's activities effect the environment for good or ill. We cannot expect improvement unless attitudes of people change and unless a better generations.

Our great need of today is knowledgeable citizens who are conscious of their surrounding and willing to take necessary, social, economic and political steps to assure a better environment for the fulfillment of need and wants of every citizen on the earth.

Types of Environment

- Physical Environment(A biotic Environment)
- Biological Environment(Biotic Environment)
- Socio-Cultural Environment

1. Physical Environment:

A physical environment or abiotic environment means non living environment. The abiotic environment means physical environment is again divided into three categories :

(a) Lithosphere(Solid Earth)

The hard crust of the earth on which we live is called lithosphere. Soil is outer part of earth's crust on which we live, work and grows food crops. The soil represents solid component of our abiotic environment.

(b) Atmosphere:

The earth's cover of gases is called atmosphere or air. The composition of atmosphere on aid is Nitrogen 78%,Oxygen 21%,Argon 0.9%,Carbon Dioxide 0.03%.The remaining percentage of 0.07% is of all other gases in the air.

(c) Hydrosphere(Water Component):

Water represents the liquid of our abiotic environment. It is the liquid cover, which surround the earth. It accounts for 71% of the earth surface.

2. Biological Environment:

Biotic Environment means living part of the environment. This consists of:

- (a) Producers
- (b) Consumers
- (c) Decomposers
- (d) Micro-Organisms

3. Socio-Cultural Environment:

We live in a society and have a culture of our own. The Socio-Cultural environment means the environment made by man through his various social and cultural activities.

In only 100 years, we have done more damage to the environment that in all preceding centuries. The craze of progress in agriculture, industry, transportation and technology is taken as the general criterion of development of any nation. Such activities of man have created adverse effects on all living

organisms in the biosphere. Rapid industrialization has left the exhausted natural resources. Today, environment has become foul, contaminated, undesirable and therefore harmful for health of living organisms including man. But in unlimited rapacious exploitation of nature by man has disturbed the delicate ecological balance existing between living and non living components. "Environment Education is the bond between the environmental crisis and the educational crisis." Environmental Education is the study of man to see that how he shapes his total natural and cultural surrounding for good or ill.

The root cause of environment pollution has been the man's misbehavior with the nature under the false ego and that he is the master of nature. In other words, the human exploitation of natural resources at a back input into the natural eco-system is responsible for environment crisis. Today India is progressing in every field i.e. chemical power, nuclear energy etc. A rapid progress in atomic and nuclear energy has added radio-active substances which emit toxic gases. Thus environment is deteriorated to such an extent that it has crossed the critical limits and has become harmful to all organisms. Thus the present study was undertaken to study the awareness towards environment education among students.

II. OBJECTIVES

The present study was undertaken with following objectives:

1. To study the difference in awareness towards Environmental Education between Rural boys and rural girls at secondary level.
2. To study the difference in awareness towards Environmental Education between urban boys and urban girls at secondary level.
3. To study the difference in awareness towards Environmental Education between Rural boys and urban girls at secondary level.
4. To study the difference in awareness towards Environmental Education between Rural girls and urban girls at secondary level.
5. To study the difference in awareness towards Environmental Education between Rural and urban students at secondary level.

III. HYPOTHESES

1. There exists no significant difference in awareness towards Environmental Education between Rural boys and rural girls at secondary level.
2. There exists no significant difference in awareness towards Environmental Education between urban boys and urban girls at secondary level.
3. There exists no significant difference in awareness towards Environmental Education between Rural boys and urban boys at secondary level.
4. There exists no significant difference in awareness towards Environmental Education between Rural girls and urban girls at secondary level.

5. There exists no significant difference in awareness towards Environmental Education between urban and rural students at secondary level.

DELIMITATION OF THE STUDY

The present study is limited to few schools of Gurgaon district.

1. The study is confined to a sample of 100 students only, 50 urban and 50 rural students.
2. Only two factors viz. sex and secondary level in respected area are considered as variables for this study.

RESEARCH METHODOLOGY

The first task of investigation is to select appropriate methodology of research. There are several methods of research. Research is determined by the nature of the problem. The present study attempts to study the awareness towards environment among the students. To achieve this objectives survey method was to be adopted.

SAMPLE

Sample is both necessary and advantageous because by sampling we study the problem at reduced cost, at greater speed, with greater scope and with greater accuracy.

To serve a useful purpose, sampling should be adequate and unbiased or representative. In present study the investigator selected samples from different schools of rural and urban area of Gurgaon district 100 students.

METHOD USED

The investigator used normative survey method to collect data for the present study.

TOOLS USED

Tools are means for collection of data, for interpretation and to explore new fields. A questionnaire is used as a tool for gathering the required data. The questionnaire is prepared by the investigator himself. The items were of multiple choices.

STATISTICAL ANALYSIS

In order to analyze and interpret the questionnaire scores the investigator adopts the following statistical techniques.

- (i) Mean
- (ii) Standard deviation
- (iii) Standard error
- (iv) 't' test

IV. MAIN FINDINGS AND DISCUSSION

On the basis of analysis and interpretation of the data, the following findings were drawn:

1. While making the comparison between rural boys and girls of secondary level regarding awareness towards environmental education, it was found that there exists no significant difference between girls and boys student of secondary level.

Table I
Comparison of mean, S. D. and C. R. between boys and girls of Rural Secondary Schools

Group	N	Mean	S.D.	S.D	t-test	Significant Level
Boys	25	29.26	3.86	1.27	.90	Not significant at 0.05 level
Girls	25	30.52	4.33			

2. While making the comparison between urban boys and girls of secondary level regarding awareness towards environmental education, it was found that there exists no significant difference between boys and girls student of secondary level regarding awareness towards environmental education.

Table II
Comparison of mean, S. D. and C. R. between Urban boys and girls of Secondary School.

Group	N	Mean	S.D.	S.D	t-test	Significant Level
Boys	25	31.52	3.15	.51	2.12	Significant at 0.05 level
Girls	25	32.60	2.30			

3. While making the comparison between rural boys and urban boys of secondary schools regarding awareness towards environmental education, it was found that there exists no significant difference between rural boys and urban boy's student regarding awareness towards environmental education.

Table III
Comparison of mean, S. D. and C. R. between Rural boys and urban boys Secondary School.

Group	N	Mean	S.D.	S.D	t-test	Significant Level
Rural Boys	25	30.44	3.65	.68	1.64	Not significant at 0.05 level
Urban boys	25	31.56	30.59			

4. While making the comparison between rural girls and urban girls of secondary schools regarding awareness towards environmental education, it was found that there exists no significant difference between rural girls and urban girls regarding awareness towards environmental education.

Table IV
Comparison of mean, S. D. and C. R. between Rural girls and Urban girls Secondary Students

Group	N	Mean	S.D.	S.D	t-test	Significant Level
Rural girls	25	30.52	4.33	0.98	2.12	Significant at 0.05 level
Urban girls	25	32.60	2.30			

5. While making comparison between urban and rural students of secondary schools regarding awareness towards environment education. It was found that there exists significant difference between urban and rural students of secondary schools regarding awareness towards environmental education.

Table V
Comparison of mean, S. D. and C. R. between Rural and Urban Secondary Students

Group	N	Mean	S.D.	S.Ed	t-test	Significant Level
Rural	25	29.96	3.75	.71	3.25	Significant at 0.05 level
Urban	25	32.28	2.45			

V. EDUCATIONAL IMPLICATION

The present study emphasis the need of developing awareness towards environmental education among students of secondary level to solve the problems of environment. This study has its educational implications for the teachers, Educational planners, parent's educators and educational administrators. Special awareness programmes in the form of seminars symposium, camps and community visits should be arranged among the environment teachers, students, parents and also masses. Environmental awareness should be provided to the youths and young children through the formal system of education. Environmental consciousness should be developed among

teachers by introducing the course of environmental education in teacher education programmes and their teaching subjects.

The discussion confirms that environmental education can play a significant role in reducing and preventing the present and future environmental imbalances. Through formal education, environmental education can be imparted in the four stages like

- Primary education stage
- Lower secondary education stage
- High secondary education stage
- College education stage

Apart from these, environmental education should be included in the curriculum of teacher training institutions, industrial training institutions, polytechnics, engineering colleges, extension training centres. So that after receiving the training when they engage in government and non-government services, the students will be able to expand the environmental education in society.

Mass media such as radio, T.V, newspapers, periodicals, feature films, etc. can be used effectively in the expansion of the environmental education.

REFERENCES

- [1] Aggarwal, Y.P., "The science of Environmental Research", Nirmal Book Agency, Kurukshetra, 1998.
- [2] Ambasht, R.S. and Ambasht, P.K., "Environment and Pollution- An Ecological Approach", Friends Co., Lanka Varanasi, 1994.
- [3] Buch, M.B., "Third Survey of Research in Education (1978-83)", NCERT, New Delhi, 1987.
- [4] Buch, M.B., "Fourth Survey of Research in Education (1983-88)", NCERT, New Delhi, 1995.
- [5] Buch, M.B., "Fifth Survey of Research in Education (1988-92)", NCERT, New Delhi, 1995.
- [6] Indira Gandhi National Open University, School of Health & Sciences:
- [7] Fundamentals of Environment, Vol.1, 2003
- [8] Adverse Effects of Environment-I
- [9] Adverse Effects of Environment-II
- [10] Adverse Effects of Environment-III
- [11] Sharma, R.A., "Fundamental of Educational Research", R.Lall Book Depot, Meerut, 2002.
- [12] Sharma, R.A., "Environmental Educational Research", R.Lall Book Depot, Meerut, 2004.
- [13] Sharma, P.O., "Ecology and Environmental Education", Rastogi Publication, Meerut, 1998.

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Diphenyl Sulphide as Corrosion Inhibitor for Zinc Metal in Acid Solutions

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Abstract- This work deals with the evaluation of diphenyl sulphide as a corrosion inhibitor for zinc in 0.5N HCl and 0.5N H₂SO₄ by conventional weight loss and gasometric methods. Results indicate that diphenyl sulphide exhibited high inhibition efficiencies in both the acids but performed better in 0.5N H₂SO₄ than in 0.5N HCl. The inhibition efficiency was found to increase with increase in the inhibitor concentration. The adsorption of the inhibitor molecules on the zinc metal surface obeyed Temkin adsorption isotherm.

Index Terms- Diphenyl sulphide, acidic solutions, zinc corrosion, weight loss, gasometry.

I. INTRODUCTION

Acid pickling, acid cleaning and acid descaling are some of the industrial process in which metals are exposed to different acids of various concentrations. In order to reduce the metal loss and acid consumption corrosion inhibitors are added to the acid solutions¹⁻⁸. Organic compounds containing nitrogen, oxygen and sulphur in their molecular structures have been reported to function as effective inhibitors for various metals in different corrosive media. The efficiency of these compounds as corrosion inhibitors is attributed to the number of mobile electron pairs present⁹, the π -orbital character of the electrons¹⁰ and the electron density around the hetero atoms¹¹. The efficiency of the corrosion inhibitors are also reported to be influenced by their molecular structure, molecular size and the nature of the substituent groups^{12, 13}. These compounds minimize the corrosion rate of the metals by getting adsorbed on the metal surface thereby blocking the active sites on the metals.

In the present work, we have evaluated diphenyl sulphide as an inhibitor for zinc corrosion in 0.5N HCl and 0.5N H₂SO₄ using the conventional weight loss and gasometry methods. The efficiency of the inhibitor was evaluated at four different concentrations.

II. EXPERIMENTAL

The zinc metal specimens of composition: lead 1.03%, cadmium 0.04%, iron 0.001% and the remainder being zinc and size of 4cm*2cm* 0.08cm with a small hole of approximately 3mm near the end of the specimen were used for weight loss and gasometry studies. Zinc metal specimens were polished with a series of emery papers of various grades from 400-1200, degreased with absolute ethanol and air dried. The inhibitor compound, diphenyl sulphide was imported from the Fluka AG

of Switzerland. The corrosion medium was 0.5N HCl and 0.5N H₂SO₄ prepared from A.R grade HCl and H₂SO₄ and deionised water.

III. WEIGHT LOSS AND GASOMETRY STUDIES

Weight loss and gasometry studies were conducted as reported earlier^{14,15}. From the weight loss experiments the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{W_o - W_i}{W_o} \times 100$$

$$\theta = \frac{W_o - W_i}{W_o}$$

Where W_o and W_i are the weight loss of the metal in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the metal was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6 W}{A t D}$$

Where W is the weight loss of the zinc metal (mg), A is the surface area of the metal specimen(cm²), t is the exposure time (h) and D is the density of the metal (g/cm³).

From the gasometry experiments the inhibition efficiency is calculated by using the following equation.

$$I.E = \frac{V_o - V_i}{V_o} \times 100$$

Where V_o and V_i are the volume of hydrogen gas evolved in the absence and presence of the inhibitor respectively.

IV. RESULTS AND DISCUSSION

Values of inhibition efficiency obtained from the weight loss and gasometry experiments for the inhibitor for the corrosion of zinc in 0.5N HCl and 0.5N H₂SO₄ in the presence of different concentrations of diphenyl sulphide are presented in the tables 1 and 2 respectively.

Table 1 Values of inhibition efficiency obtained from the weight loss experiments.

Corrosive medium	Values of I.E(%) for different concentrations (mM) of diphenyl sulphide				
	5	10	30	50	100
0.5N HCl	31.2	41.9	60.3	67.8	75.1
0.5N H ₂ SO ₄	38.1	48.8	66.1	72.3	79.2

Table 2 Values of inhibition efficiency obtained from the gasometry experiments.

Corrosive medium	Values of I.E(%) for different concentrations (mM) of diphenyl sulphide				
	5	10	30	50	100
0.5N HCl	31.8	42.1	61.0	67.2	75.6
0.5N H ₂ SO ₄	38.7	48.2	66.9	71.8	78.6

The results presented in the tables 1 and 2 shows that the inhibition efficiencies increase with increase in the inhibitor concentration. It can also be seen from these tables that diphenyl sulphide performed better in 0.5N H₂SO₄ than in 0.5N HCl. A similar observation has already been made by several authors¹⁶⁻²¹.

The inhibitor used in this study contains two phenyl rings in its molecular structure which are rich sources of electrons apart from the sulphur atom which contains two lone pairs of electrons. The adsorption of this inhibitor molecule on the surface of zinc metal surface can occur in the following ways. (i).The sulphur atom with its two lone pair of electrons can act as an efficient adsorption centre and get adsorbed on the positively charged metal surface leading to the formation of a protective layer on the metal surface. This protective layer acts as a barrier between the zinc metal and the corrosive media thus bringing down the corrosion rate of the metal. (ii.)The two phenyl groups with their π-electrons can also get adsorbed on the metal surface leading to the protection of the metal. (iii).The two phenyl groups being bulky in nature, on adsorption on the metal surface offers good surface coverage to the metal surface against attack by the corrosive media. (iv).The sulphur atom in the molecule in acid medium can be protonated to some extent to form the cationic form of the inhibitor. The chloride and sulphate ions in the corrosive medium with less degree of hydration gets specifically adsorbed on the positively charged metal surface leading to the creation of excess negative charges on the metal surface. This situation highly favours the adsorption of the inhibitor molecules on the metal surface resulting in reduced corrosion rate. Infrared spectrum confirm that a metal sulphur bond may exist between the sulphur atom and the metal²². The dependence of inhibition efficiency of the inhibitor on its concentration is shown in figure 1.

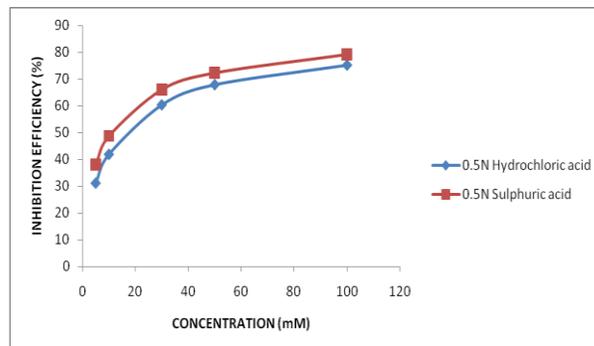


Figure- 1 Variation of inhibition efficiency with concentration of the diphenyl sulphide inhibitor for zinc in 0.5N HCl

Values of corrosion rates (mm/year) obtained from the weight loss experiments for the inhibition of the corrosion of zinc in 0.5N HCl and 0.5N H₂SO₄ in the presence of different concentrations of diphenyl sulphide is presented in the table 3.

Table 3 Values of corrosion rates (mm/year) from the weight loss measurements

Corrosive medium	Values of corrosion rates (mm/year) for different concentrations (mM) of diphenyl sulphide				
	5	10	30	50	100
0.5N HCl	96.3	81.3	55.6	45.1	34.9
0.5N H ₂ SO ₄	63.8	52.7	34.9	28.5	21.4

From the table 3 it can be observed that the corrosion rates for the corrosion of zinc in 0.5N HCl and 0.5N H₂SO₄ decreases with increasing concentration of the inhibitor. The effect of inhibitor concentration on the corrosion rates is shown in figure 2.

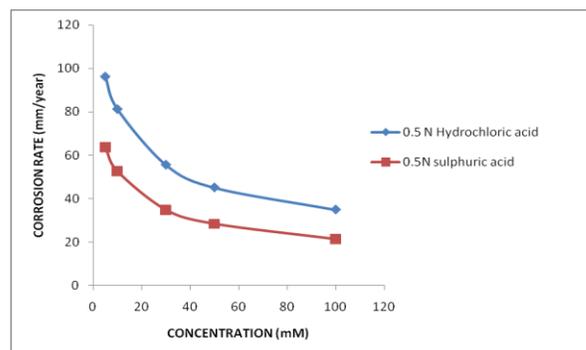


Figure- 2 Variation of corrosion rates with concentration of the diphenyl sulphide inhibitor for zinc in 0.5N HCl.

Adsorption isotherms

Adsorption isotherms play an important role in the understanding of the mechanism of inhibition of corrosion of metals. From the weight loss values the degree of surface

coverage (θ) for various concentration of diphenyl sulphide inhibitor were determined and plotted against $\log C$ for different concentrations of the inhibitor. A straight line was obtained indicating that the adsorption of the inhibitor on the zinc metal surface follows Temkin adsorption isotherm. Figure 3 shows the Temkin adsorption isotherm.

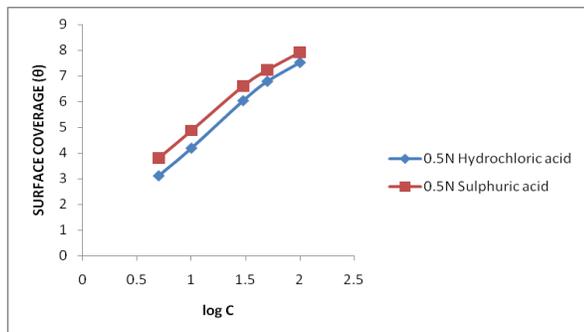


Figure-3 Temkin adsorption isotherm plot for corrosion of zinc in 0.5N HCl containing different concentrations of inhibitor.

V. CONCLUSIONS

The inhibitor diphenyl sulphide used in this work exhibited good inhibition efficiency. Inhibition efficiency increases with increase in inhibitor concentration. The inhibitor performed better in 0.5N H₂SO₄ than in 0.5N HCl. The adsorption of the inhibitor molecules on the metal surface obeys Temkin's adsorption isotherm.

REFERENCES

- [1] H.B.Rudresh, S.M.Mayanna, Corrosion, 31(1980) 286
- [2] M.r.arshadi, M.Lasgari, Gb-A.Parasafar, Mater.Chem.Phys., 86(2004) 314.
- [3] M.Abdalla, Corros.Sci.,45(2003) 2705.
- [4] .L.Wang, X.Pu, H.C.Luo, Corros.Sci., 48(2003) 677.
- [5] E.E.Foad El-Sherbini, S.M.Abdel whab,M.Deyab, Meter.Chem .Phys., 89(2005)183.
- [6] R.D.Amstrong, L.Prggs,Corros.Sci., 36(1994) 749.
- [7] Y.K.agrawal, J.D.Talati, M.D.Shaw, M.N.Desai, N.K.Shaw,Corros.Sci., 46(2004)633
- [8] J.D.Talati, M.N.Desai, N.K.Shaw., Mater.Chem.Phys.,93(2002)54
- [9] K.Aramaki, T.Oya, S.Fuji, Boshoku Gijutsu., 31(1961) 519
- [10] N.Hackerman , R.M.Hurd, Proc.1st Intl cong on Metallic Corrosion, London,U.K. April 1960, Butterworths, London, p.166.
- [11] O.L.Riggs, R.L.Evey,Corrosion, 18(1962) 262.
- [12] S.Muralidharan, M.A.Quraishi, S.Venkatakrishna Iyer, Corros.Sci., 37(1995) 1794
- [13] R.Hariharaputran, A.Subramanian, A.A.Antony, P.M.Shankar, A.Gopalan, T.Vasudevan,S.Venkatakrishna Iyer, Br.Corros.J., 33(1998) 214.
- [14] S.Muralidharan, M.A.Quraishi and Venkatakrishna Iyer, Corros. Sci.,37(1995) 1739.
- [15] S.Rengamani, S.Muralidharan and Venkatakrishna Iyer, Ind.Jour. Chem.Tech, 1 (1995) 168
- [16] N.Subramanyan, S.K.Rangarajan,K.Balakrishnan, S. Venkatakrishna Iyer, S. Venkatesan and B.Sathianathan 3rd Eur symp Corr.Inh., University of Ferrara Ferrara, Italy, N.S. Saz. 4, (1970) 592.
- [17] G.Schmitt. Br. Corros. J, 19, (1984) 165.

- [18] W.Machw, Proc III Eur.Symp. Corr. Inh., University of Ferrara, Ferrara, Italy (1971) P. 107.
- [19] S.Muralidharan, M.A. Quraishi and S.Venkatakrishna Iyer, Portugalia Electrochem. Acta, 11, (1913) 255.
- [20] S.Muralidharan, M.A.Quraishi and S.V.K. Iyer, Corros. Sci, 37, (1995) 1739.
- [21] K.Madhavan, S.Muralidharan and S.Venkatakrishna Iyer, Anti Corros. Methods and Maters, 45, (1998) 227.
- [22] T.J.Lane and A.Yemayuchi, J.Am. Chem Soc, 81, (1959) 3824

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Reactive Blue Dye as a Novel Corrosion Inhibitor for Zinc Metal in Acidic Solutions

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Abstract- Reactive blue dye was evaluated as a corrosion inhibitor for zinc in 0.5N HCl by weight loss, gasometric and thermometric methods. The inhibition efficiency was found to increase with increase in the inhibitor concentration. The adsorption of the inhibitor molecules on the zinc metal surface obeyed Temkin adsorption isotherm.

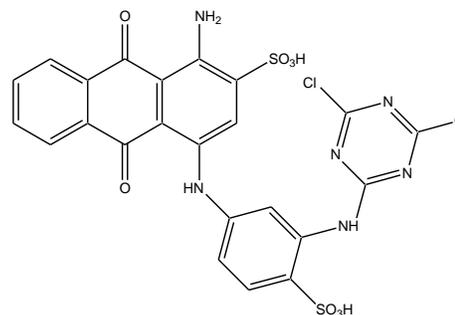
Index Terms- Reactive blue, acidic solutions, zinc corrosion, weight loss, gasometry, thermometry.

I. INTRODUCTION

The attention on zinc metal corrosion has increased because of its wide applications such as electrode material in batteries, sacrificial anodes and metallic coatings. Therefore zinc metal has to be protected against corrosion from aggressive environments. In industries hydrochloric and sulphuric acids are widely used for the cleaning of metals and alloys. During this process metal loss occurs due to the dissolution of the metals in acids. In order to avoid metal loss and for reducing acid consumption many organic compounds are used as corrosion inhibitors. A review of the literature clearly brings out the fact that many organic compounds were used as corrosion inhibitors for zinc metal in various environments¹⁻²¹. The presence of hetero atoms such as sulphur, oxygen and nitrogen, multiple bonds, aromatic rings and large surface area are some of the requirements to be satisfied by organic compounds to be employed as corrosion inhibitors. Many synthetic dyes are found to satisfy these requirements. Therefore we have selected and evaluated reactive blue dye as a corrosion inhibitor for zinc metal in 0.5N HCl acid solution by weight loss, gasometry and thermometric methods.

II. EXPERIMENTAL

The zinc metal specimens of composition: lead 1.03%, cadmium 0.04%, iron 0.001% and the remainder being zinc and size of 4cm*2cm* 0.08cm were used for weight loss gasometry and thermometry studies.. Zinc metal specimens were polished with a series of emery papers of various grades from 400-1200, degreased with absolute ethanol and air dried. The inhibitor compound, reactive blue dye was obtained from the Alfa-Aesar chemicals of United kingdom.. The corrosion medium was 0.5N HCl prepared from A.R grade HCl and deionised water. The structure of the inhibitor molecule is given below.



Weight loss, gasometry and thermometric studies

Weight loss, gasometry and thermometric studies were carried out as reported earlier²²⁻²⁶. From the weight loss experiments, the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{W_o - W_i}{W_o} \times 100$$

$$\theta = \frac{W_o - W_i}{W_o}$$

Where W_o and W_i are the weight loss of the metal in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the metal was calculated by using the following equation.

$$C.R(mmy) = \frac{87.6 W}{A t D}$$

Where W is the weight loss of the zinc metal (mg), A is the surface area of the metal specimen(cm^2), t is the exposure time (h) and D is the density of the metal (g/cm^3).

From the gasometry experiments the inhibition efficiency is calculated by using the following equation.

$$I.E = \frac{V_o - V_i}{V_o} \times 100$$

Where V_o and V_i are the volume of hydrogen gas evolved in the absence and presence of the inhibitor respectively.

From the thermometric studies the reaction number was first calculated by using the equation

$$RN = \frac{T_m - T_i}{t}$$

Where T_m is the maximum temperature, T_i is the initial temperature and t is the time taken to attain the maximum temperature.

The inhibition efficiency is calculated by using the following equation

$$I.E = \frac{RN_o - RN_i}{RN_o}$$

Where RN_o is the reaction number in the absence of the inhibitor and RN_i is the reaction number in the presence of various concentrations of the inhibitor.

III. RESULTS AND DISCUSSION

Weight loss, gasometry and thermometric studies were carried out at seven different concentrations of the inhibitor and the inhibition efficiency (IE) values were calculated. Values of inhibition efficiency obtained from these experiments for the inhibitor for the corrosion of zinc in 0.5N HCl in the presence of different concentrations of the inhibitor are presented in the table-1

Table 1 Values of inhibition efficiency (I.E(%)) obtained from the weight loss, gasometry and thermometric experiments for the corrosion of zinc in 0.5N HCl in the presence of different concentrations of the inhibitor.

Method employed	Values of I.E(%) for different concentrations (mM) of reactive blue inhibitor						
	1	5	10	20	30	40	50
Weight loss	24.2	52.4	63.1	75.6	83.5	88.7	91.2
Gasometry	23.8	51.9	63.9	74.8	83.1	88.2	90.8
Thermometry	24.8	53.1	64.6	76.2	84.6	89.4	92.5

It can be observed from the table 1 that there is very good agreement between the values of inhibition efficiency obtained from these three methods. The results also show that the inhibition efficiency increases with increase in the inhibitor concentration. The dependence of inhibition efficiency of the inhibitor on the concentration is shown in figure-1.

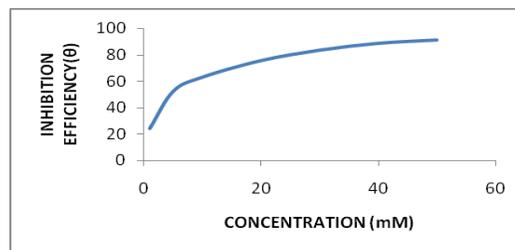


Figure 1 Variation of inhibition efficiency with concentration of the inhibitor.

The first step in the reduction of corrosion by inhibitors is the adsorption of the inhibitor molecules onto the metal surface. After the adsorption is completed, the inhibitor retards the cathodic and/ or anodic reaction at the metal surface. The inhibitor reactive blue molecule contains three hetero atoms namely sulphur, oxygen and nitrogen in its molecular structure. All these hetero atoms possess lone pair of electrons. Through these lone pair of electrons they get adsorbed on the metal surface leading to the formation of a layer on the metal surface. This layer acts as a barrier between the metal and the corrosive media giving protection to the metal. The inhibitor also contains many aromatic rings with lot of π electrons through which also adsorption of the inhibitor molecules on the metal surface can take place leading to enhanced protection. In addition to these, the inhibitor molecule contains primary and secondary amine groups in the molecular structure. These amine groups can be easily protonated in acid medium to form the cationic form of the inhibitor. The chloride ions present in the acid medium gets adsorbed specifically on the positively charged metal surface due to its lesser degree of hydration leading to the creation of excess negative charges on the metal surface which favours the adsorption of these cationic form of the inhibitor molecules on the metal surface leading to the protection of the metal. Another important factor responsible for the higher inhibition efficiency of the inhibitor is the large surface area of the inhibitor molecules which provides higher surface coverage to the metal after getting adsorbed on the metal surface.

Values of corrosion rates obtained from the weight loss experiments for the inhibitor for the corrosion of zinc in 0.5N HCl in the presence of different concentrations of the inhibitor are presented in the table-2

Table 2 Values of corrosion rates obtained from the weight loss experiments.

Values of corrosion rates for different concentrations (mM) of reactive blue inhibitor						
1	5	10	20	30	40	50
106.1	66.6	51.7	34.2	23.1	15.8	12.3

From the table-2 it can be seen that the corrosion rates for the corrosion of zinc in 0.5N HCl decreases with increasing concentration of the inhibitor. The effect of inhibitor concentration on the corrosion rates is shown in figure-2.

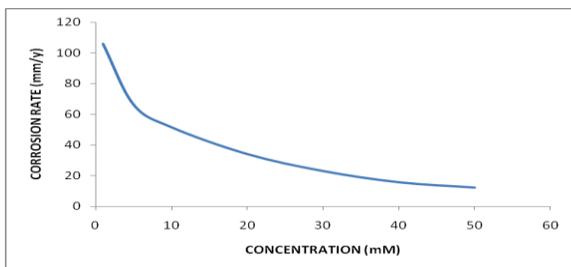


Figure 2 Variation of corrosion rates with concentration of the inhibitor.

IV. ADSORPTION ISOTHERMS

Basic information regarding the interaction between the metal surface and the inhibitor molecules can be obtained from the adsorption isotherms. Adsorption of inhibitor molecules on the metal surface is characterized by various adsorption isotherms such as Langmuir, Temkin, Freundlich etc., From the weight loss measurements, the degree of surface coverage (θ) for various concentrations of the inhibitor were evaluated. Langmuir's isotherm was tested by plotting C/θ vs C and no straight line was obtained which indicated that the adsorption of the inhibitor on the surface of the zinc from 0.5N HCl does not obey Langmuir's adsorption isotherm. Temkin's adsorption isotherm was tested by plotting $\log C$ vs θ which resulted in a straight line thereby showing that the adsorption of the inhibitor on the surface of zinc from 0.5N HCl obeys Temkin's adsorption isotherm. Figure -3 shows the Temkin adsorption isotherm plot for zinc in 0.5N HCl containing different concentrations of the inhibitor.

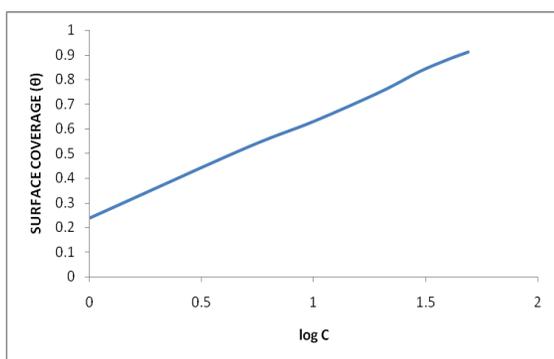


Figure 3 Temkin adsorption isotherm plot for zinc in 0.5N HCl containing different concentrations of the inhibitor

V. CONCLUSIONS

The reactive blue dye used as a corrosion inhibitor for zinc in 0.5N HCl performed well and gave high percentage of inhibition efficiency. It exhibited a maximum inhibition efficiency of 92.5 % at 50mM concentration. The inhibition efficiency of the inhibitor increases with the increase in the concentration of the inhibitor. The adsorption of the inhibitor on zinc surface obeyed Temkin adsorption isotherm.

REFERENCES

- [1] Jain, B.L., and Gaur, J.N., J.Electrochem.Soc of India, 37, (1978)165.
- [2] Balakrishnan, K., Ramakrishnaiah, K., Raghavan M., Sathianadhan, B., and Palaniswamy, N., Proc.8th Intl.Cong. Met. corros., Germany, (1981)1193).
- [3] Ramakrishnaiah, K., Bull. Electrochem, 3, (1987) 97.
- [4] Kawai,S., Kato,H., Hatoushika, Y., and Yasumasa,M., Denki Kagaku, 43, (1975) 127.
- [5] Cavallaro, L., Felloni, L., and Trabaneli, G., 1st Euro.Symp.Corro. Inhibition, University of Ferrara, Ferrara, Italy, (1960) p 129.
- [6] Antropov, L.I., Zash. Metal. 6, (1970) 440.
- [7] Biallazo, S., Elektrokimiya, 1, (1965)1137).
- [8] Aziz, K., and Shams El din A.M., Corros.Sci, 5, (1965)489.
- [9] Ramamani, R., and Shanmuganadhan, S.P., Current Science, 37, (1968)39.
- [10] Machu, W., and Gouda, V.K., Werkst.Korro. 13, (1962)745.
- [11] Antropov, L.I., Zash. Metal. 6, (1970)440.
- [12] Leroy, R.L., Corrosion, 34, (1978)98.
- [13] Elkhar Abo, B., Mostafa, K.M., Kamal,I.A., and Abdel Hamid, K., Ind.J.Chem, 15A, 0 (1977)1010.
- [14] Abdel Aal, M.S., Abdel Wahab, A.A., and El Saeed, A., Corrosion, 37, (1981)557.
- [15] Stupnisek – Lisac, E., Podbrsec, S., and Soric, T., J. Appl. Electrochem, 24, (1994)779.
- [16] Stupnisek – Lisac, E., Kasumic, D., and Varkapic – Furae, Corrosion, 51, (1997)767.
- [17] Fouda, A.S., Madkour, L.H., Elshafei, A.A., and Elmaksoud, S.A.A., Bull. Korean. chem.soc., 16, (1995)454.
- [18] Mourad, M.Y., Saliman, S.A., and Elmetaal, Bull . Soc. Chim, France, 6, (1991)832.
- [19] Mani, N., Venkatakrishna Iyer, S., and Lal Bahadur, Bull.Electrochem, 19, (2003)53.
- [20] Mani, N., Venkatakrishna Iyer, S., and Lal Bahadur, Trans. SAEST, 38, (2003)67.
- [21] Agarwal, Y.K., Talati, J.D., Shah, M.D., Desai, M.N., and Shah, N.K., Corros.Soc, 46, (2003)633.
- [22] S.Muralidharan, M.A.Quraishi and Venkatakrishna Iyer, Corros.Sci.,37(1995) 1739.
- [23] S.Rengamani, S.Muralidharan and Venkatakrishna Iyer, Ind.Jour.Chem.Tech, 1 (1995) 168
- [24] 15. B.N.Oza and R.S.Sinha, Trans.SAEST, 17(1982) 281.
- [25] 16.R.K.Upadhyay and S.P.Mathur, E.J.Chem 4(2007)408.
- [26] 17. A.Y.El-Etre, Corros.Sci.43(2001)1031

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Inhibitive Action of Solanum Nigrum Extract on the Corrosion of Zinc in 0.5N HCl Medium

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Abstract- In this work, the extract of the leaves and berries of *solanum nigrum* was examined as a green corrosion inhibitor for zinc in 0.5N HCl by using weight loss, gasometric and thermometric methods. Results obtained showed that the extract of *solanum nigrum* offered good protection against corrosion of zinc metal and exhibited high inhibition efficiencies. The inhibition efficiency was found to increase with increase in the extract concentration. The adsorption of the inhibitor molecules on the zinc metal surface obeyed Temkin adsorption isotherm.

Index Terms- Solanum nigrum, acidic solutions, zinc corrosion, weight loss, gasometry, thermometry.

I. INTRODUCTION

Corrosion is defined as the deterioration of a metal due to its interaction with the environment. Due to corrosion many useful properties of a metal such as malleability, ductility and electrical conductivity are lost. Synthetic organic compounds are widely used as corrosion inhibitors for the prevention of corrosion of many metals and alloys in various aggressive environments. Because of their hazardous nature, researchers focus their attention on developing cheap, non-toxic, biodegradable and environment friendly natural products of plant origin as corrosion inhibitors¹⁻²⁷.

Solanum nigrum is a plant with medicinal value, found throughout Tamil Nadu, India and belongs to the family solanaceae. The leaves and berries of *solanum nigrum* are widely used to cure mouth ulcer. In the present work we have evaluated the extract of the leaves and berries of *solanum nigrum* as a green corrosion inhibitor for zinc metal in 0.5N HCl using weight loss, gasometry and thermometry methods.

II. EXPERIMENTAL

The zinc metal specimens of composition: lead 1.03%, cadmium 0.04%, iron 0.001% and the remainder being zinc and size of 3cm*1.5cm* 0.08cm were used for weight loss gasometry and thermometric studies. Zinc metal specimens were abraded with a series of emery papers of various grades from 200- 1200, washed with distilled water, degreased with absolute ethanol and air dried. The corrosion medium employed was 0.5N HCl prepared from A.R grade HCl and deionised water.

2.1.Preparation of the extract

The solanum nigrum plant was obtained from the local market. It is cleaned with tap water to remove mud particles. The

leaves and berries of the plant were then dried in an oven for 2 hours at 100°C and ground to get the powder form of the material. 250 ml of alcohol was then added to 10 gram of this powder and left standing for three days with occasional shaking. The solution was then filtered and the alcohol was evaporated to get a brown sticky mass. 1 gram of this sticky mass was then dissolved in 1L of 0.5N HCl to get the stock solution. From this stock solution, concentrations of 200, 400, 600, 800 mg/L were prepared by dilution.

2.2 Weight loss, gasometry and thermometric studies

Weight loss, gasometry and thermometric studies were carried out as reported earlier²⁸⁻³². In order to get accurate results, the experiments were conducted in triplicate and the average of the three values is obtained. From the weight loss experiments the % inhibition efficiency (I.E) and the degree of surface coverage (θ) were calculated by using the following equations.

$$I.E = \frac{W_o - W_i}{W_o} \times 100$$

$$\theta = \frac{W_o - W_i}{W_o}$$

Where W_o and W_i are the weight loss of the metal in the absence and presence of the inhibitor respectively.

The corrosion rate (C.R) of the metal was calculated by using the following equation.

$$C.R(mm\text{y}) = \frac{87.6 W}{A t D}$$

Where W is the weight loss of the zinc metal (mg), A is the surface area of the metal specimen(cm^2), t is the exposure time (h) and D is the density of the metal (g/cm^3).

From the gasometry experiments the inhibition efficiency is calculated by using the following equation.

$$I.E = \frac{V_o - V_i}{V_o} \times 100$$

Where V_o and V_i represent the volume of hydrogen gas evolved in the absence and presence of the inhibitor respectively.

From the thermometric studies the reaction number was first calculated by using the equation

$$RN = \frac{T_m - T_i}{t}$$

Where T_m is the maximum temperature, T_i is the initial temperature and t is the time taken to attain the maximum temperature.

The inhibition efficiency is calculated by using the following equation

$$I.E = \frac{RN_o - RN_i}{RN_o}$$

Table 1 Values of inhibition efficiency(I.E(%)) obtained from the weight loss, gasometry and thermometric experiments for the corrosion of zinc in 0.5N HCl in the presence of different concentrations of the extract.

Method employed	Values of I.E(%) for different concentrations (mg/L) of the extract				
	200	400	600	800	1000
Weight loss	18.9	43.1	55.4	65.2	71.8
Gasometry	18.1	43.9	54.7	64.6	71.1
Thermometry	19.2	42.7	54.2	65.8	70.6

From the table it can be seen that there is very good agreement between the values of inhibition efficiency obtained from these three methods. The results also indicate that the inhibition efficiency of the *solanum nigrum* extract increases with increase in the concentration. The dependence of inhibition efficiency of the extract on the concentration is shown in figure-1

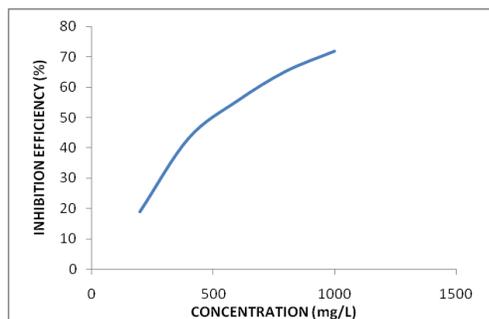


Figure 1 Variation of inhibition efficiency with concentration of the plant extract.

Values of corrosion rates obtained from the weight loss experiments for the extract for the corrosion of zinc in 0.5N HCl in the presence of different concentrations of the extract are presented in the table-2

Where RN_o is the reaction number in the absence of the inhibitor and RN_i is the reaction number in the presence of various concentrations of the inhibitor.

III. RESULTS AND DISCUSSION

Weight loss, gasometry and thermometric experiments were carried out at five different concentrations of the extract and the inhibition efficiency(IE) values were calculated. Values of inhibition efficiency obtained from these experiments are presented in the table-1

Table 2 Values of corrosion rates obtained from the weight loss experiments.

Values of corrosion rates (mm/y) for different concentrations (mg/L) of the extract				
200	400	600	800	1000
113.5	79.7	62.4	48.7	39.5

From the table-2 it can be seen that the corrosion rates for the corrosion of zinc in 0.5N HCl decreases with increasing concentration of the plant extract. The effect of extract concentration on the corrosion rates is shown in figure-2.

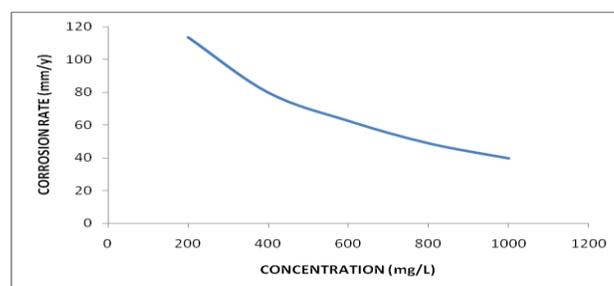
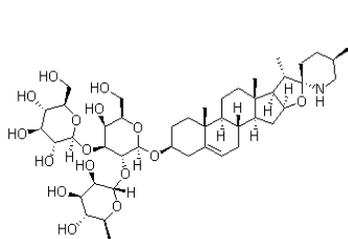
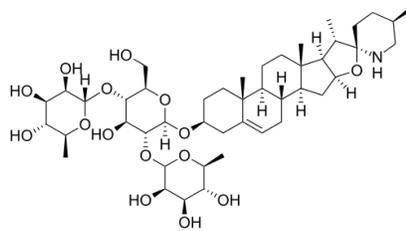


Figure 2 Variation of corrosion rates with concentration of the inhibitor.

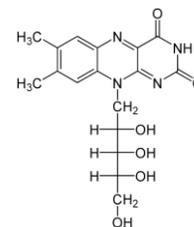
The inhibitive action of *solanum nigrum* extract can be attributed to the presence of various high molecular weight organic compounds. These include steroidal alkaloid glycosides, alpha and beta solamargine, alpha and beta solanigrine and solasonine. It also contains steroidal sapogenins: diosgenin and tigogenin; solasodine and solasodiene. The leaves contain riboflavin, nicotinic acid and vitamin-C. The molecular structure of some of these compounds are shown below.



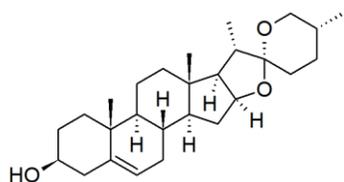
Solasonine



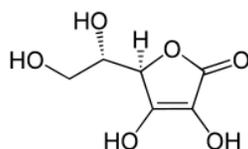
solamargine



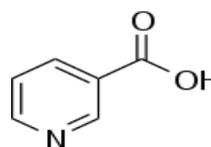
Riboflavin



Diosgenin



Vitamin-C



Nicotinic acid

The molecular structure of these compounds shows the presence of many hetero atoms, double bonds and aromatic rings which are potential adsorption centres for adsorption on to the metal surface. Organic compounds containing π -electrons, hetero atoms and multiple bonds have been reported to function as effective inhibitors for the corrosion of many metals in various media³³⁻³⁷. Since the *solanum nigrum* extract contains many organic compounds, it is very difficult to mention a particular compound for the inhibition activity. The inhibitive activity of the extract is attributed to the combined action of all the compounds present in the extract.

IV. ADSORPTION ISOTHERMS

Inhibitors reduce the corrosion of metals by getting adsorbed on the metal surface forming a thin film which acts as a barrier between the metal and the aggressive media leading to corrosion inhibition. To study the mechanism of corrosion inhibition, attempts were made to fit the data available to the various adsorption isotherms such as Langmuir, Temkin, Freundlich, Bockris-Swinkels and Flory-Huggins. From the weight loss values the degree of surface coverage (θ) for various concentration of extract were determined and plotted against $\log C$ of the extract which results in a straight line. This indicates that the adsorption of the inhibitor on the zinc metal surface follows Temkin adsorption isotherm. Figure 3 shows the Temkin adsorption isotherm.

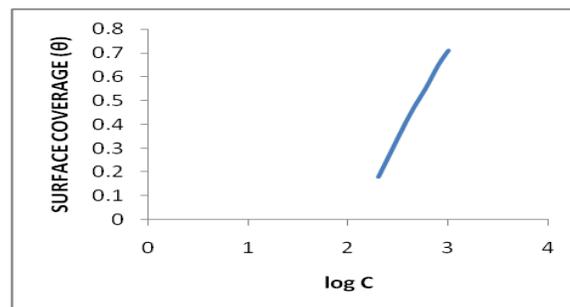


Figure 3 Temkin adsorption isotherm plot for zinc in 0.5N HCl containing different concentrations of the extract.

V. CONCLUSIONS

The extract of leaves and berries of *solanum nigrum* used in this work exhibited good inhibition efficiency. The inhibition efficiency increases with increase in the concentration of the extract. The adsorption of the components of the extract on to the metal surface in 0.5N HCl follows the Temkin adsorption isotherm.

REFERENCES

- [1] B.Muller, Corros.Sci. 44 (2002) 1583.
- [2] A.El-Hosary, R.M.Saleh,A.M.Shams El Din, Corros.Sci. 12(1972)897.
- [3] A.Y. El-Etre, Corros. Sci. 45 (2003) 2485.
- [4] A.Y. El-Etre, Corros. Sci. 40 (1998) 1845.
- [5] A. Chetouani, B. Hammouti, Bull. Electrochem. 19 (2003) 23.
- [6] A. Loto, Nigerian Corros. J. 1 (1998) 19.
- [7] M. Abdallah, Port. Electrochimica. Acta. 22 (2004) 161.

- [8] S. Verma, G.N. Mehta, Trans. SAEST 32 (1997) 4.
[9] S. Martinez, I. Stern, J. Appl. Electrochem. 31 (2001) 973. [51]
[10] B. Bouyanzer, Hammouti, Bull. Electrochem. 20 (2004) 63.
[11] K.O. Orubite, N.C. Oforka, Mater. Lett. 58 (2004) 1768.
[12] S. Verma, G.N. Mehta, Bull. Electrochem. 15 (1999) 67.
[13] A.Y. El-Etre, M. Abdallah, Corros. Sci. 42 (2000) 731. [28]
[14] B. Hammouti, S. Kertit, M. Mellhaoui, Bull. Electrochem.13(1997) 97.
[15] S. Kertit, B. Hammouti, M. Mellhaoui, Moroccan Patent, 23910, 1995.
[16] K. Srivatsava, P. Srivatsava, Br. Corros. J. 16 (1981) 221.
[17] G. Gunasekaran, L.R. Chauhan, Electrochimica.Acta. 49 (2004) 4387.
[18] A. Bouyanzer, B. Hammouti, L. Majidi, Mater. Lett. 60 (2006) 2840.
[19] A.Y. El-Etre, Appl. Surf. Sci. 25 (2005) 8521.
[20] A.Y. El-Etre, Corros. Sci. 43 (2001) 1031.
[21] A. Bouyanzer, B. Hammouti, Pigm. Res. Technol. 33 (2004) 287.
[22] E.E.Oguzie, Pigm.res.Technol.34(2005)321.
[23] F. Zucchi, I.H. Omar, Surf. Tech. 24 (1985) 391.
[24] K.S. Parikh, K.J. Joshi, Trans. SAEST 39 (2004) 29.
[25] M.G. Sethuraman, P. Bothi Raja, Pigm. Res. Technol. 34 (2005) 327.
[26] P. Kar, A. Hussein, G. Varkey, G. Singh, Trans. SAEST 28 (1997) 2801.
[27] R. Ananda Louise Sathiyathan, S.Maruthamuthu, M. Selvanayagam, S.Mohanan, N. Palaniswamy, Ind. J. Chem. Tech. 12 (2005) 356.
[28] S.Muralidharan, M.A.Quraishi and Venkatakrishna Iyer, Corros.Sci.,37(1995) 1739.
[29] S.Rengamani, S.Muralidharan and Venkatakrishna Iyer, Ind.Jour.Chem.Tech. 1 (1995) 168
[30] B.N.Oza and R.S.Sinha, Trans.SAEST, 17(1982) 281.
[31] R.K.Upadhyay and S.P.Mathur, E.J.Chem 4(2007)408.
[32] A.Y.El-Etre, Corros.Sci.43(2001)1031.
[33] E.H.El Ashry, A.El.Nemr, S.A.Essawy,S.Ragub, Prog.in. Org.Coat .61(2008)11.
[34] K.Abiola, Corros. and Mater.10(2007)10
[35] K.C.Emregul,M.Heyvali, Mater.Chem.Phys. 83(2004)209.
[36] S.Viswanatham, N.Haldar, Corros.Sci.50(2008)2999.
[37] S.V.Ramesh, A.V.Adhikari, Mater.Chem.Phys. 115(2009)618.

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Cerebroprotein Hydrolysate in Extra-Pontine Myelinosis – A Case Report

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Abstract- Extrapontine myelinosis (EPM) is a common co-occurrence with central pontine myelinosis in head injury and alcohol withdrawal where hyponatremia may be the precipitating cause. There are not many treatment options available in these cases except a supportive management. We describe here a case of head injury under the influence of alcohol that also displayed EPM without hyponatremia after alcohol withdrawal in a chronic alcoholic that responded very well to cerebroprotein therapy.

Index Terms- Extra pontine myelinosis, cerebroprotein, head injury, hyponatremia.

I. INTRODUCTION

Central pontine myelinolysis (CPM) is a disease affecting alcoholics and the malnourished with hyponatremia being a common cause.¹ In approximately 10% patients, CPM is associated with extrapontine myelinolysis (EPM), and this may generate parkinsons symptoms and psychotic features.² Although the cause and pathogenesis of CPM and EPM remain unclear, many studies have implicated the rapid correction of hyponatremia as the major factor associated with CPM, due to exposing the pontine glia and extrapontine glia to osmotic stress.³

Cerebroprotein hydrolysate is an unique neurotrophic peptidergic mixture produced by standardized enzymatic breakdown of lipid-free porcine brain proteins.⁴ It has unique neurotrophic activity that enhances neurogenesis, neuronal survival, provides neuromodulatory action, increases neuronal plasticity and neuronal repair and has neuroimmunotrophic actions.⁵ It has been found in animal studies that early intervention with cerebrolysin reduces blood-brain and blood-cerebrospinal fluid barriers permeability changes, attenuates brain pathology and brain edema, and mitigates functional deficits caused by traumatic brain injury.⁶ It improved brain bioelectrical activity i.e. reduced EEG ratio by increasing fast frequencies and reducing slow activities and also enhanced cognitive performance in tasks evaluating attention and memory functions in postacute traumatic brain injury patients.⁷ We describe here a case of head injury under the influence of alcohol that also displayed EPM without hyponatremia after alcohol withdrawal in a chronic alcoholic that responded very well to cerebroprotein therapy.

II. CASE REPORT

A 35 year old 8th standard educated, married male furniture repairer work was referred to us from the internal medicine department in view of further management of alcohol

dependence. He was alright till 3 weeks prior to presentation when under the influence of alcohol he met with an accident and suffered a head injury, details of which were not known to relatives and the patient had no memory of the same. He was admitted in the surgery ward for 7 days and was in semi-conscious state for 2-3 days. CT Scan of the brain showed 'Linear mildly displaced fracture of left frontal bone involving both tables of frontal sinus, comminuted displaced fracture of lamina, papyracea, ethmoid trabeculae, inferior lateral wall of left orbit and greater wing of left sphenoid bone. The fracture fragments impinging on left medial and lateral rectus and involving inferior orbital fissure. There was another linear and undisplaced fracture of right petrous temporal bone involving walls of the sphenoid sinus and right foramen ovale with hemomastoid. Extradural hemorrhage were seen in left frontal and left temporal region'.

On recovery the patient was discharged and went home and at home started with altered behavior in form of irrelevant talking that someone was coming to harm him, could see things invisible to others, was hearing voices inaudible to others, was not able to identify relatives, had decreased sleep at night and would try to run away from home. So was brought to our hospital immediately and admitted in medicine ward for his delirium state 2-3 days after admission he got better and stopped irrelevant talking and running away behavior. But he stopped talking, also started developing rigidity of limbs and tremors of body. He was incontinent too. He was not able to walk or get up from lying down position. He became bed ridden. He could not do any of his personal chores and had to be assisted in everything. An MRI Brain showed 'Bilateral caudate nucleus, lentiform nucleus, insular cortex, splenium of corpus callosum which were T2 and FLAIR hyperintense that meant subtle restriction of diffusion most likely secondary to hypoxic ischemic changes and extrapontine myelinosis. The patient was diagnosed as hypoxic ischemic encephalopathy and extrapontine myelinosis in a case of head injury with subdural hematoma and subarachnoid hemorrhage. Extradural collection in left frontal and left temporal region showing restriction of diffusion with corresponding low ADC values and thin peripheral rim which blooms on gradient sequences suggestive of extradural hematoma (subacute). Thin rim of concavo-convex extra-axial, subdural collection noted in right fronto-parietal region of maximum thickness of 4.8mm which is T2 hyperintense and FLAIR and T1 hypointense and does not show restriction of diffusion suggestive of subdural haemotoma. Sub arachnoid haemorrhage in right high parietal region. T2, FLAIR and T1 hyperintense signal is noted in left anterior ethmoid air cells, right sphenoid sinus and right mastoid air cells suggestive of hemosinus and hemomastoideum'.

His condition did not improve so was referred to psychiatric department to us after about 2 weeks. We evaluated him and diagnosed him as major neurocognitive deficit disorder due to traumatic brain injury in a case of delirium. We decided to start him on cerebroprotein therapy. His Addenbrooke's Cognitive Examination- (ACE-R) score was 0/100 as he was not able to speak. Also his score on Barthel's activities of daily living (ADL) was 2. He received 20 injections of cerebroprotein 60mg i.v. in 100cc normal saline over 1-2 hour infusion. His condition started gradually improving. He started feeding by self after the 9th injection. He started walking with support. His rigidity and tremors gradually started disappearing. After the 20th injection his ACE-R was 60/100 and Barthel's ADL score was 12. On discharge he was able to feed by self, dress by self, go to the toilet by self.

III. DISCUSSION

Traumatic brain injury causes functional disability in the patient and there are very few medications that may reduce it. The complex study of cognitive and emotional status, levels of serum serotonin and brain-derived neurotrophic factor (BDNF) performed in 72 patients with acute traumatic brain injury, with a special focus on middle brain injuries (MBI), treated with Cerebrolysin found that cerebrolysin promotes activation of neurotrophic processes and improves outcomes of closed craniocerebral injury.⁸ A double-blind, placebo-controlled, randomized study showed that Cerebrolysin improves the cognitive function of patients with mild traumatic brain injury (MTBI) at 3rd month after injury, especially for long-term memory and drawing function tested on Mini-Mental Status Examination (MMSE) and Cognitive Abilities Screening Instrument (CASI) scores.⁹ Cerebroprotein hydrolysate is a medication that acts at a brain level and provides us with an effective tool for improving levels of activities of daily living in patients of head injury and decreasing their dependence on caregivers though further trials in large populations and clinical trials is warranted. To the best of our knowledge this is the first case report of cerebroprotein therapy with a successful outcome in a case of head injury with extra pontine myelinosis.

REFERENCES

- [1] Adams RA, Victor M, Mancall EL. Central pontine myelinolysis: a hitherto undescribed disease occurring in alcoholics and malnourished patients. *Arch Neurol Psychiatry* 1959; 81 :154-72.
- [2] Ashrafian H, Davey P. A review of the causes of central pontine myelinolysis: yet another apoptotic illness? *Eur J Neurol* 2001; 8:103-9.
- [3] Korn-Lubetzki I, Virozub Y, Orbach H. Central pontine myelinolysis after alcohol withdrawal. *Isr Med Assoc J* 2002; 4: 656-8.
- [4] Hartbauer M, Hutter-Paier B, Skofitsch G, Windisch M. Antiapoptotic effects of the peptidergic drug cerebrolysin on primary cultures of embryonic chick cortical neurons. *J Neural Transm* 2001; 108(4): 59-73.
- [5] Sharma HS, Zimmermann-Meinzingen S, Johanson CE. Cerebrolysin reduces blood-cerebrospinal fluid barrier permeability change, brain pathology, and functional deficits following traumatic brain injury in the rat. *Ann N Y Acad Sci* 2010; 1199: 125-37.
- [6] Wong GK, Zhu XL, Poon WS. Beneficial effect of cerebrolysin on moderate and severe head injury patients: result of a cohort study. *Acta Neurochir Suppl* 2005; 95: 59-60.
- [7] Alvarez XA, Sampedro C, Pérez P, Laredo M, Couceiro V, Hernández A. Positive effects of cerebrolysin on electroencephalogram slowing, cognition and clinical outcome in patients with postacute traumatic brain injury: an exploratory study. *Int Clin Psychopharmacol* 2003; 18(5): 271-8.
- [8] Selianina NV, Karakulova IV. The effect of neurotrophic treatment on the activation of reparative processes in patients with acute traumatic brain injury. [Article in Russian] *Zh Nevrol Psikhiatr Im S S Korsakova*. 2012; 112(5): 46-9.
- [9] Chen CC, Wei ST, Tsaia SC, Chen XX, Cho DY. Cerebrolysin enhances cognitive recovery of mild traumatic brain injury patients: double-blind, placebo-controlled, randomized study. *Br J Neurosurg* 2013 [Epub ahead of print].

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Influence of Promotional Mix and Price on Customer Buying Decision toward Fast Food sector: A survey on University Students in Jabodetabek (Jakarta, Bogor, Depok, Tangerang, Bekasi)Indonesia

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Abstract-This research investigates the influence of promotional mix and price on consumer buying decision towards fast food. A survey of university student in Jabodetabek. Descriptive researched was used to 300 correspondents as the consumer of fast food products. Data were collected through online questionnaire. The result of questioner then will be analyzed by SPSS statistics, which are factor analysis, reliability test, and regression analysis. It is found that the promotional mix and price has significant influence towards consumer buying decision in fast food industry.

Index term-Promotional mix, price, consumer buying decision, fast food sector

1. Introduction

In today's era, competitive environment is everywhere to stay in competitive market, communication is one of the ways to reach customers. Communication is also one of the tools to achieve company objective (Fill & Jamieson, 2011). To having customer buy retailer's product, retailer should be able to influence customer-buying decision. Consumer buying decision process is consisting of five stages. There are problem recognition, information search, and evaluation of alternatives, purchase, and post-purchase evaluation. Furthermore, the process of buying decision may not take all the five stages (Pride & Ferrell, 2012). Unconsciously, the decision to purchase a product is mainly influenced by promotions and price. Advertising combine with sales promotion and others marketing tools can have sustainable effect. Promotional mix is one of retailer tools to wooing the customer to buy their products and one of the major tools in promotion is advertising. As many managers believe, promotion has play important role in creating brand awareness of the product (Blythe, 2005).

The economic growth of Indonesia in that has grown stable for the past few years. It has grown for more than 6%. Based on a Nielsen survey in 12 cities in Indonesia, the number of middle and high income people has increased from 42% in 2008 to 62% in 2010. With these current situations, many retailers start to see Indonesia as a promising market and try to enter Indonesian market. Among the retailers who want to enter Indonesian market, there are food retailers. One of them is Fast Food retailer.

Due to the globalization, fast food has widely spread across the world, including in Indonesia. As Indonesian is becoming richer, they tend to qualifying food as a want not a need and as a result they tend to eat more fast food. Furthermore, in 1998 when the economic crisis strike, the number of fast food restaurant in Indonesia increasing up to 74, 2%(Ramdhani, 2005).Furthermore in 2012, there are 3 brands that dominates market share of fast food industry, there are McDonalds, KFC, and Es Teller 77. McDonalds and KFC are very known foreign brands that more focus on television advertisement and rapid outlet expansion. Meanwhile, Es Teller 77 more focuses on below-the-line advertising, familiar menus, and renewal of its outlets (euromonitor.com).

Currently, the existence of fast food is well known and well enthused by people around the world. Therefore, this kind of condition leads the fierce competition in attracting customers for buying their product then indirectly becomes the favorite food for some people. Although, many resources that have mentioned about the controversy of consuming this fast food, that not only could cause of triggering obesity, but also can reduce the bone density (Firdaus, 2012).

To further our understanding, we explore how the promotional mix can influence customer buying decision. More specifically, the research questions driving this study as follows:

- Does the product price influence customer buying decision?
- To what extent fast food promotions significantly influence customer buying decision?

Later, in this journal the writers will talk about: the literature review of promotional mix and customer buying decision. Then followed by, the research design and the methodology used in the study. Finally, the writers will discuss about the future implication and the conclusion.

II. Literature Review

2.1 Promotional Mix

According to Swastha and Irawan (2008), promotional mix is information flows or one way persuasion which directing someone, people, or organization to make a demand. Promotional mix is used to expand and penetrate the market, build the company's image, provide information, increase and stabilize sales, add value to product and differentiate the products (Williamson, 2012).

Tanner and Raymond (2012) declare that there are several factors that might influence selection of promotional mix such as budget, product life cycle, product and type of purchase decision, target market characteristics and consumer's readiness to purchase, what way consumer wants to be reached, the regulations, competitors and environmental factors and the last is the availability of media. In order to be able to market the product, budget that available in the firm should be considered. Budget that is available could influence number of people who got influence by the promotion and how often the promotion influences the people. Furthermore, each product that usually has different life cycle, thus it will result in different promotion. Products that have high quality or require technical procedure should be promoted by personal selling, thus customer will be more understand on how to operate and maintain the products. At last, a company could use all kind of media for one product at the same time.

According to Tanner and Raymond (2012), promotional mix consists of 6 variables, there are; firstly, advertising is an activity that involves identification spreading of a brand using different medium at the same time during the promotion period. Secondly, personal selling is an activity that involves interaction between buyers and seller. Thirdly, sales promotion which has to be done in order to get quick response, huge number of sales and repeating purchases. Fourthly, Publicity is a way to promote and improve image of a company by putting positive perception by public relations. The last, is direct marketing which involves the delivering of personal promotion material directly to individual customer through mail, catalogs, internet, e-mail, telephone, or direct response advertising Internet Marketing.

2.2 Price

Price indicates some amount of money that needs to be paid to achieve something (Friedrich, 2004). Some products or services are purchased based on customer's perception of price instead of the actual money price (E. S. Asamoah, 2011).

2.3 Consumer Buying Decision

Customer buying decision is a series of choices made by consumer before making a purchase after they have the willing to buy. Pride and Ferrell (2012) stated that to understand consumer buying decision, the marketer should understand the consumption process and the utility of products in consumers' perceptions. They also declared that when purchasing products unconsciously, consumer gets through several steps in the making of purchase decision, purchase, and post-purchase evaluation. The first step decision is problem recognition where the consumers are able to differentiate between their needs and wants. Marketers usually use advertising, sales person, and packaging to stimulate recognition of the needs or wants. The second step is information search where the consumer seeks the information from their memory about the products, seeking the information from outside sources, such as from friends, relatives, government reports, publication, sales person, website, packaging label, and display, or by repetition. The third is evaluation of alternatives where the consumer will establish criteria which consist of characteristic that are important for them. Consumer buying process can be influenced by circumstances, time, and location. Furthermore, situational factor that can influence on consumer buying process consists of five categories; the first one is physical surrounding like location, store ambience, or weather. Second is social surrounding like characteristics and interactions with others. Third is the time dimension. Time playing an important role as the buyer considers the durability of the product or the frequency of product use. Forth is the reason why consumer buy certain products. The last is consumer's condition or feeling might affected to consumer buying decision process.

2.4 Hypothesis

- H1: There is aninfluence of Advertising towards purchase decision of fast food consumer
- H2: There is an influence of Personal Selling towards purchase decision of fast food consumer
- H3: There is aninfluence of Sales Promotion towards purchase decision of fast food consumer
- H4: There is aninfluence of Publicity towards purchase decision of fast food consumer
- H5: There is an influence of Price towards purchase decision of fast food consumer

III. Methodology

3.1 Sampling

Sample is a part of the population. Sample consists of a number of selected members of the population. By using sample, general conclusion towards certain population can be established. When doing a research, it would be practically impossible to collect data from every subject in the population. Even if it were possible, it would create barrier towards cost, human resource, and time. Sampling is the process of selecting the exact number of samples should be taken for the research. The exact number must be taken to make sure that the sample is fairly close to the population parameter (Sekaran & Bougie, 2013).

In this research, we are going to use Statistical rule of thumb to calculate our sample size. Hereby, the formula;

$$N > 50 + 8m \quad \text{where, } N = \text{Sample size} \\ m = \text{number of questions available in our questionnaire}$$

In statistical rule of thumb the exact sample size is better be greater than the calculation result (50+8m). So, since there are 27 questions available in the questionnaire $N > 50 + 8 \times 27$, then $N > 266$. This means that this research better be taking more than 266 respondents. Finally, the authors decide to round up the number and take 300 respondents for the survey (VanVoorhis & Morgan, n.d)

3.2 Data Collection

The data for this research is mainly taken in October to November 2013 via online survey, by Google drive and email, and probability sampling design. Furthermore, according to Environmental Protection Agency (2002) probability-based sampling design is involve sampling theory and random selection of correspondents. Furthermore, Correspondent of online survey will be taken from the people surrounding the researcher who are willing and has qualification to become potential correspondents.

3.3 Measures

3.3.1 Validity

Validity reflects the compatibility of the research concept with what is implied in the questionnaire. A research can be classified as valid when there is a precise amount of correspondents answer the questionnaire provided in order to support the fact written in the research. There are four types of validity that can be identified to accomplish the research, namely content validity, predictive validity, concurrent validity, and construct validity. Construct validity will be implemented in this research. Construct validity will be determined by using exploratory factor analysis and confirmatory factor analysis to examine factors of empirical data. By operating empirical data analysis, results can be achieved through the exploratory factor analysis; factor loading, the rotated simple structure, the plot of Scree test. While, confirmatory analysis will implement priori factor pattern and indices for goodness of model fit. Finally, the determination of research validity will be obtained from the factor analysis procedures provided (ChengHsiung Lu , 2008)

3.3.2 Reliability

From the 300 questionnaires as the pre-test, the reliability is analyzed. The reliability test can also be found in Item-Total Statistic table by seeing the Cronbach's Alpha for each item. The Cronbach's Alpha should be greater than 0.6. The Cronbach's Alpha of Sales promotion is 0.925 which is greater than 0.6. This means that the sales promotion is reliable. This will also work for the other variable such as the Cronbach's Alpha for Personal selling is 0.873, Advertising is 0.848, Publicity is 0.756, and for Price is 0.678.

3.3.3 Classical Assumption Test

In order to use the multiple regression models, classical assumption test is needed to implement such as normality test, multicollinearity and heteroscedascity test.

3.3.3.1 Normality

Normality is used to determine whether the data population is normally distributed or not. In order to fulfill the criteria of using multiple regression analysis, the residual value should be normal distributed. In this study, the author used the normal distribution by using *Probability P Plot*.

3.3.3.2 Multicollinearity

Multicollinearity is used to determine whether there is the similarity of independent variable with the other independent variables in the regression model or not. The similarity among the independent variable will cause a high correlation among an independent variable with other independent variables. Furthermore, the test of multicollinearity in a data can be seen through its Variance Inflation Factor (VIF) value that cannot be more than 5 and tolerance value is not less than 0.1 and not more than 1. VIF value is used to determine whether there is multicollinearity or not. If the value of VIF is greater than 5, then the independent variable has linear relation towards other independent variables in multicollinearity model. However, if the value is lower than 5, it means there is no relationship among the independent variables. The independent variables only influence dependent variable (Y) and it is not influencing each other.

3.3.3.3 Heteroscedasticity

Heteroscedasticity is used to determine whether there is a variance similarity from the residual value in the regression model or not. A good regression model should not heteroscedasticity. Moreover, the scatter plot of heteroscedasticity should not create certain pattern.

3.3.4 Multiple Regressions

Multiple regression analysis is a method of analyzing the collective and relationship of two or more independent variables on a dependent variable (Kanom, 2011). This analysis is aim to know how big the influence of independent variable, *Advertising* (X1), *Personal Selling* (X2), *Sales Promotion* (X3), *Publicity* (X4), and *Price* (X5) towards customer buying decision (Y) as the dependent variable. The formula of multiple regression of this study can be written as:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$$

IV. Implication and Discussion

4.1 Data Analysis

Before running the statistic data analysis and multiple regression, KMO and communalities test should be conducted before. Here are the result for both independent and dependent variables.

4.1.1 Kaiser-Meyer-Olkin Test

KMO test tells whether the sample size used for the reseach is enough or not to covered the questions in the variable. If the KMO is greater 0.5, it means the sample size usedfor this research is enough for factor analysis and reability. The significant of Barlett's test should be less than 0.05 in order to prove null hypothesis as stated are correct. In this result the KMO value is 0.771 and barlett's value is 0.00 which means that the factor model is appropriate for further analysis process. KMO Test result for Four Independent Variables and Dependent Variablecould be seen in the table 1.2.

4.1.2 Communalities

Communalities test is used to test whether the questions for the variable is sufficient to explain the variable itself. Value of communalities of each questions must be greater than 0.5, and from the table above shows that the value of communalities is all greater than 0.5. Therefore, the variable is highly represented by the questions.

4.1.3 Total Variance Explained

The Variance is to explain the eigenvalue of the factors. That eigenvalue itself having a relation with the number of variables. SPSS extract only total value more than 1.0, because if the total value less than 1.0 it means the contribution of the variance is not sufficient or it causing redudancy. From the figure 1.3, the variables is explained with strong relationship as 64.7% and can be extracted because the total value is greater than 1.0.

4.2 Factor Loading and Cronbach Alpha

To see the close relationship between the questions in the same group variable, Cronbach Alpha is used as the standard measurement. As high the result, it means the relationship is measuring real parts to form something as a whole. The value of Chronbach Alfa and Loading factors in rotated component matrix is all above 0.6, showing close relationship between the questions in variables.

4.3 Multiple Regression

As stated before in chapter 3, Multiple regression is used to measure the value created from independent to dependent variable. However, before Multiple regression executed, the data should passed three Classical Assumptions.

4.3.1 Normality

To ensure that the inferences of F-test and T-test are valid, the distribution of residuals should follow a normal distribution. Second measurement is called as normal probability plot. Without the exact calculation, the assumption of normal probability plot must supported the normal distribution of residuals by the plot point close to the straight line from which is drawn from the lower left to the upper right of the graph.

4.3.2 Heterocedasticity

The residuals scatterplots are spread randomly above and under zero line which means the data have no heterocedasticity problem. Heterocedasticity can make the statistical test of significant become invalid. Since there is no heterocedasticity, the next process need to be done is the multiple regression.

4.3.3 Multicollinearity

Multicollinearity is a correlation between all independent variables. It makes difficulty in the process of making inferences and multiple regression. There is a strong relationship between independent and dependent variables if the value of tolerance close to 1 and the VIF should be around 1.

The values of all VIFs are around 1 which means the independent and dependent variable have strong relationship. The significant interval on the table shows the significant possibility of the independent variable in influencing the dependent variable. Looking at the numbers constant of the variables, those numbers are all positive, means that those four variables giving positive impact toward the dependent variables.

From the variables that shows in the coefficient table 1.4, started from design, color and innovation, information specified and material used, all have the significance below $>.005$ which means that all of these variables has a really strong affect to the consumer preference.

4.3.4 F-test and T-Test

F-test or simultaneous test which used to check whether all the independent variable simultaneously influence the dependent variable. The requirement is P-value or the significant of the variables must be less than 0.05. With this result of significant, the hypothesis stated before is accepted. The F-test result could be seen in table 1.5. T-test is used to test whether partially of each independent variables are influenced the dependent variable. The requirement is that the significance in Coefficient Table 1.4 is less than 0.05 means each independent variable strongly influenced dependent variable.

4.3.6 Adjusted R-square Table

Table 1.6 shows the relationship between all the independent variables's portion contributed for dependent variable. In Multiple regression, the percentage shown by Adjusted R-square. The value is 0.415 which means all the independent variables (design, color and innovation, information specified, material used) contributed 41,5% to dependent variable (consumer preferences).

V. Conclusion and Recommendation

5.1 Conclusion

This research is focusing on the factors that can influence the customer buying decision on fast food industry. The hypothesis H1, H2, H3, H4, and H5 represent the factors that influence customer buying decision towards fast-food. The factors are advertising, publicity, sales promotion, personal selling, and price. In order to prove that these factors are actually support the hypothesis, the T-test values as mentioned before should be less than 0.05. As shown in the existing data, all T-test values of all 5 factors are proven to be less than 0.05. Broadly, this means that promotional mix and pricing arranged by fast food companies affect the customer buying decision. Additionally, in order to know how strong these factors affect the customer buying decision on fast food, R-square table shows that 37.2% of customer buying decision influenced by the company's promotional mix and price set while, the rest 62.8% is influenced by other factors. Overall, this percentage proves that promotional mix and price set decently influence customer buying decision on fast food.

5.2 Recommendation

The result of this research is proving that promotional mix and price only takes 37.2% in consumer buying decision towards fast food sector. The rest of percentage proves that there are other factors that influence the consumer buying decision towards fast food like location, product, etc. If the fast food's retailer wants to have focus on promotional mix and price, the retailer should more focus on the personal selling. From the other variables of promotional mix and price, personal selling has the most significant relationship toward consumer buying decision on fast food. Furthermore, by seeing this result, the writers suggest the fast food retailer to strengthen the personal selling, thus the consumer can get influenced more.

References

- Ampuero, O., & Vila, N. (2006). *Consumer Perception of Product Packaging*. Spain: Emerald Group Publishing Limited.
- Brand Packaging. (2013 йил 20-May). *Articles: Study Expands Innovation's Definition in Packaging Industry*. Retrieved 2013 йил 20-October from Brand Packaging: <http://www.brandpackaging.com>
- Castilo, J. (2009 йил September). Retrieved 2013 йил 17-October from Explorable: <http://www.explorable.com>
- Carter, R., Day, B., & Meggs, P. (2007). *Form and Communication*. In *Typographic Design*. United States of America: John Willey and Sons Inc.
- DC Velocity Staff. (2013 йил 3-September). *Packaging: from cost center to competitive advantage*. Retrieved 2013 йил 20-october from DC Velocity: <http://www.dcelocity.com>
- Deliya, M., & Parmar, B. (2012). *Role of Packaging on Consumer Buying Behavior*. Patan District: Global Journal of Management and Business Research.
- Design Council. (2013). *About Design: The Power Of Packaging Design*. Retrieved 2013 йил 20-October from Design Council: <http://www.designcouncil.com>
- DS Smith Packaging. (2013 йил 1-august). *Design and Innovation*. Retrieved 2013 йил sunday-october from DS Smith Packaging: <http://www.dssmithpackagingeurope.com>

Gobé, M. (2005). *Emotional branding: paradigma baru untuk menghubungkan merek dengan pelanggan*. (B. Mahendra, Trans.) Jakarta: Erlangga.

Grundvåg, G. S., & Østli, J. (2009). Consumer evaluation of unbranded and unlabelled food products: The case of bacalhau. , *European Journal of Marketing*, 43.

Husfloen, K. (2009). *Antique Trader Perfume Bottles Price Guide*. United States of America: Krause Publications.

Hair Jr, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis 7th Edition*. Pearson Prentice Hall.

Harminingtyas, R. (2013). Analisis Fungsi Kemasan Produk Melalui Model View Dan Pengaruhnya Terhadap Keputusan Pembelian Konsumen Pada Produk Rokok Kretek Merek Dji Sam Soe Di Kota Semarang . *Jurnal STIE Semarang* , 5 (2), 3.

How Can Packaging Increase Sales. (2013, January 2). Retrieved October 14, 2013, from Business Marketing Press: <http://www.businessmarketingpress.com>

Keegan, W. J., & Green, M. (2012). In P. Policy, *Global Marketing*. New Jersey: Pearson Prentice Hall.

Kotler, P., & Gary, A. (2008). Consumer Markets and Consumer Buyer Behavior. In *Principles of Marketing 12th Edition*. United States of America: Pearson Prentice Hall.

Ksenia, P. (2013). Packaging Design as a Marketing Tool and Desire to Purchase.

Levigne, D. M. (2004). In *Statistic for Managers Using Microsoft Excel*. New York: McGraw Hill.

Lockman, J. (2012 йил 2012-November). *Creative Packaging Design: Live Creatively*. Retrieved 2013 йил 20-October from M-Theory: <http://www.mogultheory.com>

Mayer, E. G. (2006). Factor Analysis 1. *Statistical in Psychosocial Research* .

Market Research Group, LLC. (2004). Convenience Foods Packaging and Serving Size Trends, Volume 3 in the Series, The U.S. Market for Convenience Foods. *Packaging Facts* .

Peter, P. J., & Olson, J. C. (2005). Consumer Behavior and Product Strategy. In *Consumer Behavior and Marketing Strategy*. New York: McGraw Hill.

Polyakova, K. (2013). *Packaging design as a Marketing tool and Desire to purchase*. Saimaa University of Applied Sciences, Faculty of Business Administration, Lappeenranta. <http://www.Publications.Theseus.Fi>.

Suhendra. (2009, 10 26). *Pemasok 90% Bahan Baku Dunia, Tapi RI Masih Impor Parfum*. Retrieved 10 14, 2013, from detikFinance : <http://www.finance.detik.com>

Sekaran, U., & Bougie, R. (2013). *Research Method for Business* (6th Edition ed.). Italy: John Wiley.

Silayoi, P., & Speece, M. (2007). *The Importance of Packaging Attributes: A Conjoint Analysis Approach*. European Journal of Marketing.

Stewart, B. (2004). In *Packaging Design Strategies Second Edition*. United Kingdom: Pira International Ltd.

Rundh, B. (2009). *Packaging Design Creating Competitive Advantage with Product Packaging* .

Tresnasih, W. (2011). *Pemanfaatan Methylobacterium spp. untuk meningkatkan pertumbuhan bibit tanaman nilam (Pogostemon cablin Benth.) dalam kultur in vitro*. Thesis , Institut Pertanian Bogor, Fakultas Pertanian.

VanVoorhis, C., & Morgan, B. (n.d). What Authors Don't Want to Forget About Sample Sizes. *Statistical Rule of Thumbs* . (2011 йил 6-November). Retrieved 2013 йил 10-October from Survey Method Blog : <http://www.blog.surveymethods.com>

53 Authorsst Baltimore Pike. (n.d.). Developing Consumer Insight: The Determination of Consumer Preference. *International Communications Research* .

Notes:

Table 1.1

	N	%	Income		Occupation			
Gender			1,000 k -	205	68.7	Student	189	83
Female	139	46.3	2,000 K			Employee	54	18
Male	161	53.7	2,000 K -	64	21.3	Entrepreneur	17	5.7
Total	300	100	5,000 K			Professional	18	6
Age			5,000 K -	-		Housewife	8	2.7
20-30	300	100	10,000 K			Others	14	4.6
Total	300	100	> 10,000 K	30	10	Total	300	100
			Total	300	100			

Table 1.2

KMO Dependet Variable Sig	.771
KMO Independent Variable Sig	.683

Table 1.3Total Variance Explained

Extraction Sums of Squared Loadings (Total)	Rotation Sums of Squared Loadings (Cumulative %)
1.131	64.778

Table 1.4

Coefficients^a

Model	Sig
1 (Constant)	-.892
AVERAGE D	.000
AVERAGE C I	.000
AVERAGE IS	.002
AVERAGE M	.000

Dependent variable: AVERAGE Y

Table 1.5

Anova^a

Model	F	Sig
1. Regression	54.226	.000 ^b
Residual		
Total		

a. Dependent Variable: AVERAGE CONSUMER PREFERENCE

b. Predictors: (Constant), AVERAGE MATERIAL USED, AVERAGE INFORMATION SPECIFIED, AVERAGE DESIGN, AVERAGE COLOR AND INNOVATION

Table 1.6

Model	R	R Square	Adjusted R Square	Std. Error of the Estimated	Change Statistics				
					R Square Change	F Change	Df 1	Df 2	Sig. F Change
1	.650 ^a	.423	.415	.52094	.423	54.226	4	296	.000

a. Predictors: (Constant), AVERAGE MATERIAL USED, AVERAGE INFORMATION SPECIFIED, AVERAGE DESIGN, AVERAGE COLOR AND INNOVATION

b. Dependent Variable: AVERAGE CONSUMER PREFERENCE

A Prominent Analysis on Head Phantom Image using Correlation Coefficient

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Abstract- 2D projections of the real 3D space are the only available information in the imaging technics like in X- Ray and MRI. In this paper we study projections of images as generated by Radon transformation. We implemented an image reconstruction algorithm which receives different projections of the original image as input. We performed this experiment using artificially created image in order to test and verify the algorithm. The quality of images reconstructed by an algorithm is most prominent to check. So in this paper, we performed analysis on head phantom MRI image by calculating correlation coefficient, Cutoff rotation angle for an image and linearity of correlation coefficient.

Index Terms- Image processing, Radon Transform, Image Reconstruction, correlation Coefficient

I. INTRODUCTION

The determination of the 3D structure of macromolecules is an important field of interest for biology. Nowadays, two methods dominate this determination: X-ray crystallography and Magnetic Resonance Imaging (MRI) spectroscopy. They have the ability to produce a detailed picture of the 3D structure of biological macromolecules at atomic resolution [1,2]. We focus on the MRI approach.

MRI is a spectroscopic technique that reveals information about the environment of magnetically active nuclei. An external magnetic field is used to align them and this alignment is perturbed by an electromagnetic field.

Up to 2003, the number of 3D structures of macromolecules that has been deposited in the Protein Data Bank (PDB) [4] was greater than 3150. MRI is also very useful in Structural genomics. Many efforts are being made in this filed to supplement the knowledge on the sequence of proteins by structural information on a genome-wide scale, determined either experimentally or by theoretical homology modelling [2].

For many years, MRI has been dominated virtually exclusively by the Fourier Transformation (FT) [3,6]. FT gives a simple graphical picture of correlations among different molecular sites within a molecule. But as the spectra is getting more complex due to more intense magnetic fields, extension to three or even four dimensions is needed to resolve ambiguities. This result to an increase to the amount of data acquired and the required processing time [7].

Fig.1 illustrates a typical 2D parallel projection. We need to determine the position and quantity of white matter in brain sample image. If we were able to look at the spectrum from different angles we could get this information.

Currently the only available information are projections of the spectrum from different angles. Using that 2D information, we try to reconstruct the correct 3D image [8]. This image reconstruction approach, using different projections and angles of views, is very popular in many fields such as x-ray scanning, tomography and determination of protein structure. If only two projections are used some resonances might be cut off by others. Thus, more projections may be required depending on the problem under study.

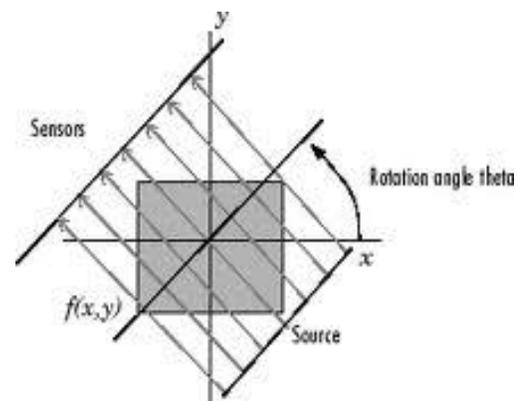


Figure 1: Example of a typical parallel projection

In this paper we present an image reconstruction algorithm introduced by E. Kupce and R. Freeman [18]. Inputs of the algorithm are 1D projection. They are acquired using the Radon transformation. The algorithm was implemented and verified on artificial image shown in figure 2. The correlation coefficient was chosen as a measurement for the resemblance between the reconstructed image and the original one.

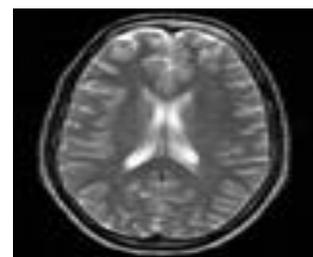


Figure 2: Head phantom artificial image

The rest of this paper is organized as follows: Section II presents a mathematical background of Radon transformation and the reconstruction algorithm. In section III, the acquired

results are illustrated. Finally, we discuss about future work and conclude our paper in section IV.

II. METHODS

A. The Radon Transformation

The 2D Radon transformation is the projection of the image intensity along a radial line oriented at a specific angle as shown in fig. 1. Radon expresses the fact that reconstructing an image, using projections obtained by rotational scanning is feasible. His theorem is the following: The value of a 2-D function at an arbitrary point is uniquely obtained by the integrals along the lines of all directions passing the point. The Radon transformation shows the relationship between the 2-D object and its projections [8].

The Radon Transformation is a fundamental tool which is used in various applications such as radar imaging, geophysical imaging, nondestructive testing and medical imaging [9]. Many publication exploit the Radon Transformation. Meneses-Fabian et al. [10] describe a novel technique for obtaining border-enhanced tomographic images of a slice belonging to a phase object. Vitezslav [11] examines fast implementations of the inverse Radon transform for filtered backprojection on computer graphic cards. Sandberg et al. [12] describe a novel algorithm for tomographic reconstruction of 3-D biological data obtained by a transmission electron microscope. Milanfar [13] exploits the shift property of Radon transformation to image processing. Barva et al. [14] present a method for automatic electrode localization in soft tissue from radio-frequency signal, by exploiting a property of the Radon Transform. Challenor et al. [15] generalize the two dimensional Radon transform to three dimensions and use it to study atmospheric and ocean dynamics phenomena.

Figure 3 illustrates several 1D projections from different angles at an image consisting of white spots in the 2D domain. In some of the projections, only partial spot is shown. This reveals the importance of the selection of the “correct” projections for image reconstruction.

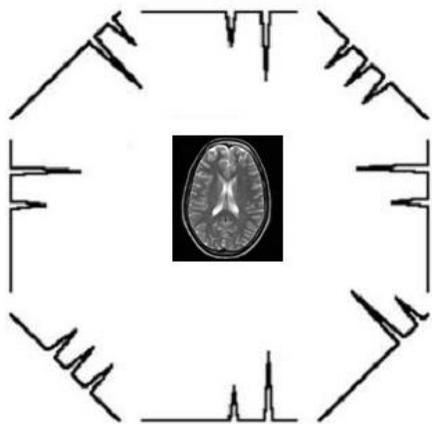


Figure 3: Different projections on a head image example.

Suppose a 2-D function $f(x, y)$ (Fig. 4). Integrating along the line, whose normal vector is in θ direction, results in the

$g(s, \theta)$ function which is the projection of the 2D function $f(x, y)$ on the axis s of θ direction. When s is zero, the g function has the value $g(0, \theta)$ which is obtained by the integration along the line passing the origin of (x, y) -coordinate. The points on the line whose normal vector is in θ direction and passes the origin of (x, y) -coordinate satisfy the equation:

$$\frac{y}{x} = \tan\left(\theta + \frac{\pi}{2}\right) = \frac{-\cos \theta}{\sin \theta} \quad \dots(i)$$

$$\Rightarrow x \cos \theta + y \sin \theta = 0 \quad \dots(ii)$$

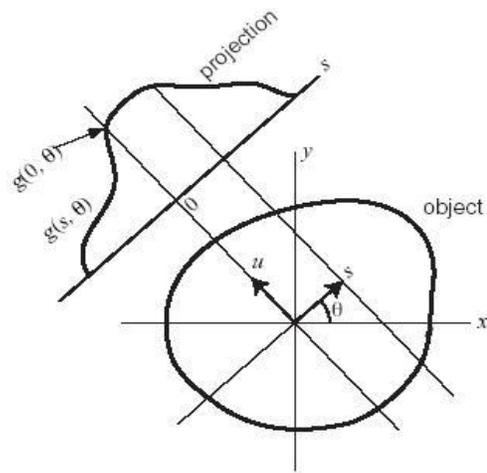


Figure 4: The Radon Transform computation.

The integration along the line whose normal vector is in θ direction and that passes the origin of (x, y) -coordinate means the integration of $f(x, y)$ only at the points satisfying the previous equation. With the help of the Dirac “function” δ , which is zero for every argument except to 0 and its integral is one, $g(0, \theta)$ is expressed as:

$$g(0, \theta) = \iint f(x, y) \cdot \delta(x \cos \theta + y \sin \theta) dx dy \quad \dots(iii)$$

Similarly, the line with normal vector in θ direction and distance s from the origin is satisfying the following equation:

$$(x - s \cdot \cos \theta) \cdot \cos \theta + (y - s \cdot \sin \theta) \cdot \sin \theta = 0 \quad \Rightarrow$$

$$x \cos \theta + y \sin \theta - s = 0 \quad \dots(iv)$$

So the general equation of the Radon transformation is acquired: [8, 9, 13, 14, 16]

$$g(s, \theta) = \iint f(x, y) \cdot \delta(x \cos \theta + y \sin \theta - s) dx dy \quad \dots(v)$$

The inverse of Radon transform is calculated by the following equation [12] :

$$f(x, y) = \int_{-\pi/2}^{\pi/2} \rho \cdot R_{\theta}(s(x, y)) d\theta \quad \text{..(vi)}$$

where R_{θ} is the Radon transformation, ρ is a filter and

$$s(x, y) = x \cos \theta + y \sin \theta \quad \text{..(vii)}$$

B. Image Reconstruction Algorithm

Kupce and Freeman [17] presented an image reconstruction algorithm from a limited set of projections. They suggest a method of implementing the inverse Radon transformation. Firstly, they get the projections from different perspectives. Then they expand every 1D projection at right angles, so as to create a 2D map that consists of parallel ridges. The superposition and the comparison of the created 2D projection maps result in the final reconstructed image.

Their technique can be explained by the following example: Suppose the existence of two perpendicular projections of four absorption peaks in each one (Fig. 5). From these two projections, the potential peaks are 16, but not all of them are true cross peaks. If we take into account another projection at a different angle and reapply the lower-value algorithm, we eliminate some potential as being false peaks and we get the image shown in Figure 5.

Another projection would refine the solution even further. Usually three projections are enough to have an accurate definition of the peaks, but if the original spectrum is complex more projections may be required. Because of the discrete nature of the MRI resonances, the problem converges very rapidly.

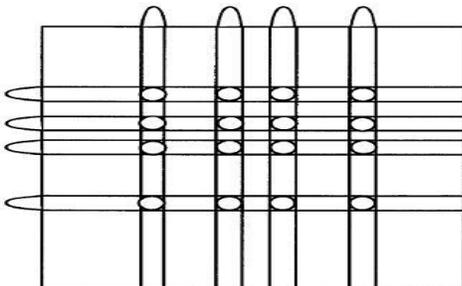


Figure 5: Peaks using two projections.

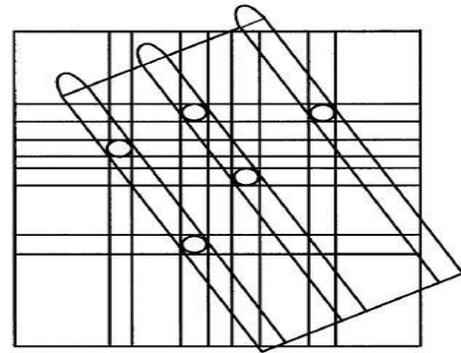


Figure 6: Peaks using three projections.

The algorithm we implemented is based on the previous described algorithm of Kupce and Freeman and its steps are:

- Step 1:** Acquisition of three different projections.
- Step 2:** Expansion of the 1D projection in 2D projection maps.
- Step 3:** Padding (with black) of the 2D projections maps in order not to lose information due to the next step.
- Step 4:** Rotation of the maps to the correct angle.
- Step 5:** Reconstruction of the original image by multiplying the maps pixel by pixel.

III. RESULTS

We studied the Radon transformation using Matlab and the Image Processing Toolbox in particular. Initially we created a artificial image and applied the Radon transformation in order to construct the corresponding projections. Fig. 2 presents an example of this image which is used in reconstruction for six different angles: 0, 2, 5, 10, 15, 20 degrees. Even though the image consists of also white spot, in some projections, there seem to be partial spots. This proves the need of several projections in order to verify the correct number of existing spots and their positions.

We implemented the reconstruction algorithm described in section II to reconstruct artificially created image. Six projections were used to reconstruct the original images. The quality of the reconstruction is measured by calculating the absolute value of the 2D correlation coefficient between the original image and the reconstructed one. This gives a value between 0 and 1. As the value increases, so does the resemblance that exists between the original image and the reconstructed one.

Figure 8: illustrates six different images that were reconstructed . Table 1 presents the correlation coefficient for the different values of the variable projection angle.

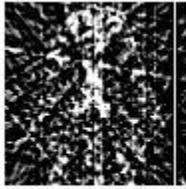


Image : Reconstructed by projection at 20 degree rotation

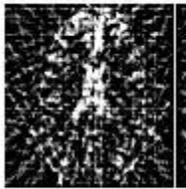


Image : Reconstructed by projection at 15 degree rotation

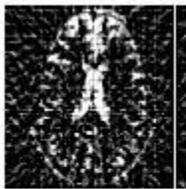


Image : Reconstructed by projection at 10 degree rotation



Image : Reconstructed by projection at 5 degree rotation

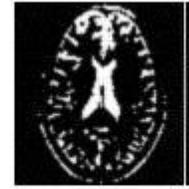


Image : Reconstructed by projection at 2 degree rotation

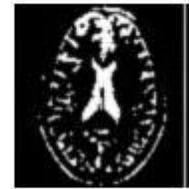


Image : Reconstructed by projection at 1 degree rotation

Figure 8: Image Reconstruction using 6 different projections

Table 1: Rotation Angle and corresponding Correlation Coefficient.

Rotation angle	Correlation Coefficient
1	1
2	0.992
5	0.8721
10	0.676
15	0.5585
20	0.4946

We also noticed that correlation coefficient becomes more linear as it reaches to 1 or we can say that more rotations in projection gives better reconstruction of the images. Which is shown in Figure 9.

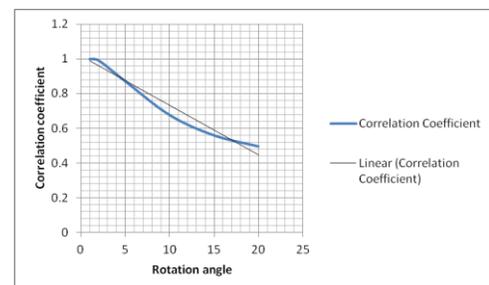


Fig. 9 linearity of correlation coefficient of head phantom image

In this paper we tried to define a new term 'cutoff rotation angle' which may be defined as the rotation angle at which almost 70% of reconstructed image resembles to original image. Here in our experiment it is 10 degree. Fig 10 represents this result.

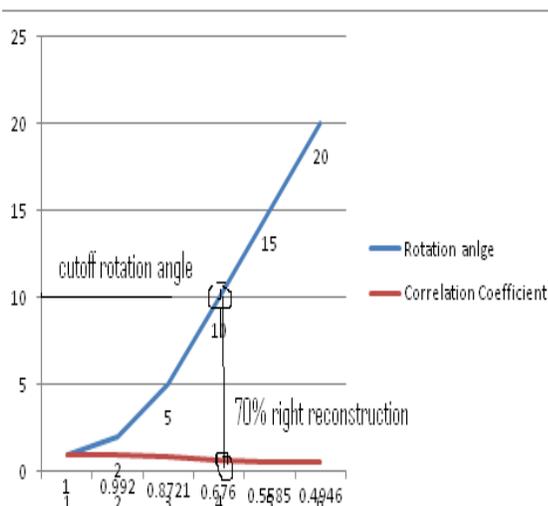


Figure 10: Cut off rotation angle for an image

IV. CONCLUSIONS

To summarize, in this paper we tried to reconstruct an image using projections from different perspectives, which we obtained with the use of the Radon transform. In order to achieve this, we implemented an algorithm, based on the one proposed by Kupce and Freeman [16]. In the presented examples we used six projections of the input image, reaching a correlation coefficient of 1. Future perspectives of the proposed work include the application of the implemented algorithm to real MRI data, the application of more projections for the image reconstruction and the development of heuristics for the determination of optimal projection angles.

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REFERENCES

- [1] S. Venturas, I. Flaounas " Study of Radon Transformation and Application of its Inverse to NMR", Algorithms in Molecular Biology, 4 July 2005.
- [2] P. Guntert, "Automated NMR protein structure calculation", RIKEN Genomic Sciences Center, 1-7-22 Suehiro, Tsurumi, Yokohama 230-0045, Japan, Accepted 23 June 2003.
- [3] Thomas Sangild Srensen*, Tobias Schaeffter, Karsten Østergaard Noe, and Michael Schacht Hansen
"Accelerating the Nonequispaced Fast Fourier Transform on Commodity Graphics Hardware" IEEE Transactions On Medical Imaging, Vol. 27, No. 4, April 2008

- [4] David S. Goodsell "The Protein Data Bank: Exploring Biomolecular Structure" Department of Molecular Biology, The Scripps Research Institute © 2010 Nature Education
- [5] K. Howard, "Improving NMR/MRI", Princeton Weekly Bulletin, Feb, 2012, <http://www.princeton.edu/pr/pwb/98/1123/nmr.htm>
- [6] W.P. Aue, E. Bartholdi, and R.R. Ernst, J.Chem. Phys. Vol 64, 2229 (1976).
- [7] E. Kupce, R. Freeman, "Fast Multidimensional NMR Spectroscopy by the Projection – Reconstruction Technique", Spectroscopy Vol. 19, pp. 16-20, 2004.
- [8] A. Asano, "Radon transformation and projection theorem", Topic 5, Lecture notes of subject Pattern information processing, 2002 Autumn Semester, <http://kuva.mis.hiroshima-u.ac.jp/~asano/Kougi/02a/PIP/>
- [9] A. Averbuch, R.R. Coifman, D.L. Donoho, M. Israeli, J. Wald'en, Fast Slant Stack: A notion of Radon Transform for Data in a Cartesian Grid which is Rapidly Computible, Algebraically Exact, Geometrically Faithful and Invertible., to appear in SIAM J. Scientific. Computing, 2001
- [10] C. Meneses-Fabian, G. Rodríguez-Zurita, and J.F. Vázquez-Castillo "Optical tomography of phase objects with parallel projection differences and ESPI", Investigacion revista mexicana de fisica 49 (3) 251–257 Junio 2003.
- [11] V.V. Vlcek, "Computation of Inverse Radon Transform on Graphics Cards", 2012 1-12.
- [12] K. Sandberg, D. N. Mastrorade, G. Beylkina, "A fast reconstruction algorithm for electron microscope tomography", Journal of Structural Biology 144 (2003) 61–72, 3 September 2003.
- [13] P. Milanfar, "A Model of the Effect of Image Motion in the Radon Transform Domain", IEEE Transactions on Image processing, vol. 8, no. 9, September 1999
- [14] M. Barva and J. Kybic with J. Mari and C. Cachard, "Radial Radon Transform dedicated to Micro-object Localization from Radio Frequency Ultrasound Signal", In UFFC '04: Proceedings of the IEEE International Ultrasonics, Ferroelectrics and Conference. Piscataway: IEEE, 2004, p. 1836-1839. ISBN 0-7803-8412-1.
- [15] P.G. Challenor , P. Cipollini and D. Cromwell, "Use of the 3D Radon Transform to Examine the Properties of Oceanic Rossby Waves", Journal of Atmospheric and Oceanic Technology, Volume 28, 2012.
- [16] E. Kupce, R. Freeman, "The Radon Transform: A New Scheme for Fast Multidimensional MRI", Concepts in Magnetic Resonance, Wiley Periodicals, Vol. 28, pp. 4-11, 2011

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REVIEW OF CHALLENGES AND STANDARD RESEARCH CONTRIBUTION IN OPTICAL NETWORKS

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Abstract- The need of more capacity of the network due to exponential usage of internet by users is the concern of majority of the researchers currently. In line of exploring better solution, it can be said that currently fiber optics has become the core of telecommunication and data networking infrastructures giving birth to optical networking system. These factors have driven the deployment of high capacity optical network and their remarkable rapid transmission from the research laboratories into commercial deployment. However, with the progress of technology taking pace, trade-off is surfaced by the unpredictable traffic situation over the dynamic users situated world wide that is quite challenging to standardize the performance of the existing optical networks. Hence, this paper reviews some of the standard and frequently used techniques for mitigating the traffic issues in Optical networking system.

Keywords- component; Optical Communication, Wavelength Routing, WDM, network

Introduction

Optical communication systems [1] and networks will continue to play a significant role in the development and deployment of emerging network infrastructures. These networks are expected to support the diverse requirements of a broad range of existing and future applications. To accommodate this wide spectrum of applications, network infrastructures are evolving rapidly in terms of technology and architecture towards a more flexible and intelligent optical layer based on Dense Wavelength Division Multiplexing [2] (DWDM) that utilizes new optical switching architectures and technologies as well as advanced control and management protocols. Optical component technology is rapidly maturing, offering cost-effective solutions to a point where optical networks are currently being deployed in core backbone networks, and are gaining increased interest for deployment in metro and access environments. The widespread deployment of optical communication systems and networks introduces many challenges and opportunities, which this special issue aims to address. At present, WDM is preferred over other multiplexing technologies [3] since all of the end-user equipment need to operate only at the peak electronic processing speed where as in TDM and CDM, some part of an end user's network bandwidth can be divided into multiple non-overlapping frequency or wavelength channels. Each WDM channel may be operated at any speed, e.g., peak electronic speed of a few gigabits per second (Gbps). Currently, commercially available optical fibers can support over a hundred wavelength channels, each of which can have a transmission speed of over a gigabit per second (e.g., OC-48, OC-192, and OC-768 [4] in the near future). Optical TDM and CDM are somewhat futuristic technologies today. Under (optical) TDM, each end-user should be able to synchronize to within one time slot. The optical TDM bit rate is the aggregate rate over all TDM channels in the system, while the optical CDM chip rate may be much higher than each user's data rate. As a result, both the TDM bit rate and the CDM chip rate may be much higher than electronic processing speed, i.e., some part of an end user's network interface must operate at a rate higher than electronic speed. Thus, TDM and CDM are relatively less attractive than WDM [5], since WDM - unlike TDM or CDM- has no such requirement. Specifically, WDM is the recent favorite multiplexing technology for long - haul communications in optical communication networks since all of the end-user equipment needs to operate only

at the bit rate of a WDM channel, which can be chosen arbitrarily, e.g., peak electronic processing speed. Hence, the major carriers today all devote significant effort to developing and applying WDM technologies in their businesses. Research is ongoing to introduce more intelligence in the control plane of the optical transport systems, which will make them more survivable, flexible, controllable and open for traffic engineering. Some of the essential desirable attributes of optical transport networks include real-time provisioning of lightpaths, enhanced network survivability, interoperability functionality between vendor-specific optical sub-networks, and enabling operational protection and restoration capabilities. The research efforts now are focusing on the efficient internetworking of higher layers, primarily IP with WDM layer. The current paper discusses various traits of issues and their existing countermeasures in Optical networking. The paper is expected to brief the most related techniques considered in the studies of Optical network. In section 2, the illustration of issues in Optical network is discussed followed by discussion in Wavelength Division Multiplexing in Section 3. Switching mechanism in Optical networks is discussed in Section 4 accompanied by Section 5 elaborating Optical packet Switching. Section 6 Discusses about various multiplexing techniques followed by discussion on prior established research work in Section 7. Finally, some concluding remarks are made in Section 8.

Approaches in Traffic management

The development of a broadband and ubiquitous Internet is mainly based on optical network technologies for building high capacity transport and access networks, and on wireless network technologies for providing ubiquitous Internet accesses. The various approaches in Optical Network in traffic managements are discussed as follows:

- **Traffic Management:** Minimum-Fiber and Minimum-Conversion optical network wavelength assignment problems [6], dealing with assigning wavelengths to network user demands in a fashion that minimizes the total number of deployed fibers or conversions, respectively. The solution [7] techniques for such issues perform nearly optimally on all assignment problems for which the optimal solution is known. However, today it is widely recognized that the traffic expected to be carried by the public transport networks will be progressively dominated by data, which is growing at explosive rate due to the migration of many applications and services over IP [8]. Measurement methods using direct per link interface monitoring were found to perform worse than methods that aggregate per flow bandwidth information extracted from IP/MPLS ingress nodes in order to derive logical topology link loads. Failure propagation [9] causes if the choice of clear-channels is realized without taking into account the interaction between the two levels.
- **Traffic Protection:** In a wavelength-routed WDM optical network as well as in other networks, the failure of a network element (e.g., fiber link, cross-connect, etc.) may cause the failure of several optical channels [10], thereby leading to large data and revenue losses. Protection schemes can be classified by the type of routing strategy as link-based versus sub-path-based versus path-based, and by the type of backup-resource sharing as dedicated versus shared. Similarly, restoration schemes can be classified by the routing strategy, such as link-based versus sub path-based versus path-based. A brief illustration of the routing aspect for the protection mechanisms is explained by using following example. Consider the topology shown in Figure 4.

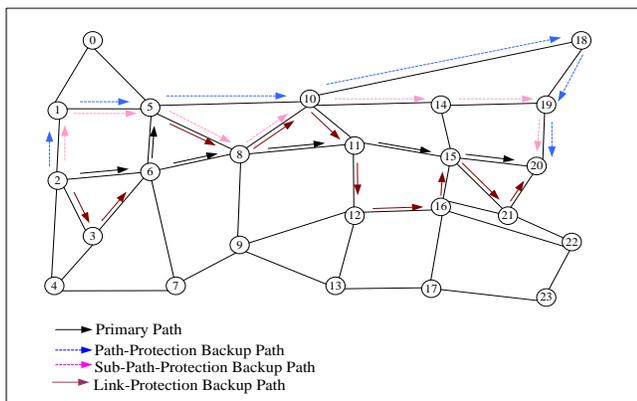


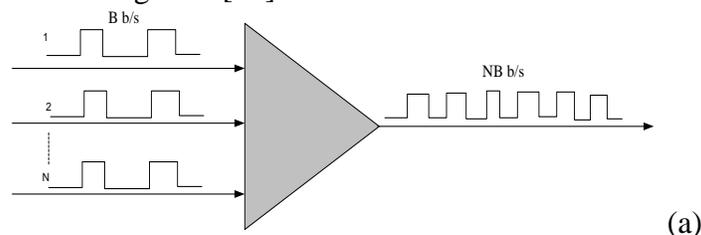
Figure 1 Path Vs Subpath vs link protection

The lightpath from node 2 to node 20 has primary path $\langle 2, 6, 8, 11, 15, \text{ and } 20 \rangle$. Under path protection, the lightpath can have backup path $\langle 2, 1, 5, 10, 18, 19, \text{ and } 20 \rangle$. If a link along the primary path (e.g., link $\langle 8, 11 \rangle$) fails, an end node of the failed link (node 8) notifies the source node of the lightpath (node 2) about this failure, and the source node switches traffic path protection, the lightpath can have backup path $\langle 2, 1, 5, 10, 18, 19, 20 \rangle$. If a link along the primary path (e.g., link $\langle 8, 11 \rangle$) fails, an end node of the failed link (node 8) notifies the source node of the lightpath (node 2) about this failure, and the source node switches traffic to the backup path (this is called 1:1 path protection).

- Traffic Grooming:** Traffic grooming is a term used to describe how different and low-speed traffic streams are packed into higher-speed streams [7]. In a WDM optical network, each wavelength can carry several lower-rate traffic streams in TDM fashion. Regular traffic pattern [11] are considered, as a generalization of the all-to-all traffic pattern and focused on the Unidirectional Path-Switched Ring (UPSR) networks. The concept in [7] proved that the traffic grooming problem is NP-hard for the regular traffic pattern in UPSR networks, and in this paper it was shown that the problem does not admit a Fully Polynomial Time Approximation Scheme (FPTAS). Grooming of the non-uniform traffic on unidirectional and bidirectional rings [12], unidirectional rings were mapped onto a linear topology, and then a two-step approach had been developed to solve the grooming problem, while minimizing the number of the wavelengths and the ADMs, for the mapped topologies. For the first step, an algorithm MIN-STRINGS has been developed that produces the optimal (minimum) number of strings on a linear topology, while compacting each string with traffic streams. For the second step, an effective heuristic has been designed to groups strings for each wavelength such that the numbers of the ADMs used per wavelength are minimized.
- Traffic Coloring:** Since lightpath are the basic building block of optical network architecture, their effective establishment is crucial. The wavelengths assigned must be such that no two lightpaths that share a physical link use the same wavelength on that link [13]. Once a path has been chosen for each connection, the number of lightpaths traversing any physical fiber link defines the congestion on that particular link. Wavelengths must be assigned to each lightpath such that any two lightpaths that are sharing the same physical link are assigned different wavelengths. The wavelength assignment problem (also known as the path coloring problem) for a set of lightpaths and their routes, involves assigning a wavelength to each lightpath such that no two lightpaths share the same wavelength (colour) on a given fiber link. One approach to solving this problem is to formulate it as a graph-coloring problem. Once a path has been chosen for each connection, the number of lightpaths traversing any physical fiber link defines the congestion on that particular link [14]. Wavelengths must be assigned to each lightpath such that any two lightpaths that are sharing the same physical link are assigned different wavelengths. Assigning wavelengths to different lightpaths in a manner that minimizes the number of wavelengths used under the wavelength continuity constraint reduces to the graph-coloring problem.

Wavelength Division Multiplexing (WDM)

There are basically two ways to increase the fiber capacity in transmissions as discussed in viewpoints of multiplexing techniques as shown in Figure 2 [20].



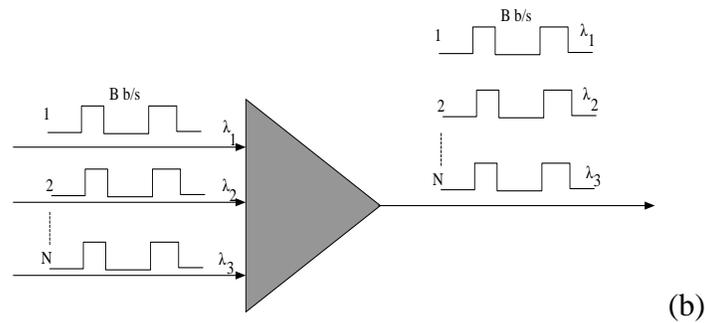


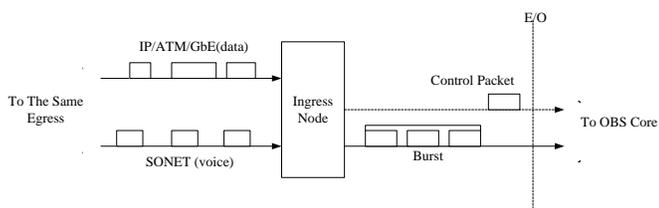
Figure 2 Different multiplexing techniques for increasing the transmission capacity on an optical fiber. (a) Electronic or optical time division multiplexing and (b) wavelength division multiplexing. Both multiplexing techniques take in N data streams, each with B b/s, and multiplex them into a single fiber with a total aggregate rate of NB b/s.

- **TDM (Time Division Multiplexing):** TDM is a method for transmitting multiple digitized data, voice, and video signals at the same time over a single communication medium by interleaving pulses that represent bits from different channels or time slots. Many lower-speed data streams are multiplexed into a higher-speed stream at the transmission bit rate by means of electronic TDM. The multiplexer combines the lower-speed streams to achieve the higher-speed stream.
- **WDM (Wavelength Division Multiplexing):** WDM is basically the same as frequency division multiplexing (FDM), which has been used in radio systems for more than a century. The term FDM is used widely in radio communication, but WDM is used in the context of optical communication, perhaps because FDM was studied first by communications engineers and WDM by physicists. The idea is to transmit data at the same time at multiple carrier wavelengths (or, equivalently, frequencies or colors) over a fiber. WDM allows many channels onto a single fiber without the need for high-speed optoelectronic devices for end-users. Optical networks with WDM arose to endow with added capacity on existing fibers. WDM has become a widely accepted technology for meeting growing bandwidth demands. The advantages of WDM are increased usable bandwidth, reduced processing cost, protocol transparency, and efficient fault handling. WDM systems are beginning to be deployed in both terrestrial and undersea communication links. The deployment of WDM in communications networks has brought solutions to satisfy the rapidly increasing demand for bandwidth capacity introduced by the huge explosion in the public internet. Thus, WDM offers an excellent platform for carrying IP traffic. WDM technology plays a key role in the internet explosion. This situation led to research interest in WDM based optical networks, which become the right choice for the next generation internet networks to transport high-speed IP traffic [15].

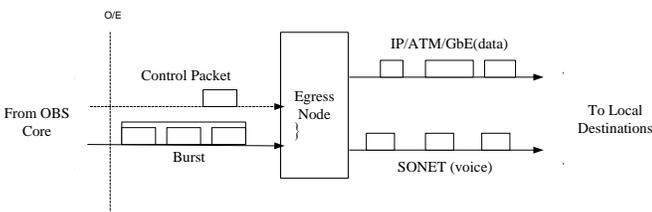
WDM and TDM both are methods that increase the transmission capacity and are complementary to each other. Consequently, most networks today use a combination of TDM and WDM. The critical question today is determining what combination of TDM and WDM should be used in carriers.

Switching Mechanisms

Network users are increasing day by day and they can transmit not only data but also multimedia applications. It is essential that the bandwidth and speed of the network have to be enhanced as the number of network user's increase every minute.. To cope with the enormous pace of development of optical networks, switching technologies are introduced. Recently many researchers have proposed new switching technologies in optical domain. They are Wavelength Routed (WR) networks, Optical Burst Switching (OBS) networks, Optical Packet Switching (OPS) networks [16]. In an OBS network, various types of client data are aggregated at the ingress (an edge node) and transmitted as data bursts (Figure 3(a)) which later will be disassembled at the egress node (Figure 3(b)). During burst assembly/disassembly, the client data is buffered at the edge where electronic RAM is cheap and abundant.



(a) Burst Assembly



(b) Burst Assembly

Figure 3: Burst Assembly/Disassembly at the Edge of an OBS Network

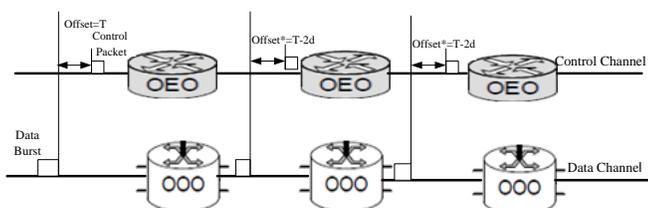


Figure 4: Separated Transmission of Data and Control Signals

Figure 4 depicts the separation of data and control signals within the core of an OBS network. For each data burst, a control packet containing the usual “header” information of a packet including the burst length information is transmitted on a dedicated control channel. Since a control packet is significantly smaller than a burst, one control channel is sufficient to carry control packets associated with multiple (e.g., hundreds of) data channels. A control packet goes through O/E/O conversion at each intermediate OBS node and is processed electronically to configure the underlying switching fabric. There is an offset time between a control packet and the corresponding data burst to compensate for the processing/configuration delay. If the offset time is large enough, the data burst will be switched all-optically and in a “cut-through” manner, i.e., without being delayed at any intermediate node (core). In this way, no optical RAM or fiber delay lines (FDLs) is necessary at any intermediate node. Nevertheless, the burst-level granularity leads to a statistical multiplexing gain which is absent in optical circuit switching. Furthermore, it allows a lower control overhead per bit than that in optical packet switching. Wavelength Routed networks is also referred as Optical Circuit Switching (OCS) networks. In OCS, a dedicated end-to-end light path is established for each connection. There is no loss in data in this technique. However, there will be considerable delay during transmission and less wavelength utilization by using this technique [17]. OBS networks are characterized by a separation of data and control channels. At first, a control packet is sent to support intermediate nodes configuration and resource reservation; meanwhile the source node builds the corresponding burst aggregating incoming packets with the same characteristics; when intermediate node is ready, the burst is sent optically switched across the network. This means that only control packets are converted to electrical domain at each hop to take reservation decisions, while the bursts always remain in the optical domain. There are two major deficiencies in OBS. They are the delay offset between a control message and its corresponding data burst is based on the diameter of a network and OBS adopts one-way resource reservation scheme. The delay offset affects network efficiency, quality-of-service, and network scalability. This one-way resource reservation scheme causes frequent burst collision and, thus, burst loss.

On the other hand, in OPS, messages are transmitted as packets. Here, control and data information travels together in the same channel. At each switching node, the packet header is processed in the electrical domain for routing purpose and the packet data is kept in the optical domain. Based on the destination, information

extracted from the packet header and the control module decides to which output the packet is to be switched and configures the switch accordingly. Fig. 5 shows a switch for packet arrivals to output fiber, where F is the number of fiber used and N is number of wavelengths used.

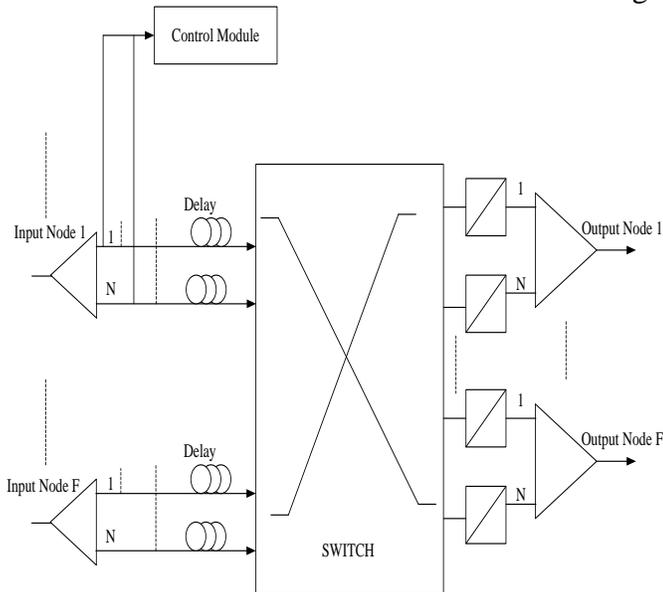
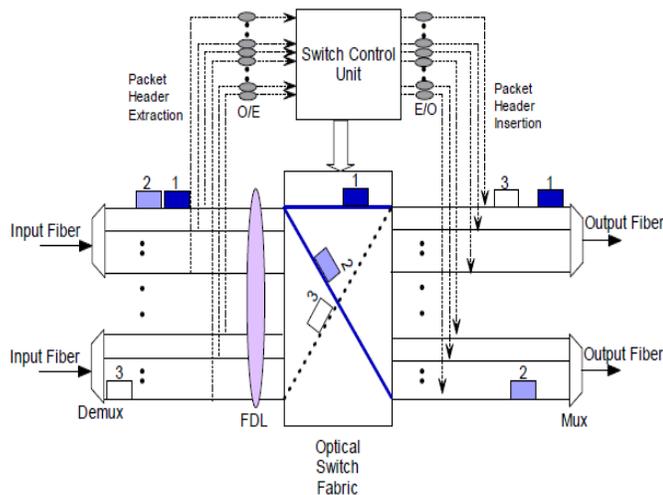
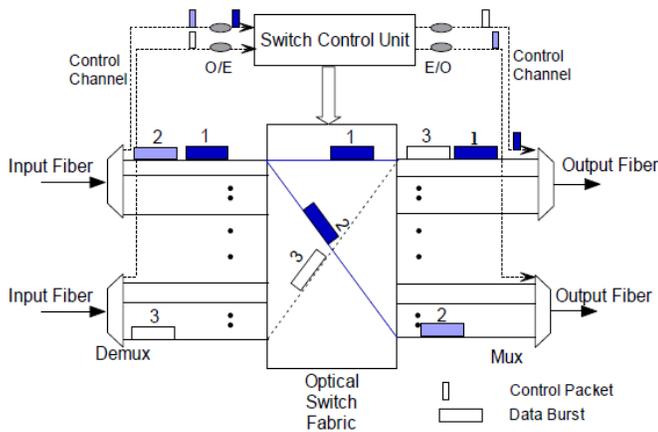


Figure 5 Architecture of the optical packet switching network

The burst in OBS and the packets in OPS can travel at their freewill by using wavelength while in OCS, data should travel only in the allocated light path. Hence, wavelengths are efficiently utilized by OPS and OBS. OPS and OBS are the technologies, which use WDM to transfer the data in optical domain. Both OPS and OBS can be used to transport IP traffic and ATM traffic. OPS and OBS are optically switched network architectures that aim to serve higher layer packet based communication protocols. Introduction of OPS and OBS became popular because they have improved their performance by using WDM, reduction in network capital and operational expenses.



a) OPS node



b) OBS node

Figure 6: Comparison of Different Switching Node Architectures

Basic switching node architectures used by various switching paradigms are illustrated and compared in Figure 6. At an optical circuit switching (OCS) node shown in Figure 6(a), once a lightpath is setup, all data carried by one input λ will go to a specific output λ . Since no O/E/O conversion of data at any intermediate node is needed, multi-hop transparency (in terms of the bit rate, protocol and coding format used) can be achieved. On average, the connection duration should be on the order of minutes or longer as setting up or releasing a connection takes at least a few hundreds of milliseconds. Shorter duration connections needed to accommodate sporadic data transmissions will result in a prohibitively high control overhead. A major difference between OCS and the other three approaches depicted in Figure 6 is that in OCS, no statistical multiplexing of the client data can be achieved at any intermediate node. More specifically, in the core, bandwidth is allocated by one λ at a time, which is a coarse granularity. In practice, however, most of today's applications only need the sub- λ connectivity. In addition, high-bit rate computer communications often involve "bursts" that last only a few seconds or less. To overcome the above deficiency of the OCS approach, O/E/O conversion can be introduced above an OCS network in the IP and SONET layers for example. The electronic switching node used in such an O/E/O approach is depicted in Figure 6(b). Here, statistical multiplexing of the client data at the sub- λ granularity is possible with electronic processing and buffering (not shown in Figure 6(b)). Since every data unit needs to go through O/E and E/O conversion, this approach is not scalable enough to support hundreds of wavelengths, each working at 40Gbps or beyond (the need for which is anticipated in the near future). In addition, electronic switches are known to suffer from problems such as limited capacity and huge power/space consumption and heat dissipation in addition to requiring expensive O/E/O conversions. Note that, although not shown, either an optical cross connect or optical add-drop multiplexer may also be used in conjunction with an electronic switch for wavelength granularity traffic that does not need to go through the electronic switch. A hybrid, multi-layer network consisting of such nodes, each consisting of both an electronic switch/router and an optical cross connect, is one way to combine the strength of the optics and electronics, but certainly not the only way to do so, and in fact may not be the ultimate long-term solution.

Since OPS and OBS are still in preparatory stage and in experimental phase, the full benefits of these switching technologies are still to be exploited. OPS and OBS are highly aggressive technologies and OPS technology is undertaken for study with a view to explore the avenues of performance improvement. OPS technology seems to be more feasible when compared to OBS. In recent times, the optical packet switching has emerged as one of the most promising technologies for future telecommunication networks. OPS networks operate in either asynchronous or synchronous mode. Synchronous OPS sometimes referred to as slotted OPS [18]. In slotted OPS network, all the packets have the same length. Header is placed inside the packet with fixed timeslot and packet is having a longer duration than the header. In slotted OPS networks, packets with the fixed length are aligned together with equally spaced timeslots before they enter the switch in each node. Packet alignment requires the design of optical synchronization stages. So, there is a pre-stage for the packet synchronization before they are switched by the following optical packet switching stage. This synchronization

stages increase equipment cost. Hence, it requires complex and expensive synchronization hardware at each node. In addition, packet chopping and combining for a consistent packet length can be another disadvantage. This type of network generally achieves a good throughput since the behavior of the packets is regulated. In asynchronous OPS network, optical packets can have variable lengths. The packets are not aligned and they are switched one by one 'on the fly'. Here, the node must be able to handle packets of variable length with variable inter-arrival times and asynchronous arrivals. The advantage of this technique is that a pre-stage for packet synchronization can be saved and no packet chopping and combination is required due to its flexibility in optical packet length. Asynchronous OPS networks generally have lower cost, better flexibility, and robustness. The asynchronous technique can have a much lower switching throughput than synchronous OPS networks due to higher chance of collisions between unsynchronized packets. The impact of contention is generally less in slotted OPS compared to asynchronous OPS. This is because the contention window is smaller in slotted OPS [19].

Prior Studies

Optical networking, like all of the other networks, has many problems. The objective of this section was to provide an overview of the research and development work in the area of optical networking that has been conducted in the past. Peng et al. [21] have propose a BP matching method to characterize the overflow traffic from one layer to another, resulting in an improved model to calculate the blocking probabilities for fixed routing in WRON with arbitrary topologies and without conversions. As the moment matching method only considers the mean moment of the overflow traffic, but ignores the second overflow traffic moment—variance Their approach is more accurate, which is showed by the final results. Xin [22] have demonstrated an analytical model is developed for dynamic traffic grooming, allowing heterogeneous data rates for sub-wavelength connections, arbitrary alternate routing in both logical and physical topologies, and arbitrary wavelength conversion. The accuracy of the model has been verified by numerical results from simulation.

Shen et al. [23] have developed the virtual nodal degree ranked algorithm for opaque node placement and the novel MILP-based models for sub-wavelength traffic grooming for translucent optical networks. The models maximize served sub-wavelength traffic demand and minimize required wavelength capacity. Figueiram et al. [24] have studies the behavior of two algorithms developed for scheduling multiple light paths requested by advance reservation. To assess the benefit of each algorithm, they compare the blocking probability introduced by each of them. The blocking probability is obtained by simulating their behavior on different topologies. This simulation is based on traces of requests generated by FONTS, their Flexible Optical Network Traffic Simulator, which provides on-demand and advance-reservation requests with different characteristics.

Nakajima et al. [25] have developed a connector for connecting optical fibers in an aerial optical closure. They achieved an easy procedure by designing support devices and introducing them into the assembly process. Moreover, they eliminated the need to re-cut the optical fiber during switching work, and the required working time was greatly reduced. These technologies are needed to support the future age of large scale optical network construction. Tian et al. [26] have proposed a wavelength-division-multiplexed (WDM) passive optical network (PON) to provide conventional unicast data and downstream multicast function. At the optical line terminal (OLT), for each WDM channel, a dual-drive Mach-Zehnder modulator (DDMZM) is used to generate a sub-carrier double-sideband differential-phase-shift-keying (DPSK) signal. All the central carriers are separated and subsequently modulated to deliver the multicast data, while the remaining sub-carrier DPSK signals carry the downstream unicast traffic.

Lee et al. [27] have design a two-step scheduling algorithm to support multiple bandwidth allocation policies for Upstream channel access in an Ethernet passive optical network. The proposed scheduling algorithm allows us a simultaneous approach for multiple access control policies: static bandwidth allocation for guaranteed bandwidth service and dynamic bandwidth allocation for on-demand dynamic traffic services. Zhang et al. [28] have generalized the basic structure and the construction scheme of Wavelength Routed Optical Network

(WRON). They also generalized the routing scheme of WRON and proposed solutions for routing problems based on the two of the three parameters source node address, destination node address, and routing wavelength. Future work includes study of fault-tolerance variant of the WRON.

Soares et al. [29] have proposed a new wavelength converter placement scheme called First Load Priority - FLP, useful for designing and planning of optical networks with sparse partial wavelength conversion architecture. A performance evaluation of FLP working in different scenarios is provided. Comparing to other wavelength converter placement schemes like MBPF, TOT and XC, FLP achieved better performance results in all scenarios studied, very close to that achieved from full complete wavelength conversion architecture. Yupapin et al. [30] have proposed a new system of a continuous variable quantum key distribution via a wavelength router in the optical networks. A large bandwidth signal is generated by a solution pulse propagating within the micro ring resonator, which is allowed to form the continuous wavelength with large tunable channel capacity. Two forms of solution pulses are generated and localized, i.e. temporal and spatial solutions. The required information can be transmitted via the spatial solution while the continuous variable quantum key distribution is formed by using the temporal one.

Lee et al. [31] have proposed and experimentally demonstrate a novel network architecture and wavelength assignment scheme for multi-wavelength passive optical networks with protection capability. Fiber failure can be protected and the bidirectional traffic can be restored promptly. Lackovic et al. [32] has aimed was to compare the topologies using two mentioned categories. The modeling procedure for network dimensioning with demand CLR constraint has been proposed and applied to the topologies. Basic statistics for the topologies has been made, and the traffic model used for calculating traffic demands was described. Simple switch architecture with tunable converters and output buffering has been used. Luo et al. [33] have presented a network architecture to provide cloud computing using Passive Optical Networks (PONs). It promotes a new application model of PON, especially for the design and development of next generation PONs. The attractive features include data-plane provisioning in addition to traditional transmission-pipe functionality, a new way to subsidize access network deployment investment, as well as high-speed fiber optic resource virtualization.

Conclusion

Due to the recent progress and development of WDM technology, increasing traffic demands can be readily accommodated in the next-generation optical networks. In spite of the huge amount of capacity provided by a WDM channel, enhanced network services and network performance improvement can only be achieved with efficient traffic-engineering mechanisms. The fault tolerant function is essential in order to provide seamless services to users by protecting their traffic against failures in the optical network because many connections can be carried on a fiber. Because the capacity of a WDM channel is very large, its bandwidth may not be efficiently utilized by a single connection. Hence, low-rate user connections need to be efficiently aggregated through the traffic grooming scheme. The prime objective of this paper was to provide an overview of the research and development work in the area of optical networking. It can be seen that the bandwidth used can be shared by many resources and also in the passive optical network system real time live broadcasting can be possible and the same type of service quality can given to many number of users. However, there is no issue of heavy load and with GPON that can provide data rate of up to Gbps. It was also witnessed that cable is harder to splice and OLT ONU control messages consumes valuable bandwidth. In application it is used in broadband video connection, peer to peer connection and local web hosting. Traffic engineering issues regarding network survivability, traffic grooming, impairment aware routing, virtual-topology engineering, and coordination among multiple layers of network architecture need to be reviewed for next generation optical networks based on Wavelength-Division Multiplexing. An intelligent routing algorithm is especially necessary in the optical network where signal impairments due to device imperfections might degrade the signal quality. In addition, the virtual network connectivity (topology) should be flexibly maintained such that dynamic changes to the traffic demands can be easily absorbed, which can be implemented by the virtual topology engineering method in a

WDM network. Due to the ever-increasing speed of optical access networks, the bandwidth bottleneck will move from the first/last mile toward Metropolitan and wide area networks. To provide higher bandwidth efficiency, current optical metro and core wavelength switching networks based on reconfigurable optical add-drop multiplexers (ROADMs) could be required to resort to more efficient switching techniques at the sub wavelength granularity in the near- to mid-term.

References

- [1] Govind P. Agrawal, *Fiber-Optic Communication Systems*, John Wiley & Sons, 23-Feb-2012 - Science - 600 pages.
- [2] http://www.cisco.com/en/US/tech/tk482/tk184/tsd_technology_support_protocol_home.html
- [3] Robert K. Wade, Wavelength division multiplexing/demultiplexing devices using polymer lenses, US Patent, US 6298182 B1, 2001
- [4] <http://www.oneunified.net/glossary.html>
- [5] Krishna M. Sivalingam, Suresh Subramaniam, *Optical WDM Networks: Principles and Practice*, Springer, 31-Mar-2000 - Computers - 352 pages
- [6] Brendan Farrell, Yi Huang, Mark Iwen, Ting Wang, Lisa Zhang, Jintong Zheng, Wavelength Assignment in Optical Network Design, *Mathematics-in-Industry Case Studies Journal*, Volume 1, pp. 49-65 (2009)
- [7] Farrell Brendan, Huang Yi, Iwen Mark, Wang Ting, hang Lisa, Zhen Jintong, 2009, "Wavelength Assignment in Optical Network Design", *Mathematics-in-Industry Case Studies Journal*, Volume 1, pp. 2-18.
- [8] Namdeo, Kalyankar V., 2009, "Network Traffic Management", *Journal of Computing*, Vol 1, Issue 1, pp 191-194.
- [9] Puype Bart, Collen Didier, Pickavet Mario and Demeester Piet, 2008, "Control Plane Issues in Multilayer Traffic Engineering", *Journal of Optical Communication and Networking*, Vol 7, Issue 10, pp 846-860.
- [10] Crochat Olivier, Boudec Jean-Yves Le, and Gerstel Ornan, 2000 "Protection Interoperability for WDM Optical Networks", *IEEE/ACM transactions on networking*, Vol. 8, No. 3, pp 384-395.
- [11] Weichenberg Guy, Chan Vincent W. S., and Medard Muriel, 2009, "Design and Analysis of Optical Flow-Switched Networks", *Journal of Optical Communication. Network*. Vol. 1, No. 3, pp 81-97.
- [12] R.Ul-Mustafa, A.E. Kamal, Grooming of Non-Uniform Traffic on Unidirectional and Bidirectional Rings.
- [13] Johannes Hamonangan Siregar, Hideaki Takagi, Yongbing Zhang, Efficient Routing and Wavelength Assignment in Wavelength-Routed Optical Networks, *APNOMS 2003*
- [14] Fu-Tai An, Yu-Li Hsueh, Kyeong Soo Kim, Ian M. White, and Leonid G. Kazovsky, A New Dynamic Bandwidth Allocation Protocol with Quality of Service in Ethernet based Passive Optical Networks,
- [15] Uyless Black. (2002). *Optical Networks: third generation transport systems*, Pearson Education
- [16] Vinod M. Vokkarane and Balagangadhar G. Bathula, Manycast Service in Optical Burst/ Packet Switched (OBS/OPS) Networks, *Institute for Computer Sciences, Social Informatics and Telecommunications Engineering, LNICST 2*, pp. 231-242, 2009.
- [17] Venkatesh, T. and Siva Ram Murthy, C. (2000). *An Analytical Approach to Optical Burst Switched Networks*, Springer Publication, 2000.
- [18] Steinar Bjornstad, Martin Nord, Torodd Olsen, Dag - Roar, Hjelme, And Norvald Stol, Burst, packet and hybrid switching in the optical core network, *Elektronikk*, 2005
- [19] Tanenbaum, A.S (1996). *Computer Networks*, Prentice Hall
- [20] Gulzar Ahmad Dar, 2Dr. Hardeep Singh Saini, Wavelength Assignment in Wavelength Division Multiplexed Network: A Review, *IJECT Vol. 4, Issue Spl - 3, April - June 2013*
- [21] YANG Peng, ZHANG Jie, ZHAO Yong-li, GU Wan-yi. (2012). "Improved wavelength decomposition approach for computing blocking probabilities in WRONs", *The Journal of China Universities of Posts and Telecommunications*, Vol.19, pp. 119-123, 2012
- [22] Chunsheng Xin et. al. (2007). "Blocking Analysis of Dynamic Traffic Grooming in Mesh WDM Optical Networks", *IEEE/ACM TRANSACTIONS ON NETWORKING*, VOL. 15, NO. 3, JUNE 2007
- [23] Gangxiang Shen et. al. (2009). "Sparse Traffic Grooming in Translucent Optical Networks", *Sparse Traffic Grooming in Translucent Optical Networks, JOURNAL OF LIGHTWAVE TECHNOLOGY*, VOL. 27, NO. 20, OCTOBER 15, 2009
- [24] Silvia Figueira*, Neena Kaushik*, Sumit Naiksatam*, Stephen A. Chiappari+, and Nirdosh Bhatnagar. (2004). "Advance Reservation of Lightpaths in Optical-Network Based Grids", *BROADNETS/GRIDNETS, 2004*
- [25] Nakajima, Tatsuya, et al. "Development of optical connector to achieve large-scale optical network construction." *Proceeding of the 55th IWCS/Focus (2006)*: 439-443.
- [26] Tian, Yue, et al. "A WDM passive optical network enabling multicasting with color-free ONUs." *Opt. Express* 16.14 (2008): 10434-10439.
- [27] Ho-Sook Lee, Tae-Whan Yoo, Ji-Hyun Moon, and Hyeong-Ho Lee. (2004). "Two-Step Scheduling Algorithm to Support Dual Bandwidth Allocation Policies in an Ethernet Passive Optical Network", *ETRI Journal*, Vol. 26, Number 2, 2004
- [28] Zhang, Lei, Mei Yang, Yingtao Jiang, Emma Regentova, and Enyue Lu. "Generalized wavelength routed optical micronetwork in network-on-chip." In *Proc. 18th Int. Conf. Parallel and Distributed Computing and Systems (IASTED)*, pp. 698-703. 2006.
- [29] Andr'e Soares, Jos'e Maranh'ao, "Wavelength Converter Placement Scheme for Optical Network with Sparse-Partial Wavelength Conversion Capability"
- [30] Yupapin, Preecha; Mitatha, Somsak. (2009). Multi-users Quantum Key Distribution Via Wavelength Routers in an Optical Network, *Recent Patents on Computer Science*, Vol. 2, pp.14-20, 2009
- [31] Chi-Man Lee, Tsan-Jim Chan, Chun-Kit Chan, Lian-Kuan Chen, and Chinlon Lin. A Group Protection Architecture (GPA) for Traffic Restoration in Multi-wavelength Passive Optical Networks
- [32] Lackovic, Marko, and Cristian Bungarzeanu. "Planning Procedure and Performance Analysis of Packet Switched All-optical Network." *Proc. of ONDM*. Vol. 3. 2003.
- [33] Luo, Yuanqiu, Frank Effenberger, and Meng Sui. "Cloud computing provisioning over passive optical networks." *First IEEE International Conference on Communications in China (ICCC2012)*, Beijing, China. 2012.

Design of Automated Hotline Maintenance Robot Using Haptic Technology

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Abstract- This paper describes design of a semi-automated robot that can inspect power transmission lines accompanied by an operator situated in the control room. This robot mainly focuses on the most frequent problems faced by the power systems, hotlines. Thus making in ease of operation and avoiding their life risk, at least for few cases, where they can use them satisfactorily.

Index Terms- Design, analysis, material selection, assembly, programming, AVR controller, simulation, haptic glove, servo mechanism

I. INTRODUCTION

The natural resources for electricity production are unevenly dispersed in India. The Planning Commission of India has set a target of 80010MW electric power generation for 2011-2012 [1]. As the technology is developing transmission of power using HVDC is coming into light with many added advantages over the HVAC [2]. This leads to increase of transmission lines and makes it difficult to maintain. Transmission lines can have power loss due to many reasons. There are mainly four types of losses that lead to the major power loss. CONDUCTOR LOSS-occurs mainly due to current passing through the resistance, DIELECTRIC LOSS- due to voltage across insulation, SHEATH LOSS-occurs because of induced current in the sheath and the INTERSHEATH LOSS- caused due to formation of circulating currents between the sheaths in loops of different phases [3]. Maintenance of electrical transmission lines is an essential activity in power grid sector. There are mainly two types of testing methods in the hot-line maintenances department, HOTSTICK and BAREHAND technique [4].

Robotics and automation is taking a very rapid growth from the past few decades [5]. The robotics technology has even reached into power grid field. We have many robots that are available with their own working methodology in maintaining the transmission systems. Expliner-a robot running on high voltage live lines in Japan (Paulo Debenest, et al.,2008). Line-Scout Technology, a mobile teleoperated robot working on the lines, up to 735 kV and 1,000 [8] Obstacle navigation control was introduced for an inspection robot suspended on overhead ground wires of power transmission lines (Ren Zhibin and Ruan Yi,et al., 2008). A double-arm inspection robot was developed for live line inspection (Xiaohui Xiao, Gongping Wu, and Sanping Li, 2007) [6].

High electric insulating material has to be selected in order to ensure the safety of the robot. Professional plastic composites that can work as good insulators at high voltages can suit the best as per the requirement [7].

Robots developed mainly focus to inspect the fault in the line. Further repairing work would be the task for a worker. We have designed a robot that would inspect as well repair some of the major problems associated with the transmission lines. The flow chart of the system is shown in the fig.1

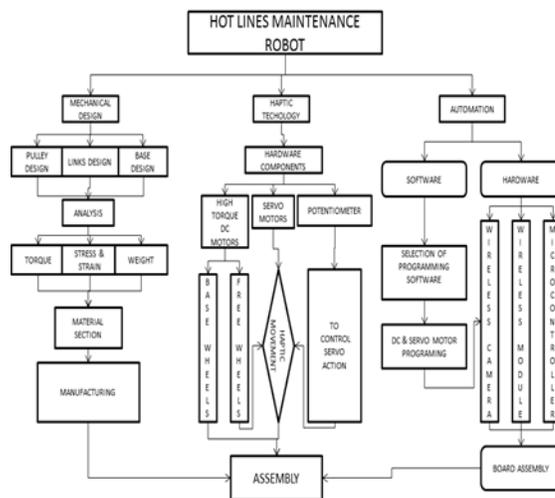


Fig.1 Flowchart of HOTLINE MAINTANANCE ROBOT production

II. PROBLEM STATEMENT

Here is a proposal for altering the risk of human loss during supervision by replacing a AUTOMATED ROBOT.

The robot is designed for the following functions:

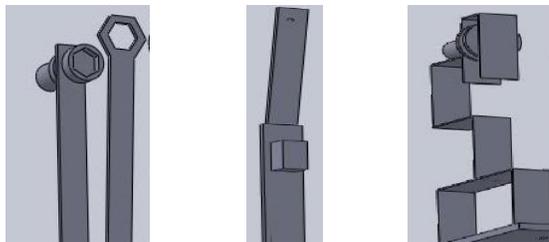
- To travel on the charged single conductor without any throttle or imbalance.
- To check the contact resistance of a contact, using a micro-ohm meter.
- To tighten/loosen the contact nuts and bolts to reduce the contact resistance.
- To place a COME-ALONG-CLAMP on the charged conductor wire for relieving mechanical stress on the insulator, for its replacement.

III. MECHANICAL DESIGN

For every system, design is the first and foremost task to be performed. According to the requirement of the robot, shape and size of the body has been designed.

A. Link design

Design of links for the robot has been obtained depending upon the type and the number of tasks to be performed by the robot and the number of arms were estimated and designed accordingly. Links are analyzed using various robotic rotational and transformational matrices to find the theoretical and practical movements of the robotic arms.



(a) (b) (c)

Fig.2: Design of the LINKS

To test the resistance of the line, the pulley [Fig.2 (b)] arm is designed such that it could test and send the resistance value present over the line. Both the pulley arms are equipped with the clamp-meter for testing before and after performing the task.

Live processing is equipped for the robot in order to view the working status of the robot. An arm is designed [Fig.2 (c)] that could show the live video of the transmission line. A COME-ALONG-CLAMP has to be designed that would be placed on to the transmission line which is used to tighten the transmission line and maintaining the proper slag angle. Assembling of COME-ALONG-CLAMP using the robot arms was designed along with the live streaming arm such that it could reduce the linkages.

B. Base design

Base of the robot is made according to the movements and orientation of each and every arm and also as per the task to be performed by them. In any design, material minimisation has to be taken care.

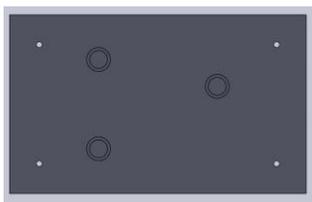


Fig.3: Design of the robot base

C. Pulley Design

Pulley is made taking into consideration of the transmission line diameter. It is the only part that makes a direct contact with the high voltage line. Any conduction through this results in total damage of the robot. However it would be best if it could receive the power from the line to run.

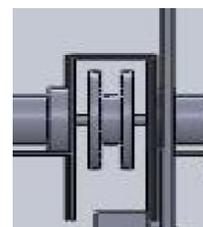


Fig.4: Design of Pulley to roll over Transmission line

D. Motors Placement Design

Various motors are placed on the robot. As per the requirement of the robot we have used five D.C. motors and four servo motors for the robot pulley and arm movements.

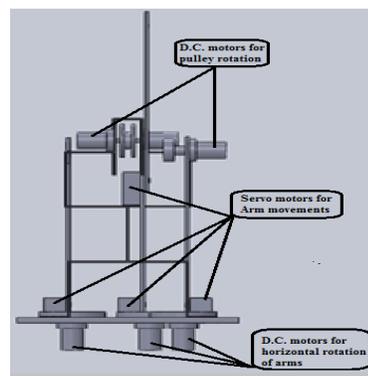


Fig.5: Design of the motors placement

E. Assembling of the robot

Assembling the robot arms along with the base of the robot and all the other accessories like all the motors, camera model etc. is been performed.

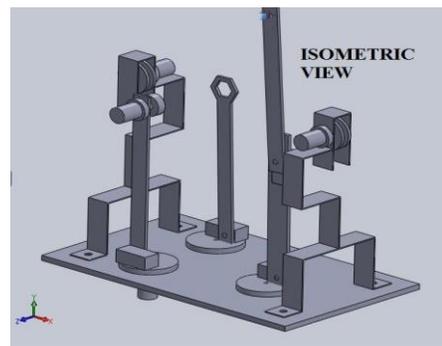


Fig.6: Assembling the Robotic parts (Isometric view)

F. Material selection

The basic parameter that we need to consider in selecting the material is electric insulation. Generally, materials with surface resistivity more than $10^{12} \Omega/m^2$ are considered to be insulating materials.

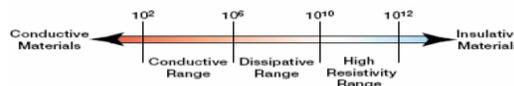


Fig.7: Resistivity of insulating materials

As per the availability, cost concern and required properties for the design of the robot, following group of materials are chosen to compare and analyse to choose the best material.

Properties	Acrylic [14]	Delrin [15]	Fiberglass [12]
Elastic Modulus (N/mm ²)	10.4	13.7	15.66
Poisson's Ratio	0.35	0.31	0.27
Material density (kg/m ³)	1.19	1.56	1.89
Electrical resistivity (Ω/m ²)	1.2×10 ¹⁵	9.3×10 ¹⁴	1.8×10 ¹⁵
Temperature resistance (°C)	99	115	104

Table.1: Different material properties that suit the robot

G. Analysis of the robot

The model has undergone stress and strain analysis with various loads applied at different places. Balancing of the robot over the transmission line, while travelling is analyzed. The model is defined with the above three mentioned materials and the obtained results are compared in order to obtain the best material.

Mainly analysis has to be done for the pulley that resists the total body weight over the transmission line.

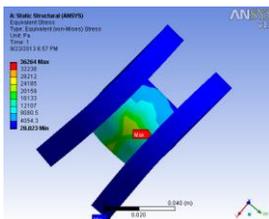


Fig.8: Pulley analysis under equivalent stress

IV. DESIGN OF CONTROL SYSTEM

A. Microcontroller

Every automated system has microcontroller as its base. We are working on the AVR microcontroller. It is a low power consumption device and small in size and also cost effective.

B. Motor Driver

The motor driver IC is used to drive the motors using a 5v signal source and can also run the motors in both reverse and forward directions.

This IC can also supply the 12V to the servo motors even though the controller voltage is of 5V. The speed of the motors in both forward and reverse direction is controlled using the microcontroller code.

C. Wireless Transmission

We are using RF (Radio Frequency) communication between the robot and the control system. The wireless camera used for the visualisation of the robotic operations on the high transmission lines is also communicated using the RF.

As we are working over the high transmission lines there may be attenuation in the signals that we are sending to the control system. To avoid these attenuation and noise we have to use a high-pass filter circuit which eliminates the low frequencies. The high-pass filter circuit can be as shown below

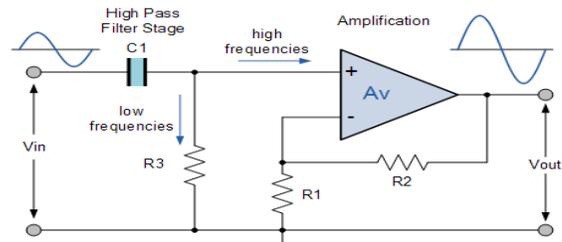


Fig 2: High-pass filter circuit for avoiding noise.

The circuit diagram for the robot is done as shown in below figure 3.

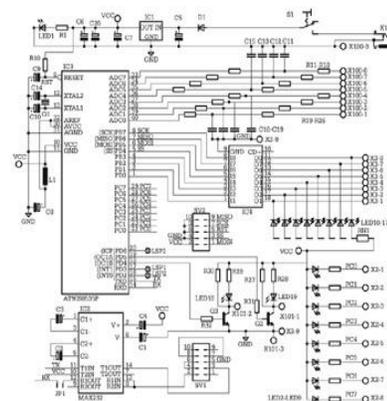


Fig 3: Schematic diagram of AVR controller

D. Simulation

The simulation of the above circuit is done using the PROTEUS software which is an embedded real-time simulating software tool. This is a universal software tool used for all types of controllers especially ATMELE family.

In the figure, the keypad is used to control the running of the motors. Here we are using four servo motors and two dc motors. In the four servo motors, three of them are used for 360 degrees rotation of the arms and one is placed at the joint of one arm which is used for second movement i.e., the arm has two degrees of freedom. This arm is used to fix the “come along clamp” on the high transmission lines.

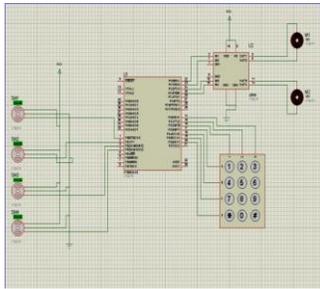


Fig 4: Simulation of the motors

The two DC motors are used for the forward and backward movement of the robot. As the dc motor cannot be driven by a microcontroller alone, we are using a driver IC to drive the motors as the dc motors require 12V supply to run and the controller cannot provide that voltage. Hence we use this driver IC for driving them. The driver IC we are using here is l293d IC. This IC can drive four motors with single way rotation or two motors with rotation on either way. Here we use only two motors for the movement of the robot, so we are using this IC. This IC will be having two voltage sources to operate i.e., 12V and 5V. The 12V supply is taken by the motors and the 5V supply used for the microcontroller.

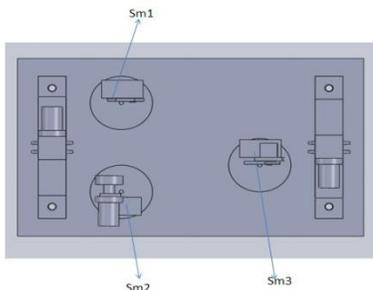


Fig 5: Bottom view of the robot showing motors

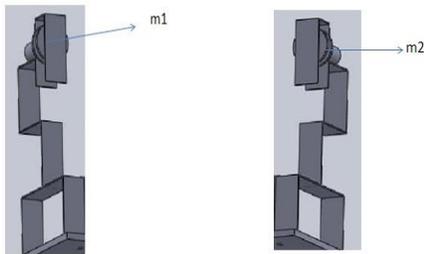


Fig 6: Pulley design showing the dc motors

The controlling of these motors is done using the keypad. According to the hardware implementation of the robot the keypad is replaced with the joystick or using the laptop keys. For the purpose of simulation we have used the 4x3 keypad as the input controlling element. The program is burned into the controller to so that we can visualize the exact hardware output in the simulation.

E. Programming

The programming for the HOTLINE maintenance robot is done using the WINAVR software tool.

Algorithm

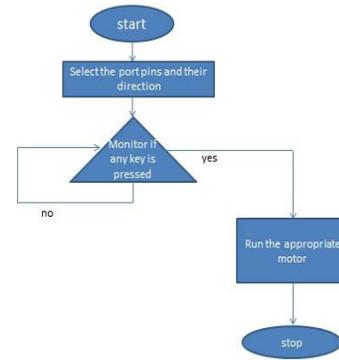


Fig 7: Algorithm for the programing

V. DESIGN OF HAPTIC SYSTEM

A. Haptic Arm Design

Haptic technology, or haptics, is a tactile feedback technology which takes advantage of the sense of touch by applying forces, vibrations, or motions of the user. This mechanical stimulation can be used to assist in the creation of virtual objects in a computer simulation, to control action of such virtual objects, and to increase the remote control of machines and devices (telerobotics).The haptic devices incorporate tactile sensors that measure forces exerted by the user on the interface.

This device is adjusted over the user's hand like an exoskeleton has potentiometers on joints like elbow, wrist & fingers, change in resistance with hand movement.

As we move our hand in order to tightening & loosening of contacts the haptic glove should move according to our hand movements which in return should move hand of robot in the same manner to do work on live transmission line.



Fig.3 Tightening & loosening of contacts

The Robotic Arm is designed using the Microcontroller programming. It works on the principle of Interfacing potentiometers and servos. This is done using atmega 16 bit microcontroller. The glove is fitted with potentiometers and the servos are attached to the body of the robotic arm. Potentiometer converts the mechanical motion into electrical motion. Hence, due to the motion of the human arm, the potentiometers produce the electrical pulses, which are the signals for the avr controller. The board process the signals, which is received from potentiometers furthermore convert them into requisite digital pulses that are then send to servomotors. This servo will responds to the pulses and the moment of the robotic arm occurs.

The micro controller interfaces all these components specified above.

B. Servo Motor

The servo motors usually have a rotation limit from 90° to 180° and even some servos also have rotation limit of 360°. Their rotation is limited to fixed angles. In this system we have used servo motors with a limit of 180°.



Fig.2 Servomotor

C. Potentiometer

The potentiometer's are used to control the arms at required position, these potentiometer's are connected to our hands, As we move our hand in any position or at any angle, the same movement is done by the haptic arm, by this we can tighten/loosen the contact nuts and bolts manually as we can feel the work is really going on the line on our own hands.

VI. WORKING AND OPERATION

The task of the robot is to check the contact resistance of the contact. For this purpose the robot is specially equipped with an arm A1, which acts similarly as a human arm. It has a base motor B1 wheel and motor M1 of combination which is compared with the shoulder joint. Then there is a joint on the other end of which a servo motor (SM1) which acts as the elbow joint. To the rotor shaft a joint is fixed. This fixed arrangement completes the construction of the human arm (the comparisons were already made for better understanding). This is made as a replica of the industrial robotic arm.

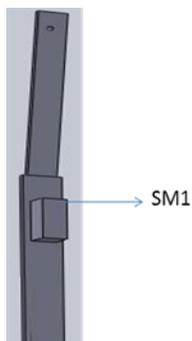


Fig.4.1 Come-Along-Clamp

The second task of the robot is to tighten/loosen the contact nuts and bolts. This is accomplished by using a drill type mechanism, which is regularly used to tighten/loosen screws. For

this we have designed two arms. These both arms will have similar construction but both have mirror images to each other. It is having a base motor M2 and M3 which are mounted below the base board and above this, a wheel is affixed. Above this wheel a servo motor SM2 is mounted on the wheels using 'L' clamps. These servo motors help to raise or lower the arm on which the fitter mechanism is arranged. They are equipped such that they are controlled using an analog potentiometer. This is connected to a micro controller which converts the analog signal of the potentiometer to a pulsated signal, which is understandable by the servomotor. This setup makes it very ease in replicating the motions of the operator, and creating a virtual existence of the operator at the work place.

Whenever there is an activity of tightening of a nut and bolt mechanism, the robot is moved and positioned on the wire. Then the controls are used to move and hold the nut and bolt by using both arms, respectively. Then the holder is made to hold and opposite arm is made to rotate with sufficient torque, necessary to tighten the bolts.

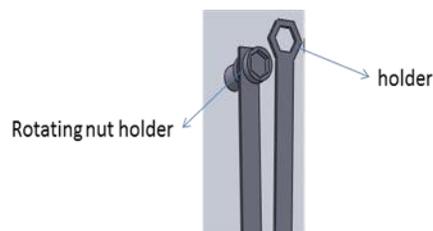


Fig.4.2 holder assembly

The last activity of the robot is the placing of the Come-Along-Clamp mechanism. The Come-Along-Clamp is placed on the edge of the arm 1 and it is controlled by using the switch controller, then after placing the COME-ALONG-CLAMP on the conductor the arms2 and 3 Holds it while the arm1 detaches the clamp from it. This is a procedure which is difficult to explain on words, but gives you a great visual experience, of the co-collaborated co-ordination of robots.

Using the potentiometers by connecting it to haptic glove we can control the servo movements by moving our hand to control the action of robotic arm in the possible way to do the work.



Fig.4.4 shows complete haptic glove

VII. CONCLUSION

Demand for electricity is going on increasing day by day in the world. This leads to construction of more number of power systems and also the transmission systems. This results in difficulty of maintaining all the lines manually being a dangerous

and tedious task. This paper could suggest an alternative and a bit easier way to maintain the lines regularly and without any human loss using a robot.

REFERENCES

- [1] Transmission and distribution systems in INDIA, a report by a joint initiative of WEC- IMC and Power Grid Corporation of India limited.
- [2] J.C. Molburg1, The Design, Construction and Operation of Long-Distance High-Voltage Electricity Transmission Technologies, Decision and information division, Argonne National Laboratory, U.S., Nov-2007.
- [3] J. R. Lucas, High Voltage Cables, High Voltage Engineering, 2001.
- [4] Live Line Maintenance, Western Area Power Admin., Dept. of energy, U.S.A.
- [5] Live Line Maintenance Manual, Power Grid Corporation of India Ltd.
- [6] Tomcat Robot developed by Electric Power Research Institute Palo Alto, California in 1980's.
- [7] R. Aracil, E. Pinto and M. Ferre, Robots for live-power lines, 1995.
- [8] Aracil et al., Robotet, 1995.
- [9] Expliner-hotline inspection robot, Hibot tech.
- [10] Line-Scout Technology, a mobile teleoperated robot, developed at Hydro-Québec Research Institute in Canada (Nicolas Pouliot & Serge Montambault 2008).
- [11] Plastic products inc., Bessemer City, NC
- [12] List of composite materials- Professional Plastics, www.professionalplastics.com.
- [13] K. S. Sidhu, Electrical transmission line insulation.
- [14] Physical properties of Acrylic sheets, AKRYLIK, furniture and accessories.
- [15] Delrin-Acetal resin, Dupoint design guide.

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E-Recruitment & E- Human Resource Management Challenges in the Flat World: A Case Study of Indian Banking Industry (With Special Reference to ICICI Bank, Jaipur)

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Abstract- The only imperative vista for an organisation that can ignite it, and give it a direction to flourish is the workforce of an organization. Human resource is the means apparatus for any organization. Organisation have to recruit people with requites skills, qualifications and experience, if they have to survive and flourish in a highly competitive environment. While doing so, they have to be sensitive to economic, social, political and legal factors within a country. To be effective they need to tap all available sources of supply, both internal and external. Internal promotion boost the morale of people and External sources too need to be explored regularly to bring qualified people with innovative ideas. Recruitment of potential staff and bringing them to the organization is a crucial job for the human resource manager in any organization. There are numerous ways they companies are adopting for recruiting the talents for their organisation. It can be done by both the means like internal sources and the external sources, which includes transfer, promotion, press advertisements, educational institutions, executive agencies, employment exchanges, labour contractors, employee recommendations, recruitments at factory gates etc. E-recruitment is a concept which have been using by many concerns now a days, as the world is getting flatter day by day because of globalization, many new technology and concepts has been derived and huge infrastructural changes has been taking place. Likewise human resource management is also undergone a huge technological advancement. Internet has a great impact on the overall functioning of human resource department. Human resource functioning whether its recruitment, selection, training, induction, database management all are done through internet media. By doing this a concept of E-HRM has come into existence. E-HRM is a progression in which all the HR plans, policies and practises are undertaking through internet medium. E-Recruitment is an internet media through which job seekers can apply for vacancies online. Here the job seekers can attach their curriculum vitae and application form and the recruiters can get the detail of the candidates. The aim of this research paper is to determine what all E-Recruitment strategies are used by the organisations in India after being globalised. For this purpose a study has been made in some of the reputed banks of India. This study has been conducted in Jaipur city; the study identifies the overall processes and methods of e-recruitments, it also study whether it's challenging for the manager and relevant advantages & limitation of E-Recruitment.

Index Terms- Traditional Recruitment, E-Recruitment, ICICI, E-HRM

I. INTRODUCTION

“**T***The Internet Will Help Achieve ‘friction free capitalism’ by Putting Buyers & Sellers in Direct Contact And Providing More Information to Both About Each Other.*” – Bill Gates

Today the world is based on technology; everything is getting automated day by day. We heard about trendy attire, shoes and brood as well, it is a new creation of inherent manufacturing. Now the couples can create their own of brood, all these are possible now because of technology. Computers are a very crucial part of human life now; people cannot imagine there lives without computers. How it is related with HRM and recruitment, as we can move in the past and remember how complicated it was to send to the resumes to the prospective employers. But now because of this technology we can send our resumes to numerous employees within a span of clicks, which was not feasible in the past. An organization needs to be forward and aggressive towards the goal they want to achieve, but it all depends upon the fact that what all resources the organisation cater from the environment in respect to human resource etc. Today in this race both domestic and international companies are running in this field to pool the best manpower for their organisation. For getting the best employees for the organisation recruitment considered to be the second main process selection and staffing are considered to be the main process. In this recruitment is to get the resume of various candidates in the company's database and in selection the securitization process is done in which the deserving candidates are selected and in the staffing process the selected candidates are placed in the right position. E-Recruitment is involving the information technology for hiring the employees to reach the masses and to save time. E-Recruitment falls under E-HRM. It's completely on the employer how to take the concept of E-Recruitment further. These articles will tells us about the recruitment, e-recruitment and human resource challenges which are faced by the people in ICICI banks in Jaipur.

On-Line recruitment helps the organisation to make a cut on cost and time taken to choose candidates. On-Line recruitment

helps the organisation to manage 20%-30% of whirls. Monster.com is now one of the leading portal providers for both employer and employee. Here the employees can put their CV's for free of charge but the employers are charged for filtration of CV's. Monster India has over 5,100 jobs that have been posted by more than 600 clients.

II. RECRUITMENT & E-RECRUITMENT

Organization make planning on the basis of which required number of human resource are determined, then the next step will be the procurement role is to allocate the sources from where the required manpower can be available & to attract them towards the organisation. This is known as 'recruitment'. Organisation has to recruit people with mandatory skills, qualifications and experience, if they want to undergo & prosper in exceptionally ruthless surroundings. While doing this they have to be responsive to fiscal, opinionated and lawful factors inside a country. In true sense, it is always not easy to find and select a suitable candidate for a job opening. The recruiter's choice of a communication medium (e.g. advertising in a trade journal read by the prospective candidate) may not be appropriate; some of the vivid candidates may commence to view the opening as not in queue with their present prospect (e.g. tough work, excellent rewards, flexible schedules and so on. One of the on the whole non-conventional forms of recruitment practice is e-recruitment. E-Recruitment is the use of internet to

recognize and draw the prospective candidates. It is the method of promoting position vacancies online, and the information regarding that profile. Two trends which make it obligatory for petite and intermediate sized concerns are to devote in the equipment for a triumphant e-recruiting plan are demographic trends and fiscal dearth. Easy availability of information generates the higher chance of getting the best manpower for the required position. It also helps the organisation in lowering their screening cost by maintaining the employee's details in a database; all the employees will be connected to the line manger through a central system.

III. E-RECRUITMENT MUTINY

Internet proved to be the recruiting mechanism in the end of 1990's, and in the early stages of internet recruitment it provides many benefits to the recruiters. It was predicated as that internet is the back bone of recruiting business. And it brings a huge development in the field of recruiting and makes the world a single place to work in. The latest trend in recruitment is the 'E-Recruitment' or 'Online Recruitment'. It made the business much easier for the employer, the employer can select or call his candidate from anywhere around the world. It also gives huge business opportunities to the organisation. Internet acts as an interactive interface between the employers and the job seekers.

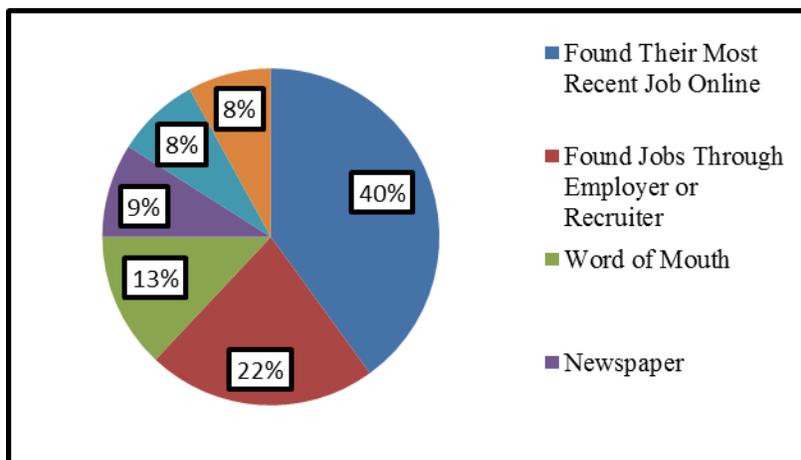


Figure – 1 Hiring Online Takes off in a Big Way in India

Here 78% candidates are satisfied with online recruitment and remaining 54% are satisfied with the traditional written and posted applications. "Temping" or hiring people for a short length is catching upbeat it provides elasticity, lowers predetermined overheads, and cuts down on dreadful hires. But tempts may lack zeal and vow. This method of recruitment is appropriate for start up enterprises.

IV. E-RECRUITMENT REIMBURSEMENT

Probable payback of E-Recruitment is –

- Unlimited exposure for both employer and job seeker, as the world become the flat world and everyone has an opportunity to contact one another and grab the chance available in the milieu.
- Advertising cost will be very less as internet will become a single interface where both the employer and job seeker come and interact, no middle man is required.
- Opportunities are unlimited and can immediately grab within a fraction of clicks.
- Employers can maintain their database directly through portals which are available in various websites.

- Candidates can apply for as many jobs they want, soon after they enter their details into the database.

E-Recruitment is getting more and more popularity companies are making developing their own websites and form corporation with online work boards. Primarily recruitment market is separated in newspapers, recruitment agencies and recruitment portals. Print media is used when they require middle-to-senior-level-executives. Portals are used when they need entry-level employees (fresher's), placement agencies only help to expand the on-line market.

	Naukri.com	Monster.com + JobsAhead.com
No. Of Clients	17,000	6,000
No. Of Live Jobs	80,000	70,000
Revenues	Rs. 45 crore (March 2005)	N.A.
Q4 Revenues	Rs. 11 crore (Jan-March 2005)	N.A.
No. Of Resumes	Rs. 36 Lakhs	Rs. 53 Lakhs
No. Of Additional Per Day	10,000	8,000

Table – 1 Source: Business Today, July 31, 2005

V. ELECTRONIC HUMAN RESOURCE MANAGEMENT (E-HRM)

The dealing out and diffusion of digitalized HR information is called electronic human resource management (E-HRM). Past researchers has suggested E-HRM increases the overall efficiency and working capabilities of HR activities and services. E-HRM is different for both small scale enterprise and large scale enterprise, they difference lies only in goals, but one thing they are common with is both want cost reduction and higher profit generation. In smaller organization only HRM specialist & Line Mangers are involved the E-HRM functions. Because of E-HRM the work which required hours of paper work and documentation now summarised into minutes with the help of some clicks, with the help of this, HR manager can focus on more strategic issues and HR issues can be handled by HR specialist or HR executives. E-HRM has completely changed the way in which traditional HRM work, which provides benefit to both the organisation and the employee individually.

VI. OBJECTIVES OF E-HRM

- To provide security & privacy to the stored information.
- To reduce the cost of manual documentation.
- To maintain the balance between human resource demand & supply.
- To faster the rate of decision making related to employees.

- To make the HR manager to focus on other strategic issues like planning & policy formulation.
-

VII. REVIEW OF LITERATURE

E-Recruitment formally implies sourcing of jobs online (Ganalaki, 2002). E-Recruitment is also known as online recruitment with the help of which the job seekers can send their CV's directly to the employer in an electronic form and their on the other end the employer will receive the CV and can filter is from the other respective candidate's CV's (Finn, 2000). By installing the software like "active recruiting" it is now becoming much easier for the employer to catch the deserving candidate for a particular profile, earlier 62 days were required to fill up vacant position but now it just require 42 days to fill up the same position it is now much easier (willenbrock, 2005). It has been argued that online recruitment cannot replace the traditional way of recruiting but a well implemented online recruitment can help the organisation to make their much more easier (caggiano, 1999 & borck, 2000). At the Nike's headquarter they don't miss any of the resume they receive, they treat every CV's to be a prospective one, and the application like "active recruiter" makes it's much easier for them (Nike's, 2005).

VIII. INDUSTRIAL CREDIT AND INVESTMENT CORPORATION OF INDIA (ICICI)

ICICI is a financial institution which was founded by industrial credit and Investment Corporation of India. They follow an online recruitment channel for hiring their candidates, and selection is done on the basis of campus written test. Online recruitment replaced the traditional method of recruitment. ICICI Bank invites all employees from every field for the vacant position for probationary officers too, and one year mandatory training is also provided to them, experienced and trained both employees can apply for this program. Bank asks their candidates to prepare their resume properly, because they have to upload their resume first while applying online.

OBJECTIVE OF THE STUDY

- To identify the techniques used for E-Recruitment at ICICI Bank.
- To understand the E-Recruitment policy of ICICI Bank.
- To identify how E-HRM becomes a challenge in the flat world.

SCOPE OF THE STUDY

The study will provide us with the information on various policies, techniques and how E-HRM proved to be the tool to pact with the challenges present in the environment.

RESEARCH METHODOLOGY

- AREA OF STUDY The area of study is confined to employees of ICICI Bank of Jaipur City.
- RESEARCH INSTRUMENT Structured Questionnaire.
- SAMPLE 100 respondents.

- **SAMPLING TECHNIQUES** Simple Random Sampling Method.
- **DATA COLLECTION** Primary data is collected with the help of questionnaire and secondary data is collected with the help of journals, magazines, book, websites etc.
- **ANALYSIS OF DATA** Data gathered has been transferred to the coding sheet and analysed with the help of tabulation

IX. FINDING & ANALYSIS

1. What are the sources of E-Recruitment at ICICI?

Job Portals	In-Built Website	All of The Above
6	2	92

Table – 2

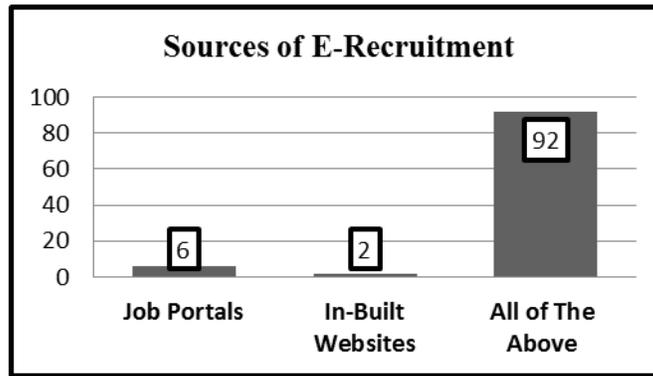


Figure – 2

Interpretation In the above analysis it can be seen that the majority of employees says that both Job Portal and In-Built websites are used by for the purpose of hiring candidates at ICICI, and the rest i.e. 6 percent employees say it is only done

through job portals and 2 percent say has been with the help of in-built website of ICICI. Job seekers are comfortable by both the means.

2. What factors will you consider in selecting a Job Portal?

Active Resumes	Popularity of Portals	Relevance of The Profiles	User Interface	All of Above
3	10	12	2	73

Table – 3

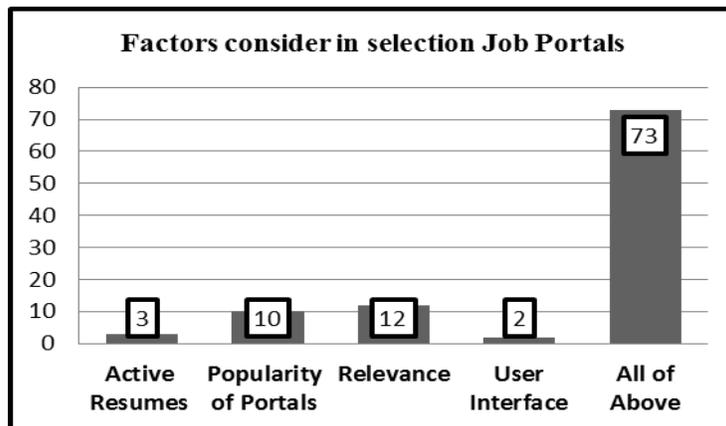


Figure – 3

Interpretation From the above table it can be conclude that in all 98 percent employees are there who think job portals are the ideal approach of putting their resumes, and the reason why candidates prefer job portals are 73 percent of them are saying that it's a user friendly interface, profiles in the portals got some relevance, their resumes stays active their and because of the

popularity of the portals, and the remaining 12 percent are saying they considered the relevance factor, 10 percent says they select portal according to their popularity, 3 percent say they select on the basis of active resumes and the remaining 2 percent say it should be user friendly interface.

3. Do you have a clearly stated E-Recruitment Policy?

Yes	No	To Some Extend
83	4	13

Table – 4

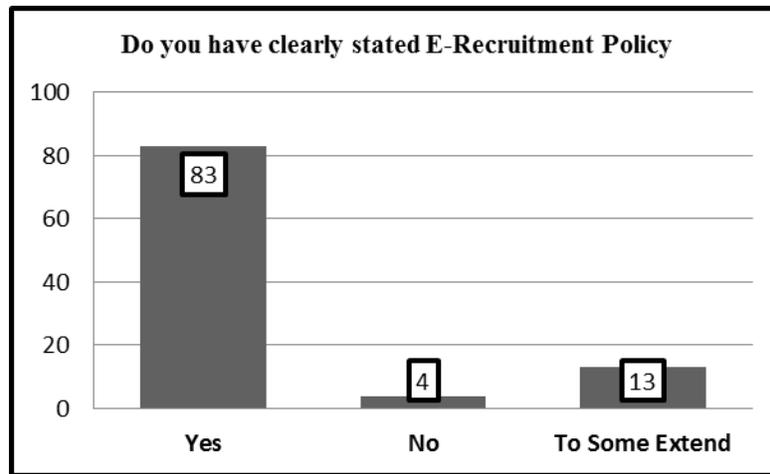


Figure – 4

Interpretation From the above table it has been concluded that 83 percent people says that ICICI has a clearly defined and stated E-Recruitment policy, 13 percent are saying to some

extent it has and 4 percent are saying no they don't not have clearly stated policies.

4. What is the quality of E-recruitment system?

Recruiting Quality People	Quick Response	Efficient Database Management	All of Above	None of Above
4	9	11	74	2

Table – 5

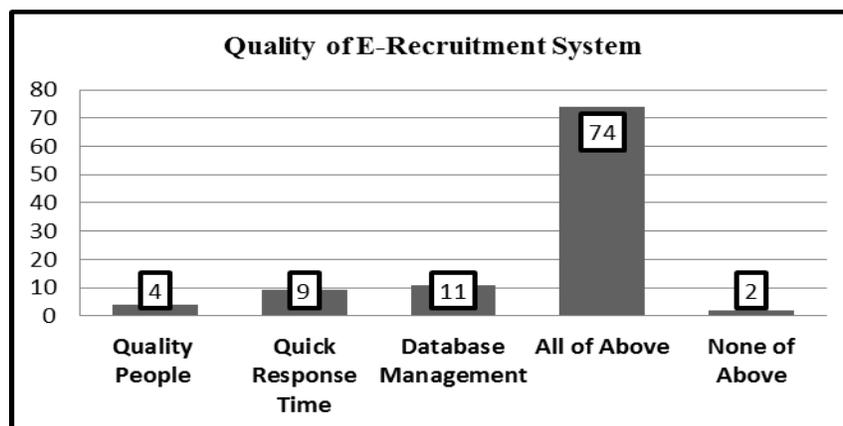


Figure – 5

Interpretation From the above data it has been seen that majority of employees are saying that quality of e-recruitment system depends on many factors like quality people, quick response time, database management, whereas 11 percent say it

only depends on efficient database management, 9 percent say it depends upon quick response time, 4 believe that it depends on recruiting quality people and 2 percent say they don't do not consider these factors.

5. Whether the company is providing an efficient and timely E-Training program?

Yes	No	To Some Extent
76	14	10

Table – 6

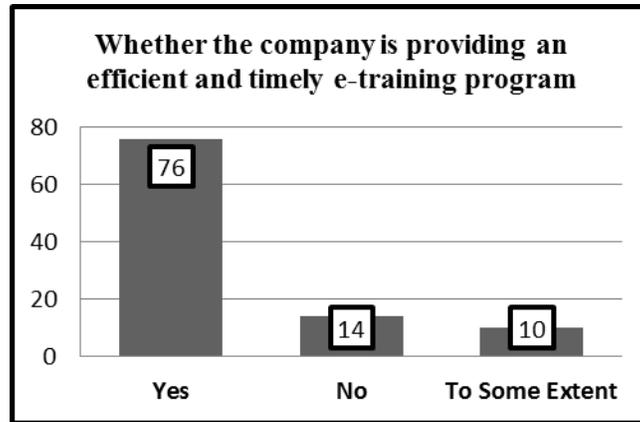


Figure – 6

Interpretation From this analysis 76 percent employees are saying that they are getting timely and efficient e-training program, 14 percent of them are saying no they are not getting

and the remaining 10 percent are saying to some extent they are getting the e-training program.

6. Do you have an appropriate Daily Activity Report (DAR) submission policy?

Yes	No
96	4

Table – 7

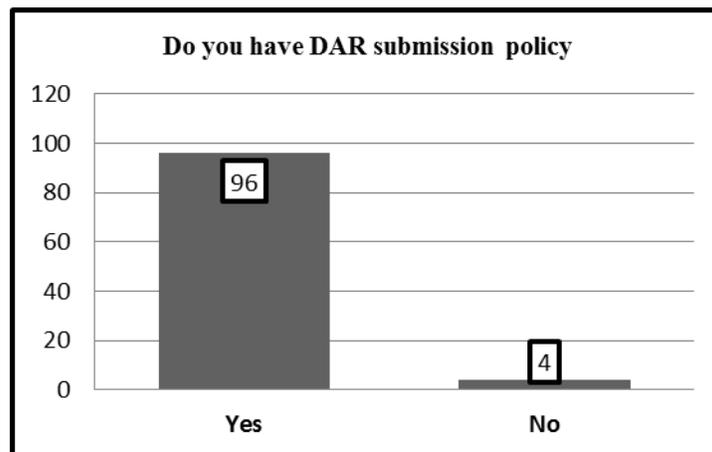


Figure – 7

Interpretation From this analysis 96 percent employees are saying that they have to submit their 'daily activity report' to their so that they can forward that report to the concerned head of

department for evaluation and they remaining 4 percent are saying they don't have to submit their 'daily activity report'.

7. Does ICICI majorly promote E-Recruitment?

Yes	No
84	16

Table – 8

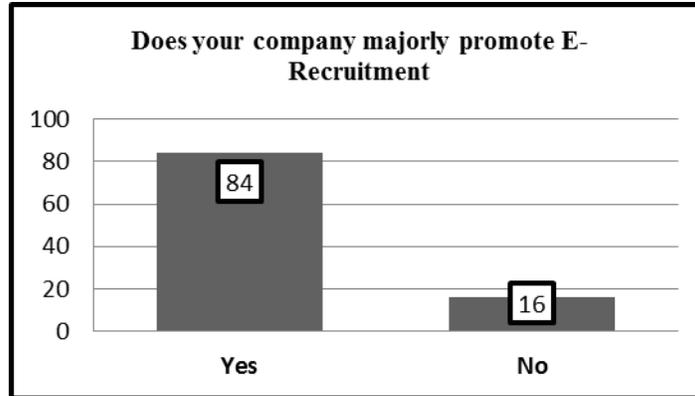


Figure – 8

Interpretation Here the majority of employees are saying that yes ICICI majorly promotes e-recruitment and the remaining 16 percent are saying no, ICICI do not promote e-recruitment.

8. If No, then how –

Walk-in-Interview	Referrals	Consultancy	Advertisement
4 (25%)	4 (25%)	6 (37.5%)	2 (12.5%)

Table – 9

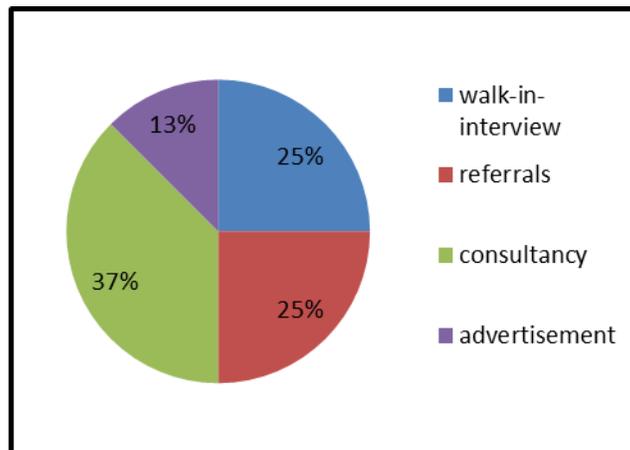


Figure – 9

Interpretation In the above interpretation it has been seen that 16 percent employees are saying that the company do not promote e-recruitment, from these 16 percent employees 4 are saying they generally promote walk-in-interview, other 4 are saying they promote recruitment through referrals, 6 percent are saying they promote recruitment through consultancy and the remaining 2 percent are saying they promote through advertisement.

X. LIMITATION OF THE STUDY

- Employees are averse to talk on these issues.
- Candidates who are programmed for interview don't turn up.
- Employees ask a lot of counter questions on the task.
- Populace didn't reveal much about their job.

XI. SUGGESTION/RECOMMENDATION

The above discussion and from the evaluation process there are some points on which managers can work upon, like the manager must differentiate between the jobs which are to be recruited through traditional way of recruiting and which are to be recruited with the help on online recruitment. The HR manager must always be vigilant so that they do not interview the wrong applicant and resultant into wasteful expenditure. Small online written interview can also be conducted along with the resume, so that manager can get a good amount of information about the applicant, which the manager cannot give just by scrutinizing the applicants resume.

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XII. CONCLUSION

Electronic Recruitment has made the job much easier for both the companies and the job seekers and here the credit goes to the Software, IT Professionals, Internet, Computer and many other people who are working back-end. E-Recruitment is an easiest and convincing way to hire people from any part of the world and promotes opportunity, it benefits the company to be recognised globally, E-HRM helps in conveying any kind of HR policies, training program, and pay slip sheets easily. E-HRM is based on more systematic & technology theorem, which helps the HR department to scrutinize employee performance carefully & accurately. It helps in imparting any HR policy; keep a track on employees daily activity report (DAR), efficiently helps the employees in promotion & transfers.

REFERENCES

- [1] Ruël, H., Bondarouk T., and Looise J. (2004), "E-HRM: innovation or irritation. An explorative empirical study in five large companies on web-based HRM", *Management Revue* 15(3): 364–381.
- [2] Parry Emma (2011), "An examination of E-HRM as a means to increase the value of the HR functions", *International Journal of Human Resource Management*, V 22, Issue 5, pp 1146-1162.
- [3] Suramardhini Mahisha (2012), "E-HRM paper presentation", ebstudies.
- [4] Dileep K M and Ramesh M (2009), "E-Recruitment: Leveraging Technology towards Business Excellence", *Business Review*, Vol. 4, No. 1 & 2, pp. 75-94.
- [5] Bemus, C., Henle, C. & Hogler, R. L. (1998). Internet recruiting and employment discrimination: a legal perspective. *Human Resource Management Review*, 8, 2,149-164
- [6] Gupta C.B. (2010), "Human Resource Management", 1st Edition, Sultan Chand & Sons. New Delhi.
- [7] Rao VSP (2005), *Human Resource Management Text & Cases*, 2nd Edition, Excel Books, New Delhi.
- [8] Dowling, P.J. & Welch, D.E.(2004).*International humanresource management*.4th edition. Thomson, Australia.

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IMPACT OF WORK ENVIRONMENT ON JOB SATISFACTION

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Abstract- The work environment can implicate the social relation at workplace and also maintain the relationship between colleague, supervisor and the organisation. It describes the neighboring circumstances in which employees are working together. A satisfied, happy and hardworking employee is biggest asset of any organisation. Effective results & productivity for any organisation is depend on the level of satisfaction of employees and work environment is one of the most important factor which influence the satisfaction & motivation level of employees. Efficient human resource management and maintain good work environment or culture effects not only the performance of employee & organisation but also affects the growth & development of entire economy. This research paper makes effort to study the work environment & work culture in the Dominos pizza. This study is conducted in Jaipur city only.

Index Term- Work environment, work culture, human resource management, motivation & job satisfaction.

1. Introduction

Dominos essentially provides jobs to a large no. of individuals and thus it is necessary to know the work environment and to measure employee satisfaction level in the working place. The study has conducted in Dominos in Jaipur city.

Domino's is the second-largest pizza chain in the United States (after Pizza Hut) and the largest worldwide, with more than 10,000 corporate and franchised stores in 70 countries. A Domino's store is the spirit center of a time critical food delivery service where a team of passionate people aim to deliver a hot and fresh pizza on time, every time.

1.1 Work Environment

The productivity of employees is determined by aninordinatelevel, on the environment in which they work. Work environment involves all the aspects which act and react on the body and mind of an employee. Under organisational psychology, the physical, mental and social environment where employees are working together and there work to be analyzed for better effectiveness and increase productivity. The majorpurpose is to generate an environment which ensures the ultimate ease of effort and eliminates all the causes of frustration, anxiety and worry. If the environment is congenial, fatigue, monotony and boredom are minimized and work performance can be maximised.

Work has an economic aspect as well as mechanical aspect and it has also psychological aspect. Effective work environment encourage the happier employee with their job that ultimatelyinfluence the growth of an organisation as well as growth of an economic.

The concept of work environment is an actual comprehensive one including the physical, psychological and social aspects that mark up the working condition. Work environment performs to have both positive and negative effects on the psychological and welfare of employees. The work environment can be described as the environment in which people are working. Such as, it is very wide category that incorporates the physical scenery (e.g. noise, equipment, heat), fundamentals of the job itself (e.g.

workload, task, complexity) extensive business features (e.g. culture, history) and even extra business background (e.g. industry setting, workers relation). However all the aspects of work environment are correspondingly significant or indeed appropriate when considered job satisfaction and also affects the welfare of employees.

1.2 Elements of work environment:

Work environment may be divided into three broad components

1. **Physical Environment:**

- ✓ Ventilation & Temperature:
- ✓ Noise
- ✓ Infrastructure & Interior
- ✓ Amenities

2. **Mental Environment**

- ✓ Fatigue
- ✓ Boredom
- ✓ Monotony
- ✓ Attitude & Behaviour of Supervisor & colleagues

3. **Social Environment:** Social environment denotes to the cluster to which an employee to be appropriate. Within an enormous ceremonial work group employees form casual cluster in their personal. Employees develop an intellect of belonging to their cluster. The standards and privileged of the cluster impact significantly the attitude and behaviour of individual employees.

1.3 Impact of Work Environment on Job Satisfaction

The main aim of this study is to identify the impact of work environment on job satisfaction. However the physical work environment creates the physical condition that can affect the health of employees. Yet, the way in which the mental environment creates venomous condition (e.g. fatigue boredom, attitude and behaviour of supervisor and colleagues) for employees and social environment can affect the confidence level or performance of employees. So, ultimately the work environment can influence the satisfaction level of employees or else these factors can consequence the performance of overall.

1.4 Characteristics of Work Environment

1. **Apparent and Open Communication:** In essence, it addresses the employees feel that they are appropriate in the organisation. However it is necessary for staff to deliberate the organisation's philosophy, mission and values.
2. **Stability of Work-Life:** There has to some sort of balance between work and personal life. In general having the sense of balance will improve job satisfaction among employees.
3. **Impartiality:** Employees need to identify that they are being impartially rewarded established on their performance. Impartiality means that the consequences of performance are resolute by the quantity and quality of the performance.
4. **Consistency:** Consistency means predictability. Subordinates want to know how their supervisor will react in a given situation. According to management studies consistency is a single most effective standard to establish with your own leadership.

2. Focus of the problem

To understand the employees are actually satisfied with their working environment and working condition. If employees are not satisfied, what are the reasons for dissatisfaction of employees with the working environment?

Other focus of problem will be on:

- ❖ What benefits & facilities provided in the working place?
- ❖ What the gap exist and where one should have modify to have satisfied working condition?

- ❖ Is the work environment main factor for growing the attrition rate?

3. Objectives of the study

- ❖ To know the working condition of employees.
- ❖ To know the overall satisfaction level of employees.
- ❖ To study the factors effecting work environment.
- ❖ To analyse the impact of work environment on job satisfaction.
- ❖ To ascertain the impactof physical & mental environment on employee performance.

4. Significance of the study

The significance of this study is to understand the work environment of employees at Dominos.

Through this study I came to know:

- ❖ The working condition of employees.
- ❖ What are the internal & external environment factors or reasons which influence the employees force to leave the job?
- ❖ The work environment influencing directly or indirectly with job satisfaction.

5. Research Methodology

- ❖ **Area of study:** The area of study to respondents from Jaipur City.
- ❖ **Research instrument:** Structured questionnaire.
- ❖ **Sample size:** 100 samples.
- ❖ **Sampling Technique:** Convenient& Random Sampling Technique
- ❖ **Data Collection:** The Primary Data has been collected through questionnaire and interview and the Secondary Data has been collected with the help of journals, magazines, books and internet
- ❖ **Analysis of Data:** Once the data has been collected through questionnaire and interview then the simplest and most revealing devices for summarizing data is the statistical table. A table will be systematic arrangement of data in column and rows. The purpose of a table will be simplifying the presentation and to facilitate results.

6. Framework of Analysis

Analysis and interpretation through bar chart:

1. General work environment

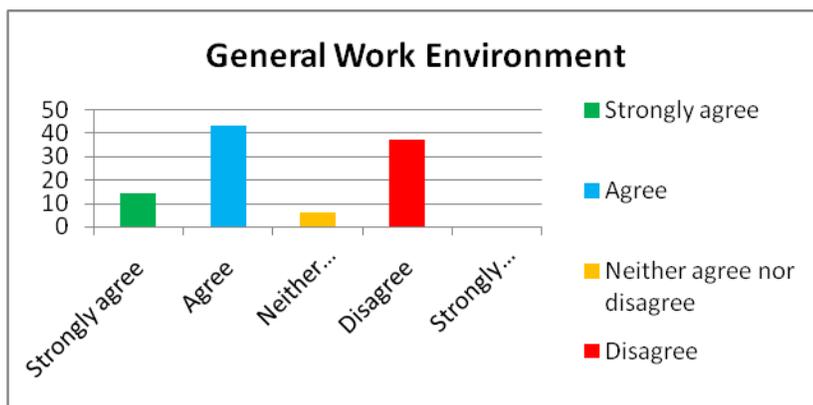


FIG 1: GENERAL WROK ENVIRONMENT

Interpretation: General work environment is supportive & positive agreed by 43% employees as well as 14% employees are strongly agree whereas 37% employees are not agree and 6% are those who are neither agree nor disagree.

2. Duties & responsibilities are equally divided in co-workers.

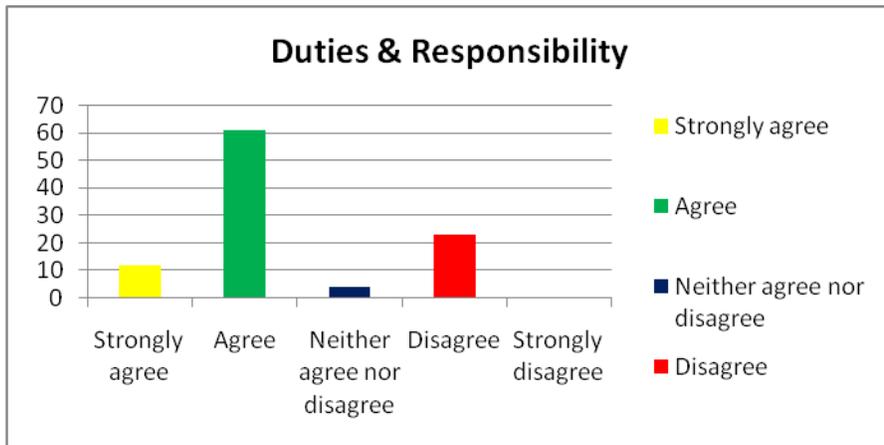


FIG: 2 DUTIES & RESPONSIBILITIES

Interpretation: About 61% employees are agree, 12% employees are strongly agree whereas 23% employees are disagree with the duties and responsibilities are equally divided in co-workers where 4% employees are neither agree nor disagree.

3. Recreation and refreshment facilities.

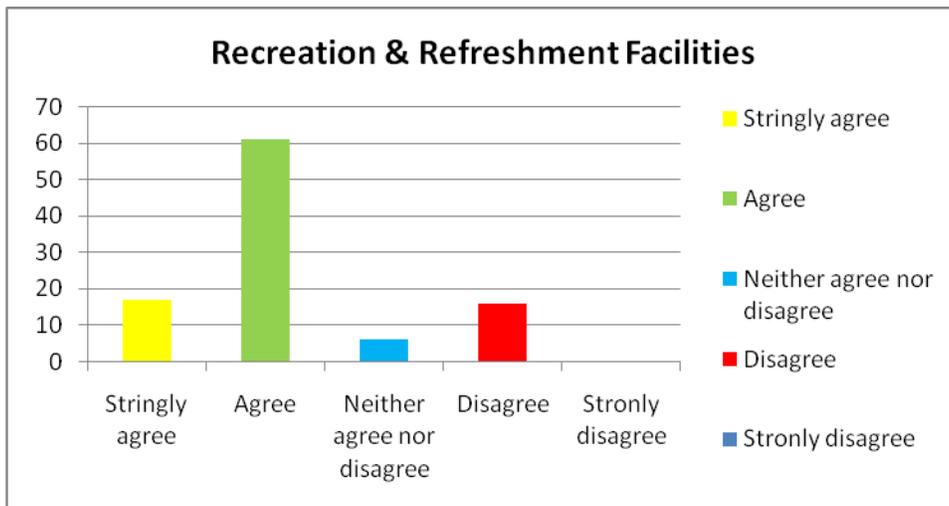


FIG 3 RECREATION & REFRESHMENT FACILITIES

Interpretation: 61% employees are agree for providing proper recreation & refreshment facilities in the working place whereas 16% employees are not agree. So, from the above table it has evaluated that Dominos provide a good refreshment facility for their employees.

4. Grievance handling

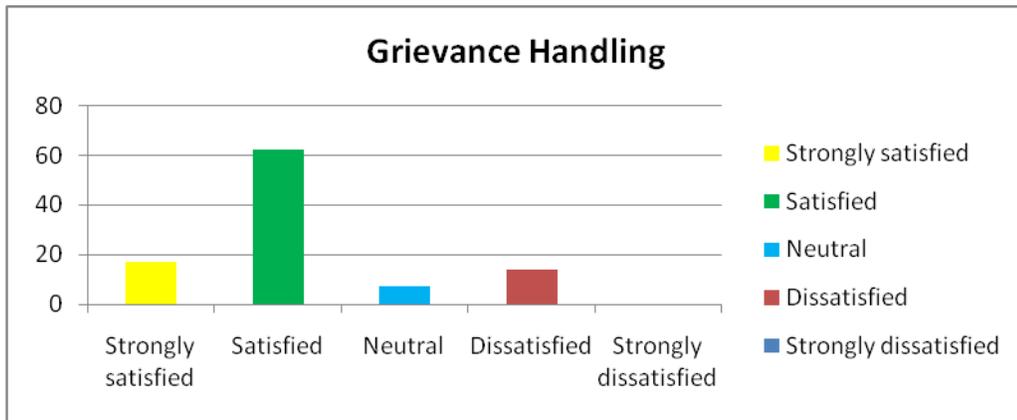


FIG 4 GRIEVANCE HANDLING

Interpretation: 62% employees are satisfied with grievance handling procedure whereas 14% employees are dissatisfied. From the above data it has evaluated that Dominos handling grievances of their employees in a good manner.

5. Attitude of Supervisor

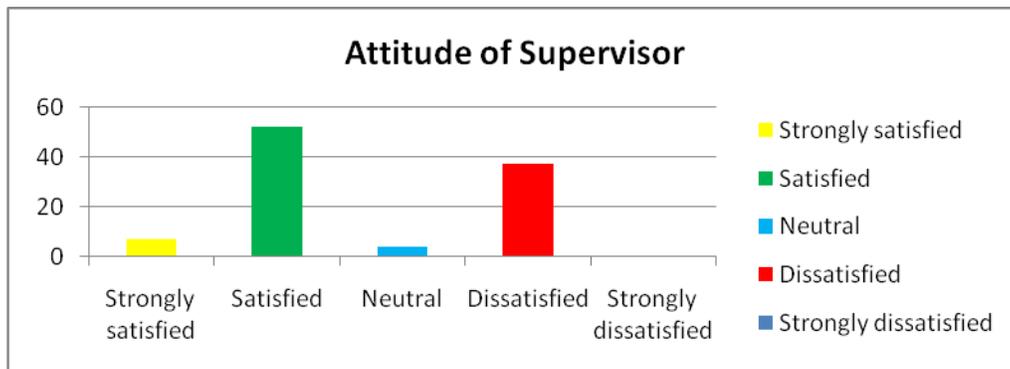


FIG 5 ATTITUDE OF SUPERVISOR

Interpretation: From the above data 52% employees are satisfied with the attitude of supervisor whereas 37% employees are dissatisfied. So, it has evaluated that maximum employees are satisfied but the no. of employees who are dissatisfied are not very low, therefore we cannot say that attitude of supervisor is moral for all employees.

6. Fun at workplace



FIG 6 FUN AT WORK

Interpretation: 71% employees are satisfied with fun at working place and feel enjoy in working hours whereas only 15% employees are dissatisfied. Therefore, from the above table it has evaluated that employees working in Dominos are feeling good and having fun in their working place.

7. Work involves fatigue and boredom

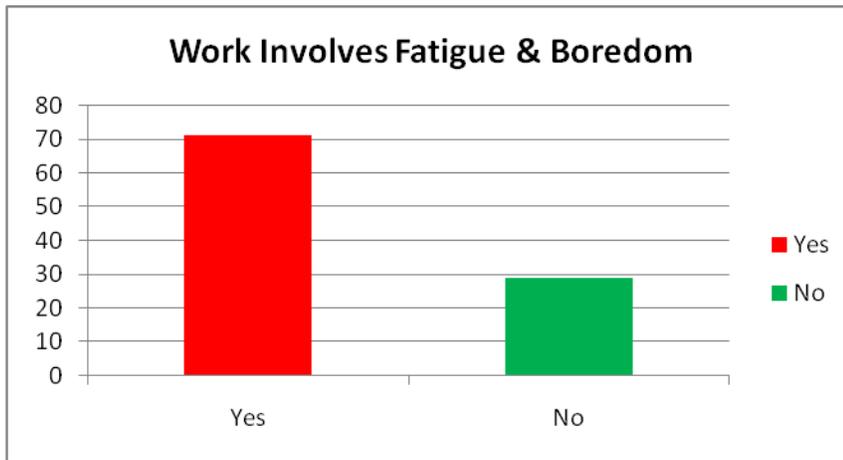


FIG 7 WORK INVOLVES FATIGUE & BOREDOM

Interpretation: 71% employees said that their work involves fatigue & boredom, whereas 29% employees feel work does not involve fatigue and boredom. So, from the above data it has evaluated that in Dominos employees feel fatigue and boredom in the working place.

8. Health & safety facilities



FIG 8 HEALTH& SAFETY FACILITY

Interpretation: 71% employees said that they get proper health & safety facility whereas, 29% employees felt they do not get proper facilities in the working place. So, from the above thcxat it has evaluated that Donimos has adapt good health & safety facility for their employees.

9. Problem facing by employees

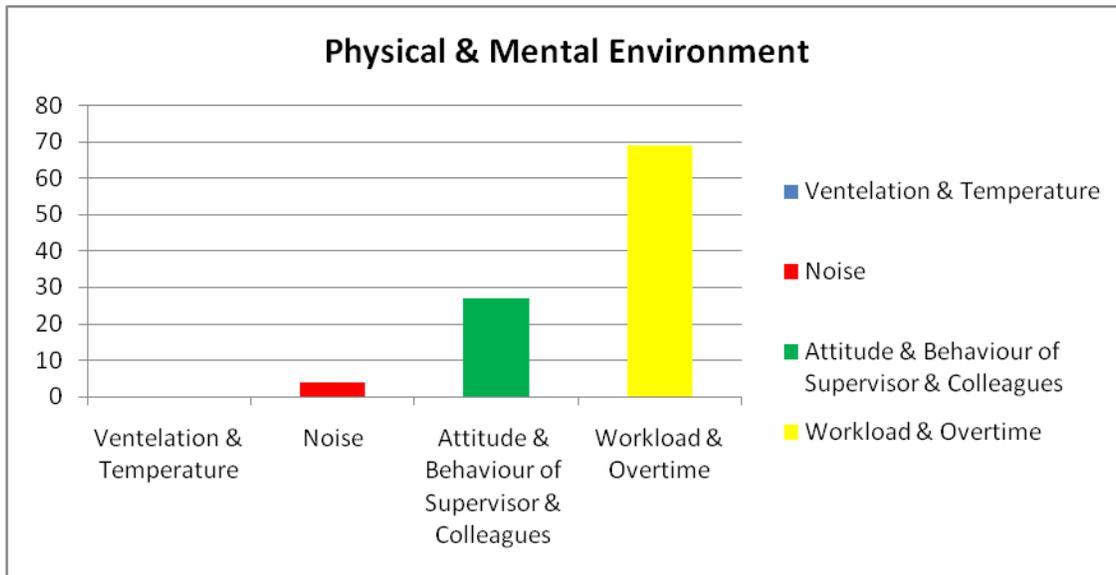


FIG 10 PHYSICAL & MENTAL ENVIRONMENT

Interpretation: 69% employees said that they are facing problem of workload and overtime whereas, 27% employees said that attitude & behaviour of supervisor are not virtuous and only 4% employees are facing problem of noise. So, from the above data it has evaluated that maximum no. of employees are facing such problem of workload and overtime therefore organisation should adapt some strategies to overcome.

7. Limitation of the study

- ✓ Sample may not represent the true population.
- ✓ Satisfaction level to environment factor may differ from person to person.
- ✓ Study may be absolute because of changing environment and needs.
- ✓ Employees were not cooperating.

8. Findings of the study

Subject of the present study has been selected from managerial and non-managerial staff of Dominos from Jaipur city.

- ✓ Employees of Dominos are basically well satisfied with these factors: work environment, duties and responsibilities, refreshment & recreation facility, grievance handling procedure, fun at workplace, health & safety facility. Dominos can retain their employees with these aspect.
- ✓ However every coin has its two faces head either tail, same as pros and cons are always be there in entirety. Therefore employees are not satisfied or dissatisfied with these factors: workload & overtime, job includes fatigue & boredom, attitude of supervisor. These aspects can directly impact on attrition rate or else job satisfaction.

9. Suggestion & Recommendation

- ✓ Organisation should adapt virtuous strategies for overcome with the problem related to fatigue and boredom. Company would be change the job for decay the fatigue and boredom.
- ✓ Organisation should divide the work equally for workload or else appoint more employees. As workload stimulus stress, so company has to take some action.
- ✓ Attitude towards the subordinate & colleagues should smooth and positive for effective results.
- ✓ Organisation should change the job time to time for avoiding fatigue & boredom.

10. Conclusion

The result of the study indicates that workload, stress, overtime, fatigue, boredom are some factors to increase job dissatisfaction. On the other hand good working condition, refreshment & recreation facility, health & safety facility, fun at workplace increase the degree of job satisfaction. Effectual human resource management and preserving progressive work environment would consequence the job satisfaction and performance of organisation as well as entire economy. Hence, for the success of organisation it is vital to accomplish HRM successfully and find whether the work environment is satisfied for employees or not.

11. References

- [1] Paul e specter, job satisfaction, India, Sage, 2001
- [2] Dr. C.B. Gupta, human resources management, 2008
- [3] Genster DC, Schaubroeck j. work stress and employees health, management 1991
- [4] Keller, "satisfaction from job facilities", Journal of IMS group (bi-annual journal of IMS, Ghaziabad; volume 5 no.1, Jan-June, 2008. ISSN no. 0973-824x)
- [5] Wall TD, Parker SK. Job and Work Design. Thousand Oaks: Sage, 1998.

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A Survey of routing protocol LEACH for WSN

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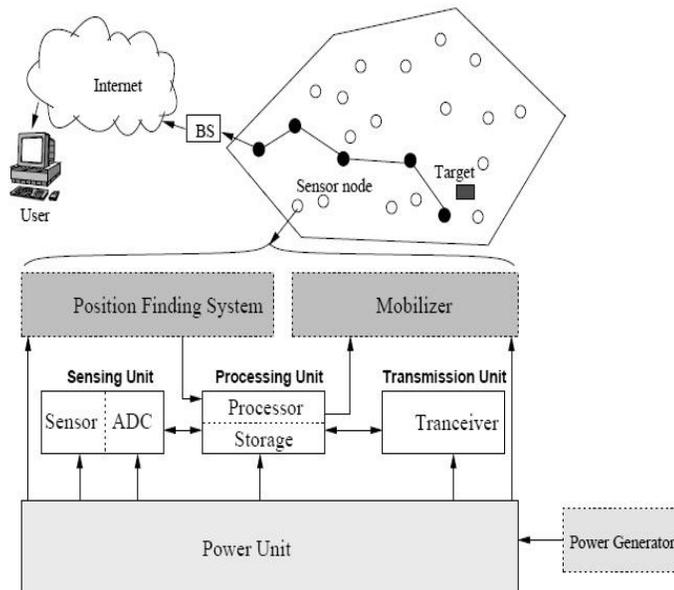
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Abstract- Wireless sensor network consists of spatially distributed sensor nodes which sense physical and environmental condition like sound, pressure, temperature etc and pass the data to the main location through the network. In WSN network life time and node energy efficiency are two most important terms. One major issue in wireless sensor networks is developing an energy-efficient routing protocol which has a significant impact on the overall lifetime of the sensor network. Clustering based Energy efficient LEACH (Low-Energy Adaptive Clustering Hierarchy) protocol can effectively increase WSN performance by dynamically changing cluster head. This paper surveys working of LEACH protocol, its limitations and advancements done in LEACH to improve its performance.

Index terms- wireless Sensor networks, Routing protocols, LEACH, Energy efficiency, Number of Cluster head NCH, network lifetime.

I. INTRODUCTION

Wireless Sensor networks have emerged as a promising tool for monitoring (and possibly actuating) the physical conditions, utilizing self-organizing networks of battery-powered wireless sensors that can sense, process and communicate. The requirements and limitations of sensor networks make their architecture and protocols both challenging and divergent from the needs of traditional Internet architecture.



A sensor network [1] [4] is a network of many tiny disposable low power devices, called nodes, which are spatially distributed in order to perform an application-oriented global task. These nodes form a network by communicating with each other either directly or through other nodes. One or more nodes among them will serve as base station (BS) they communicate with the user either directly or through the existing wired networks. The primary component of the network is the sensor, essential for monitoring real world physical conditions such as sound, temperature, humidity, intensity, vibration, pressure, motion etc. at different locations.

Each node typically consists of the four components: sensor unit, central processing unit (CPU), power unit, and communication unit.

Figure 1: Structural view of sensor network

The sensor unit consists of sensor and ADC that is Analog to Digital Converter. The sensor unit is responsible for collecting information as the ADC requests, and returning the analog data it sensed. ADC is a translator that tells the CPU what the sensor unit has sensed, and also informs the sensor unit what to do. Communication unit is tasked to receive command or query from and transmit the data from CPU to the outside world. CPU is the most complex unit. It interprets the command or query to ADC, monitors and controls power if necessary, processes received data, computes the next hop to the sink, etc. Power unit supplies power to sensor unit, processing unit and communication unit. Each node may also consist of the two optional components namely Location finding system and Mobilizer. If the user requires the knowledge of location with high accuracy then the node should possess Location finding system and Mobilizer may be needed to move sensor nodes when it is required to carry out the assigned tasks.

II. APPLICATION OF SENSOR NETWORK

- 1) Military: Military situation awareness. Sensing intruders on basis. Battle field surveillances [5].
- 2) Emergency situation: Disaster management. Fire/water detectors [2]. Hazardous chemical level and fires [4].
- 3) Physical world: Habitual monitoring. Observation of biological and artificial systems. Environmental monitoring of water and soil.
- 4) Medical and health: Sensors for blood flow, respiratory rate, ECG (electrocardiogram), pulse oxymeter, blood pressure and oxygen measurement. Monitoring people's location and health condition.
- 5) Industrial: Factory process control and industrial automation [6]. Monitoring and control of industrial equipment [2].
- 6) Home network: Home appliances, location awareness (blue tooth [2]). Person locator.
- 7) Automotive: Tire pressure monitoring [2]. Active mobility. Coordinated vehicle tracking [6].

III. LEACH PROTOCOL

LEACH, which was presented by Heinzelman [9], is a low-energy adaptive clustering hierarchy for WSN. The operation of LEACH can be divided into rounds. Each round begins with a set-up phase when the clusters are organized, followed by a steady state phase where several frames of data are transferred from the nodes to the cluster head and on to the base station. Its Main objectives are extension of network life time, reduced energy consumption, use data aggregation to reduce the number of communication messages.

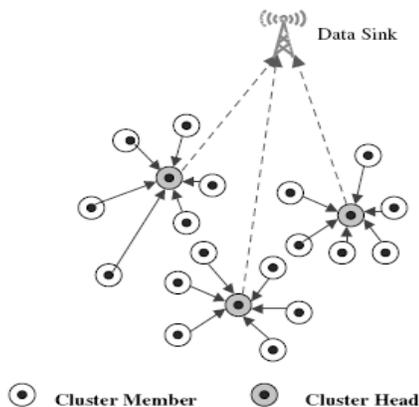


Figure 2: LEACH network model

LEACH adopts a hierarchical approach to organize the network into a set of clusters. Each cluster is managed by a selected cluster head. The cluster head assumes the responsibility to carry out multiple tasks.

The first task consists of periodic collection of data from the cluster members. Upon gathering the data, the cluster head aggregates it in an effort to remove redundancy among correlated values. The second main task of a cluster head is to transmit the aggregated data directly to the base station. The transmission of the aggregated data is achieved over a single hop. The third main task of the cluster head is to create a TDMA-based schedule whereby each node of the cluster is assigned a time slot that it can use for transmission.

The cluster head advertises the schedule to its cluster members through broadcasting. To reduce the likelihood of collisions among sensors within and outside the cluster, LEACH nodes use a code-division multiple access-(CDMA) based scheme for communication.

IV. LEACH OPERATION

The basic operations of LEACH are organized in two distinct phases as shown in figure.

(1)Setup phase: cluster-head selection and cluster formation. (2)Steady-state phase: data collection, aggregation, delivery to the base station.

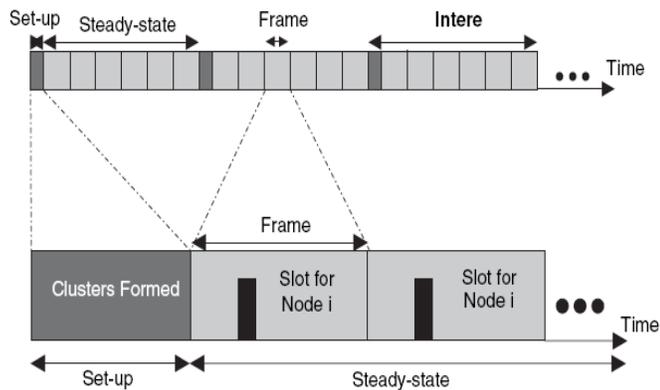


Figure 3:LEACH phases

The duration of the setup is assumed to be relatively shorter than the steady-state phase to minimize the protocol overhead.

V. LEACH ALGORITHM DETAIL

The operation is divided into rounds, where the each round starts with a set-up phase, when the clusters are organized, followed by the steady-state phase as shown in algorithm. In order to minimize the load ,the steady-state phase is long compared to set-up phase. The basic flow chart of the LEACH protocol is shown in the figure.

A. Advertisement phase

Initially, each node decides whether or not to become a cluster-head for the current round. This decision is based in the determined a priori [8] and the number of times the node has been a cluster-head. This decision is made by selecting the node n choosing a random number between 0 and 1. If this is less then threshold T(n),the node becomes cluster-head for the current round. The threshold level is set by:

$$T(n) = \frac{p}{1 - p * \left(r \bmod \left(\frac{1}{p} \right) \right)}, \quad \text{if } n \in G$$

$$= 0 \quad \text{otherwise}$$

Where the p = desired percentage of cluster heads (in our work p= 0.05),
 r = the current round, and

G is the set of the nodes that have not been cluster-heads in the last rounds.

The nodes which are being cluster-head for the current round broadcast advertisement message to rest of the nodes with same transmit energy. There must be receiver of the non cluster-head on while advertising.

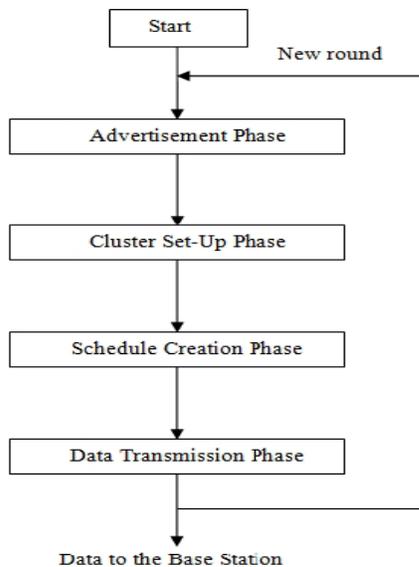


Figure
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4:LEACH algorithm flow chart

each node decide to which it would belongs base on receiving signal of advertising signal. Random cluster-head is chosen in case of the ties.

B. Cluster Set-up Phase

decided that nodes which it belongs to, it would request to cluster-head to be that cluster. During this phase ,the receiver of all the cluster-head must be

C. Schedule Creation

The cluster-head receives all the messages as request to be part of that cluster. Based on the number of nodes in cluster, it would creates a TDMA schedule to tell when it can transmits. This schedule is broadcasted back to nodes in that cluster.

D. Data Transmission

As and when TDMA schedule is fixed, data transmission can begin. The data aggregation occurred before transmitting the data to the base station. Finally the compressed data send to the base station by the cluster-head. This is the steady state operation of sensor network using LEACH protocol. After certain time these four phase would be repeated.

VI. DISADVANTAGES OF LEACH

- 1 LEACH does not provide clarity about position of sensor nodes and the number of cluster heads in the network. [9]
- 2 Each Cluster-Head directly communicates with BS no matter the distance between CH and BS. It will consume lot of its energy if the distance is far.
- 3 The CH uses most of its energy for transmitting and collecting data, because, it will die faster than other nodes.
- 4 The CH is always on and when the CH die, the cluster will become useless because the data gathered by cluster nodes will never reach the base station.

VII.LEACH IMPROVEMENT TECHNIQUES

Many techniques proposed as new modification for LEACH to provide more security & to reduce energy consumption

(1) S-LEACH

Here we introduced a secure hierarchical protocol called S-LEACH, which is the secure version of LEACH. S-LEACH improves the method of electing cluster heads and forms dynamic stochastic multi-paths cluster heads chains to communicate to the base

station, In this way it improve the energy-efficiency and hence prolong the lifetime of the network.

(2) R-LEACH

Secure solution for LEACH has been introduced called RLEACH in which cluster are formed dynamically and periodically. In RLEACH the orphan node problem is raised due to random pair-wise key scheme so they have used improved random pair-wise key scheme to overcome. RLEACH has been used the one way hash chain, symmetric and asymmetric cryptography to provide security in the LEACH Hierarchical routing protocol.

(3) LEACH-CC (LEACH-Centralized with Chain)

However, using a central control algorithm to form the clusters may produce better clusters by dispersing the cluster-head nodes throughout the network. Then a chain routing between cluster-heads is established to reduce the amount of nodes which communicate with the base station. Further improvement in energy cost for data gathering can be achieved if only one cluster-head transmits to base station and if each cluster-head transmits only to local neighbor cluster-heads in the data fusion phase.

(4) LEACH-SM

First completely analyze the basic distributed clustering routing protocol LEACH (Low Energy Adaptive Clustering Hierarchy), then proposed a new routing protocol and data aggregation method in which the sensor nodes form the cluster and the cluster-head elected based on the residual energy of the individual node calculation without re-clustering and the node scheduling scheme is adopted in each cluster of the WSNs. In the node scheduling scheme (ACTIVE and SLEEP mode) the energy efficiency is increased near to 50% than LEACH protocol and lifetime of the networks also increased.

VIII. CONCLUSION

In this paper, one of the main challenges in the design of routing protocols for WSNs is energy efficiency due to the scarce energy resources of sensors. The ultimate objective behind the routing protocol design is to keep the sensors operating for as long as possible, thus extending the network lifetime. The energy consumption of the sensors is dominated by data transmission and reception. Therefore, routing protocols designed for WSNs should be as energy efficient as possible to prolong the lifetime of individual sensors, and hence the network lifetime. Because of this reason LEACH protocol selected. It gives better performance in energy efficiency and network life time. We can say the advantage of LEACH overcome the problem of WSN and So LEACH modified further for future work. This modified or improved LEACH gives more better result than normal LEACH.

REFERENCES

- [1] Ian F. Akyildiz, Weilian Su, Yogesh Sankarabramaniam, and Erdal Cayirci: A Survey on sensor networks, IEEE Communications Magazine (2002).
- [2] José A. Gutierrez, Marco Naeve, Ed Callaway, Monique Bourgeois, Vinay Mitter, Bob Heile, IEEE 802.15.4: A Developing Standard for Low-Power Low-Cost Wireless Personal Area Networks, IEEE Network, pp. 12-19 (September/October 2001).
- [3] Ed Callaway, Paul Gorday, Lance Hester, Jose A. Gutierrez, Marco Naeve, Bob Heile, Venkat Bahl: A Developing Standard for Low-Rate Wireless Personal Area Networks; IEEE Communications Magazine, pp. 70-77 (August 2002).
- [4] Sarjoun S. Doumit, Dharma P. Agrawal: Self- Organizing and Energy-Efficient Network of Sensors, IEEE, pp. 1-6 (2002).
- [5] Elaine Shi, Adrian Perrig: Designing Secure Sensor Networks IEEE Wireless Communications, pp. 38-43 (December 2004).
- [6] Chien-Chung Shen, Chavalit Srisathapornphat, Chaiporn Jaikaeo: Sensor Information Networking Architecture and Applications, IEEE Personal Communications, pp. 52-59 (August 2001).
- [7] J N. Al-Karaki, A E. Kamal: Routing Techniques in Wireless Sensor Networks: A Survey, in the proceeding of in IEEE Wireless Communications (Dec. 2004).
- [8] Chandrakasan, Amirtharajah, Cho, Goodman, Konduri, Kulik, Rabiner, and Wang. Design Consideration for Distributed Microsensor Systems. In *IEEE 1990 Custom Integrated Circuits Conference (CICC)*, pages 279-286, May 1999.
- [9] M. Bani Yassein, A. Al-zou'bi, Y. Khamayseh, W. Mardini "Improvement on LEACH Protocol of Wireless Sensor Network (VLEACH)", International Journal of Digital Content Technology and its Applications Volume 3, Number 2, June 2009.
- [10]. D. Estrin, R. Govindan, J. Heidemann, and S. Kumar, —Scalable Coordination in Sensor Networks, || Proc. Mobicom '99, Seattle, WA, Aug. 1999, pp. 263-270

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Understanding the Cloud: Towards a Suitable Cloud Service

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Abstract- With the rapid development of databases and data storage technology, the cloud has emerged as a significant aspect of nowadays businesses. This embraces the necessity of the distinction between the cloud services and deployment models in order to obtain a service that fits the user demands. This paper provides current and potential cloud users with the basic knowledge of the cloud services and deployment models. In addition, this paper highlights the advantages and disadvantages of this technology, while providing the cloud user with methods to benefit from cloud services in a sufficient manner, and overcome the cloud limitations and risks.

Index Terms- Cloud Computing, Infrastructure as a Service, Platform as a Service, Software as a Service

I. INTRODUCTION

With the rapid development of data storage technology, cloud computing has emerged as a significant technology trend, and a critical aspect of many businesses (Leavitt, 2009; Zhang, Cheng & Boutaba, 2010). Cloud computing is considered a broad term that describes a wide range of services or a stack of services (Keps, 2011). Many scholars and practitioners have attempted to define the Cloud. Klems (2008), defined the cloud as an “internet centric software” that differs from the traditional single tenant approach of software development, by being scalable, multi-tenant, multi-platform, multi-network, and global (Geelan, 2008). While Cohen (2008) described the cloud as a broad array of web-based services that allows users to obtain a wide range of capabilities on a pay-per-use basis (Geelan, 2008). Vaquero, Merino, Caceres, and Lindner (2009), suggested a definition of the cloud that focuses on the cloud features, by describing it as a large pool of usable and accessible virtualized resources such as hardware, development platforms, and services. On the other hand, Buyya, Yeo, and Venugopal (2008), proposed their definition of the cloud based on their observation of what the cloud is promising to be:

“A cloud is a type of parallel and distributed system consisting of a collection of inter connected and virtualized computers, that are dynamically provisioned and presented as one or more unified computing resource(s) based on service-level agreements established through negotiation between the service provider and consumers.”

While the cloud definitions differ in which some are business based definitions and some are technical based, there is an

agreement on a definition of cloud computing provided by the National Institute of Standards and Technology (NIST):

“Cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction. This cloud model promotes availability and is composed of five essential characteristics, three service models, and four deployment models” (Mell & Grance, 2011).

Kaplan (2008), predicted that cloud computing will be the next transformation for building virtualization enabled software (Geelan, 2008). Therefore, considering the cloud potentials in changing the future of computing, it is essential to understand the main characteristics of cloud services and deployment models in order to form accurate selection criteria that would allow users to choose the services that best fit their business needs.

The key goal of this research paper is to provide cloud current and potential users with the basic knowledge about the similarities and differences of the cloud deployment models and services, and the main benefits and downsides of the cloud. This research aims to clear the ambiguity in terms of whether or not the user should adopt this technology, and whether or not the required service is suitable for the user. This paper also describes the main characteristics of cloud computing and cloud services, while differentiating the services and deployment models of the cloud. In addition, this paper highlights the advantages and disadvantages of cloud computing in order to provide clarifications for potential users before adopting this technology. Moreover, this research emphasizes the positive aspects of cloud computing, by providing users with suggestions to overcome the limitations and downsides of cloud services in order to achieve the highest benefits of this technology.

II. CLOUD COMPUTING

1) Cloud Characteristics

The cloud has specific characteristics that makes it distinct from other similar services. While many scholars and practitioners have attempted to describe the cloud characteristics, NIST provided a list of the main characteristics that should be available in a service to be considered a cloud. These characteristics include:

- On-demand self-service, which means that the provision of cloud resources has to be on demand whenever it is required by the users, and can be accessed through an online control panel;
- A broad network access, which means that the service has to be available for access from a wide range of devices and from different locations, whether from the internet or the private network;
- Resources are pooled, according to NIST, the provider's computing resources have to be pooled so they can serve multiple users by using a multi-tenant model according to the users demand. In general, the users have no control or knowledge over the exact location of the provided resources, however, they may be able to specify location at a higher level of abstraction (Mell & Grance, 2011);
- Rapid elasticity, which means that the service has to have the elasticity to scale larger or smaller, depending on the users/business needs;
- Measured service, which means that the service has to be measurable based on the user utilization since users are billed on a pay-per-use basis as if they are using a utility service (Keps, 2011).

2) Virtualization

Virtualization plays a significant role in enabling the cloud technology, by abstracting computer, network, and storage platforms from the underlying physical hardware (Vozmediano, Montero, & Llorente, 2012). In addition, virtualized infrastructures support server consolidation and on-demand provisioning capabilities, which results in high server utilization rates and significant cost reduction (Vozmediano et al., 2012). Virtualization environments are essential to running cloud data services (Matveev, 2010), since this technology allows multiple users of the cloud to use the same resources without having to duplicate certain aspect of the hardware (Reavis, 2012).

3) Cloud Deployment Models

Cloud deployment is the way the cloud is designed so it can provide a particular service (Naghavi, 2012). Choosing the deployment model is determined by the organizational structure and the main purpose of obtaining the cloud services. Thus, the deployment models are considered user specific (Armbrust, Fox, Griffith, Joseph, Katz, Konwinski, Lee, Patterson, Rabkin, Stoica, & Zaharia, 2009; Naghavi, 2012). In cloud computing, four main deployment models are often distinguished; these four models are: public cloud, private cloud, community cloud, and hybrid cloud. Each deployment model has its own characteristics that determine its suitability to a specific organization.

a) Public Cloud

The public cloud is based on a standardized cloud computing model, in which the resources are provisioned by a third party provider, and shared by the users. In addition, the public cloud is hosted on the premises of the cloud service provider (Mell & Grance, 2011). The users of a public cloud are billed on pay-per-use basis, which makes the public cloud more affordable and thus, preferable especially for small businesses. Unfortunately, since the public cloud is based on sharing resources and infrastructure with multiple organizations, it rises up security and compliance concerns for some users (Naghavi, 2012). In addition, users in public cloud lack control and visibility over the computing infrastructure (Naghavi, 2012). Examples of public cloud –also known as external cloud- include Amazon Web Services, Google App Engine, and Customer Relationship Management (CRM) solutions such as Salesforce.com.

b) Private Cloud

Since the public cloud is not suitable for the security concerned users, the private cloud is considered an alternative solution. Unlike the public cloud, the private cloud provides an infrastructure that is dedicated to a single user or an organization, and can be managed internally, externally, or by a third party. The high security level in the private cloud is attributed to the solely operating infrastructure to each user (Armbrust et al., 2009). While this deployment model is more secure, it is more expensive than the rest of the deployment models, which makes it less suitable to small and temporary business, and more suitable to large and steady business.

c) Community Cloud

Similar to the public cloud, the community cloud also provides shared resources and infrastructure. However, in the community cloud, the resources and infrastructure are shared only with organizations that have similar requirements or organization of the same group. For instance, all the government organization within a specific state can share the same infrastructure of a cloud in order to manage data related to the residents in that same state (Prasad, Choi, & Lumb, 2009). The community cloud rises up some security, policy, and compliance concerns which makes it less suitable for security concerned users.

d) Hybrid Cloud

The hybrid cloud combines different cloud deployment models. For instance, the hybrid cloud can provide a combination between the private and the public cloud, in which case an organization can host the security critical data on the private cloud, and the less security critical data on a public cloud. In addition, the cloud systems are connected in a manner that allows data be easily moved or migrated from one deployment model to another. This makes the hybrid cloud in the lead among all other cloud deployment modes (Armbrust et al., 2009; Naghavi, 2012). Although there are more than one cloud in the hybrid cloud, each cloud retains its unique entity (Naghavi, 2012), while remaining bonded together in a way that enables data and application portability (Mell & Grance, 2011). In addition, in the hybrid

cloud, there is a significant need for each cloud to function in a synchronized manner in order to handle any sudden rise in computing requirements (Naghavi, 2012).

III. CLOUD DATA SERVICES

Cloud computing is a broad term that describes a wide range of services, however, it is often described as a stack of services or layers (Keps, 2011). Each layer of the cloud allows users to respond to business demands in an effective and efficient manner. These layers are: Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS).

1) Software as Service (SaaS)

SaaS is a software delivery methodology that provides users with multi access as a “one-to-many model” (Keps, 2011) to software and their functions over the internet. By delivering software and application services as a web-service, SaaS eliminates the need to install and run the application on the users’ computers, and thus, simplifies maintenance, support, upgrade, and data management. According to many statistics and reports, SaaS is the most rapidly growing cloud model (Keps, 2011), which indicates that SaaS is the most common model of cloud data services. In addition, when compared with other cloud data services, SaaS is considered rather developed, as other cloud services are still in the initial phase (Matveev, 2010). Mell and Grance (2011), explained the roles of SaaS as providing access to application from various locations through a thin client interface such as web browser, or through a program interface. In SaaS, the users do not have any control or management over the underlying cloud infrastructure including network service, operating system, storage, and the applicable privileges and capabilities (Mell & Grance, 2011).

Uses: SaaS is suitable for applications that mainly provide a communication line between the organization and the outside world (Keps, 2011), such as email software and video conferencing. In addition, suitable SaaS fields include applications that depend on mobile access such as CRM, web analytics, and web content management (Velte, Velte, & Elsenpeter, 2009). Moreover, SaaS can be implemented to software that are to be used for a limited period of time, or for temporary projects (Keps, 2011). On the other hand, SaaS may not be a suitable solution to other situations such as: applications that require an extreme processing of data; applications where regulations do not permit data to be hosted externally; and similar applications that already fulfill the users need (Keps, 2011).

2) Platform as a Service (PaaS)

PaaS provides a platform for creating web applications over the internet, without having the complexity of buying, building, and maintaining the software and infrastructure (Choo, 2010; Keps, 2011; Leavitt, 2009). The PaaS allows software developers to write and deploy their own applications by providing them with

the tools to program using a programming language that is supported by PaaS (Keps, 2011; Louridas, 2010). Similar to SaaS, users of PaaS do not have control or access over the underlying infrastructure that is used to host their applications. In addition, PaaS provides a multi-tenant deployment infrastructure for applications, while providing a simple management framework and shared infrastructure for applications across organizations (Baksh, 2009). Moreover, PaaS model provides the users with the flexibility to build and deploy standard sets of shared components with a consistent software stack (Wada, Fekete, Zhao, Lee, & Liu). Furthermore, PaaS allows users to integrate, test, and modify the web services and database applications, along with providing tools to handle billing and subscription management (Keps, 2011).

Uses: PaaS is suitable mostly for projects that require interaction with external parties, or where multiple developers need to work on the same project (Keps, 2011), which makes some project phases good candidates for PaaS such as application designing, development, testing, and deployment (Keps, 2011; Velte et al., 2009). In addition, PaaS is suitable for projects that require team collaboration, data integration, and storage applications (Velte et al., 2009). On the other hand, PaaS may not be a good option for applications that require high portability in terms of their hosting location (Keps, 2011). Moreover, PaaS is not suitable for applications where hardware and software customization is critical to the application performance (Keps, 2011).

3) Infrastructure as a Service (IaaS)

IaaS delivers an on-demand scalable hosted infrastructure with virtual server and storage resources, without having to buy and install the required resources and equipment (Keps, 2011). NIST defined IaaS as a cloud computing delivery model in which the consumer uses processing power, storage, load balancers, firewall, cables networking components or middleware (Mell & Grance, 2011), without having control over the cloud infrastructure beneath them (Nasr & Ouf, 2012). Naghavi (2012), described the IaaS as the provisioning of hardware related services such as storage and virtual servers, on a pay-as-you-go basis. In addition, IaaS services include simplifying and optimizing infrastructure operation, since the applications are not tied to a specific physical server, and data are not attached to a single storage device in the IaaS model (Vozmediano et al., 2012). IaaS provides several benefits from the infrastructure management perspective such as server consolidation to reduce hardware and the physical infrastructure’s equipment (Vozmediano et al., 2012). By using IaaS, users are provided with a reconfigured and secured infrastructure (Matveev, 2010).

Uses: Since IaaS provides users with their required infrastructure, IaaS is beneficial for organizations that require scalability in their infrastructure and where they have unstable demand on the infrastructure, such as new business that have a possibility of expanding in the future (Keps, 2011). In addition, businesses with limited capital make good candidates for IaaS (Keps, 2011) since it provides scalability and the service is on a pay-as-you-go basis (Velte et al., 2009). Moreover, IaaS is

suitable for temporary businesses and business that plan on moving to a different location (Keps, 2011; Velte et al., 2009). However, users should take into their consideration the regulation of offshore IaaS providers (caps, 2011). Even though IaaS provides users with many advantages in terms of infrastructure demands, IaaS might not be the best option for organizations that require a high level of performance and a dedicated hosted infrastructure with high capacity (Keps, 2011).

IV. ADVANTAGES VS. DISADVANTAGES

A) *Cloud Data Services Advantages*

There are many advantages and benefits of cloud data services. However, in order to attain these benefits, it is critical that each aspect of the cloud platform supports the key design principles and characteristics of cloud computing (Hogan, 2008). One of the key design principles is scalability (Mell & Grance, 2011), which is a critical aspect of nowadays databases and business (Harrison, 2010). The cloud provides elastic scalability for businesses (Leavitt, 2009; Wada, Fekete, Zhao, Lee, & Liu, 2011) which allows them to scale rapidly whether they are scaling larger or smaller without the associated cost and complexity (Harrison, 2010; Keps, 2011; Leavitt, 2009; Mell & Grance, 2011). In addition, the business can add more users and capabilities, without the traditional method of adding more servers to expand the capacity of usage. This creates an economic friendly pattern, especially for large databases, by minimizing the cost (Choo, 2010; Harrison, 2010) since the cloud model provides its services without the expense of installing, maintaining and upgrading an on-site infrastructure and servers. Moreover, all the resources including networking requirement and servers are shared in the cloud, which also result in minimizing costs (Hogan, 2008; Leavitt, 2009). More importantly, the cloud provides a wide range of services without the complexity of buying the hardware and software (Keps, 2011; Leavitt, 2009).

B) *Cloud Data Services Disadvantages*

Although the cloud provides many services that can be significantly beneficial to many organizations, there are some downsides of this technology. The most common concern in cloud computing is security (Chow, Golle, Jakobsson, Masuoka, Molina, 2009; Naghavi, 2012; Reavis, 2012), which actually varies in cloud computing based on the deployment models and the cloud service (Kandukuri, Paturi, & Rakshit, 2009; Ken, 2009). Many security issues in the cloud are attributed to the fact that all the users or the organization's information are hosted off premises and by a third-party, which means that users lack control over the infrastructure (Naghavi, 2012). There are also some privacy concerns with the cloud (Matveev, 2010), especially since the data stored in the cloud is considered a target for individuals with malicious intent (Huth & Cebula, 2011).

Chow et al. (2009), categorized the security concerns in the cloud into three categories; these categories are: traditional

security, availability, and third-party data control. The traditional security includes regular computer and network threats and risks, such as attacks on the virtual machine level used by the cloud vendor; attacks on the cloud platform level, such as SQL-injections and cross-site scripting; attacks on the provider and user level such as Social Engineering; and attacks on the infrastructure level (Choo, 2010; Chow et al., 2009; Naghavi, 2012). Since cloud resources are virtualized, different users end up sharing the same infrastructure, which rises up concerns related to architecture, resource isolation, and data segregation (Lee, 2012).

The second category is availability concerns, which involves the data being available all the time (Chow et al., 2009; Lee, 2012). Cloud risks that fall in the availability category include server outage, data integrity, and natural disasters (Choo, 2010). In addition, the cloud requires constant internet connection in order to obtain access to the data stored in the cloud, which could be a concern since networks are subjected to many issues that could impact the connectivity (Jamil, & Zaki, 2011). Moreover, the cloud does not respond with low-speed internet connection (Jamil, & Zaki, 2011).

The last category is third-party concerns, which include legal and privacy implications, since cloud users lack transparency control over their data (Chow et al., 2009). In addition, the lack of clear definition of the responsibilities of users and providers may evoke conflict related to third-party concerns in the cloud (Lee, 2012). There are also issues related to software licenses which are based on the number of installations or users. Therefore, the cloud providers need to acquire more licenses than really needed at a given time (Lee, 2012).

V. DISCUSSION AND SUGGESTIONS

The cloud offers a verity of services and deployment models. Although cloud services are determined by the user's needs, it is critical to compare the user's needs with the suitability of the cloud service and deployment model. Therefore, it is essential that users understand the characteristics of the cloud and the desired service before adopting this technology. In addition, the cloud deployment models should be determined based on the criticality of the data that will be stored in the cloud, and the organization's structure. This means that users' who prefer spending lower budget on the cloud service, and have less sensitive data and low security concerns, are considered good candidates for the public cloud. In addition, the candidate users of the public cloud who prefer sharing the resources with similar organizations or business in the same field are considered good candidates for the community cloud. This distinguishes the use of public and community cloud in terms of candidacy. On the other hand, users with more sensitive data and more security concerns, and have no restrictions over their budget in terms of the services they get, are good candidates for the private cloud. Users who seek a combination of the deployment models, for instance, the security of the private cloud and the low cost of the public cloud, make good candidates for the hybrid cloud since users can use more than one deployment model. In addition, the hybrid cloud is

suitable for business with high and low sensitivity of data, since they can host the sensitive data in the private cloud while hosting the less sensitive data in the public cloud.

Choosing the right cloud data service depends on the user's need, and more importantly, how suitable the service is to the user's need or business. This means that users who are in quest for any of the cloud services and characteristics have to consider the suitability of the service. For instance, SaaS would not be a good option for applications that require extreme data processing (Keps, 2011). In fact, some users consider SaaS while their current applications fulfill their needs. Therefore, it is critical to layout all aspects of all data services and compare the objective of adopting cloud technology with current available service. In addition, considering the cloud limitations is considered with significant. For instance, users who are seeking the PaaS service have to consider the programming languages supported by PaaS. In addition, users who are seeking IaaS should take into their consideration that this service could have some limitations for business who need a dedicated infrastructure.

There are many advantages of cloud computing, and many benefits that make this technology desirable to many users. In addition, the cloud technology has managed to overcome the limitations of the traditional database, and provides scalable and flexible alternative without the cost, time, and effort of the traditional database. Although, the cloud technology offers a wide range of advantages, there are some downsides of this technology. The main concern for cloud computing –mainly the public cloud- is security that is mostly attributed to the lack of physical control over the data and infrastructure, and other aspects. Therefore, it is essential that potential cloud users consider both the negative and the positive sides of the cloud before adopting this technology. In addition, it is critical that users seek clarification about the Service Level Agreement (SLA), which is the document that defines the relationship between the user and the provider. Since the SLA provides clarification in terms of the user's requirement, complex issues, and many services related areas, it is critical that the users fully understand each aspect of the SLA. In addition, users are advised to consider reliable cloud providers, since outsourcing the data in the cloud means involving a third-party, which could result in many of the risks mentioned in the paper. Moreover, it is advised that current and future cloud users consider reliable security measure.

Security is a controversial subject in all data storage technologies, however, the security risks in the cloud can be mitigated and avoided by having a sufficient risk management plan and a business continuity plan to ensure that the critical functions of the business continue in case of disasters. Potential cloud users should not be overwhelmed by the security issues, since the cloud offers a verity of innovative business solutions. In addition, the security issues apply to all similar technologies, and not limited to cloud computing. The only aspect however, that makes the cloud subject to more concerns, is the ownership of data. Therefore, potential users of the cloud are advanced to clarify this ambiguity with the cloud provider before seeking this technology.

The cloud has many potentials, and relatively many advantages besides from the ones mentioned in this paper. Therefore, it is significant that users compare the deployment models, services, advantages, and disadvantages of this technology in order to have an accurate decision model for whether to adopt this service, which service is appropriate, and which deployment model is sufficient for the business needs.

I. CONCLUSION

The cloud is a rapidly developing technology that provides an alternative to the traditional databases, without the scalability limitations associated with the traditional databases. Although many scholars and practitioners have different definitions of the cloud, there is an agreement on the definition provided by NIST. In addition, NIST specified the standardized characteristics that define cloud services. Many of the cloud characteristics are attributed to the virtualization technology that allows multiple users of the cloud to use the same resources without hardware and software duplications.

The cloud has four main deployment models that allow the cloud to provide its services; these models include public, private, community, and hybrid cloud. The cloud deployment models vary in terms of cost and security level. For instance, the public and community cloud carry some security concerns due to the shared infrastructure. Thus, they are more suitable for users with less sensitive data. In addition, the shared infrastructure means that users are sharing the resources, and thus, have lower cost. On the other hand, the private cloud is more secured due to the dedicated infrastructure to each user. Thus, it is more suitable for users with sensitive data or users with high security concerns. Although the private cloud seems more preferable due to the high security as apposed the community and public cloud, the dedicated infrastructure makes it more expensive than other deployment models. The variety of security and cost, particularly among the public and the private cloud, makes the hybrid cloud more desirable since it provides a combination of two or more cloud services. This allows users to host the sensitive data in the private cloud and the remaining data in the public cloud. Thus, result in achieving the required security level and cots saving since the cloud users are billed on a per-per-use basis.

The cloud provides a wide range of services that include SaaS, PaaS, and IaaS. Cloud services vary in terms of uses and suitability. It is critical that users understand the characteristics of the desired cloud service, and its suitable uses in order to decide whether to adopt the service. More importantly, it is critical that users understand the advantages and disadvantages of the cloud services in order to achieve the height benefits, yet mitigate or avoid the possible risks. This includes choosing the appropriate cloud service and deployment model in order to benefit the business, while choosing a reliable cloud service provider and considering security measures and a risk management plan, since security is the most common concern in the cloud. In addition, it is critical to review the SLA while choosing the cloud provider, to avoid any ambiguity in terms of the issues and users' requirements.

REFERENCES

- [1] Armbrust, M., Fox, A., Griffith, R., Joseph, A., Katz, A., Konwinski, A., Lee, G., Patterson, D., Rabkin, A., Stoica, I., & Zaharia, M. (2009). Above the clouds: A Berkeley view of cloud computing. *EECS Department. Berkeley: University of California*.
- [2] Baksh, K. (2009). Cisco cloud computing data center strategy, architecture, and solutions. Cisco Systems.
- [3] Buyya R., Yeo, C. S., & Venugopal, S. (2008). Market-oriented cloud computing: vision, hype, and reality for Delivering IT services as computing utilities. *High Performance Computing and Communications* (pp. 5 - 13). Dalian: *IEEE International Conference*.
- [4] Choo, K. R. (2010). Cloud computing: challenges and future directions. Australian National Research and Knowledge Center on Crime and Justice.
- [5] Chow, R., Golle, P., Jakobsson, M., Masuoka, R., Molina, J. (2009). Controlling data in the cloud: Outsourcing computation without outsourcing control. *Proceedings of the 2009 ACM Workshop on Cloud Computing Security* (pp. 85-90). Chicago, IL: ACM.
- [6] Geelan, G. (2008). Twenty experts define cloud computing. *Electronic Magazine*. Retrieved from <http://cloudcomputing.sys-con.com/node/612375/print>
- [7] Harrison, G. (2010). 10 Things you should know about NoSQL databases. TechRepublic.
- [8] Harrison, G. (2010). In search of the elastic database. *Database trends and applications*.
- [9] Hogan, M. (2008). Cloud computing & database: How databases can meet the demand of cloud computing. ScaleDB.
- [10] Huth, A. & Cebula, J. (2011). The basics of cloud computing. Cambridge Mellon University.
- [11] Jamil, D., & Zaki, H. (2011). Cloud computing security. *International Journal of Engineering and Technology (IJET)*, 3(4).
- [12] Kandukuri, B., Paturi, V.R., & Rakshit, A. (2009). Cloud Security Issues. *IEEE International Conference on Services Computing*, (pp. 517-520).
- [13] Ken, N. (2009). 3 Steps to managing data in the cloud. *Information Week*, 40(42).
- [14] Keps, B. (2011). Understanding the cloud computing stack: PaaS, SaaS, and IaaS. Diversity Limited.
- [15] Leavitt, N. (2009). Is the cloud computing really ready for prime time? *IEEE Computer Society*, 15-20.
- [16] Lee, K. (2012). Security Threats in Cloud Computing Environments. *International Journal of Security and Its Applications*, 6(4).
- [17] Louridas, P. (2010). Up in the air: Moving your applications to the cloud. *IEEE Computer Society*.
- [18] Matveev, V. (2010). Platform as a Service – new opportunities for software development companies. Lappeenranta University of Technology.
- [19] Mell, P. & Grance, T. (2011). The NIST definition of cloud computing. *National Institute of Standards and Technology*.
- [20] Naghavi, M. (2012). Cloud computing as an innovation in GIS & SDI: methodologies, services, issues and deployment techniques. *Journal of Geographic Information System*, 4, 597-607.
- [21] Nasr, M., & Ouf, S. (2012). A proposed smart E-Learning system using cloud computing services: PaaS, IaaS and Web 3.0. *International Journal of Emerging Technologies in Learning (iJET)*, 7(3).
- [22] Prasad, B., Choi, E., & Lumb, I. (2009). A taxonomy and survey of cloud computing systems. *Proceedings of the 2009 Fifth International Joint Conference on INC, IMS and IDC* (pp. 44-51). Washington, DC: IEEE Computer Society.
- [23] Reavis, D. (2012). Information evaporation: The migration of information to cloud computing platforms. *International Journal of Management & Information Systems*, 16(4), 291.
- [24] Vaquero, L. M., Merino, L. R., Caceres, J., & Lindner, M. (2009). A break in the clouds: towards a cloud definition. *Strategic Management Journal*, 39(1).
- [25] Velte, T., Velte, A., & Elsenpeter, R. (2009). Cloud computing, a practical approach. US: McGraw-Hill Osborne Media.
- [26] Vozmediano, R., Montero, R., & Llorente, I. (2012). IaaS cloud architecture: From virtualized datacenters to federated cloud infrastructures. *IEEE Computer Society*, 45(12).
- [27] Wada, H., Fekete, A., Zhao, L., Lee, K., & Liu, A. (2011). Data consistency properties and the trade-offs in Commercial Cloud Storages: the Consumers' Perspective. *Proceedings of the 5th Biennial Conference on Innovative Data Systems Research*, (pp. 134-143). Asilomar, California .

Physiological Analysis of Groundnut (*Arachis hypogaea* L.) Genotypes

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Abstract- The present investigation entitled, “Physiological analysis of groundnut (*Arachis hypogaea* L.) genotypes” during summer season of the year 2011 at AICRP on Groundnut, Cotton Improvement Project, M.P.K.V., Rahuri (M.S.). The experiment was conducted in a randomized block design (RBD) with twenty two genotypes replicated two times in single rows with the spacing of 30 x 10 cm. The observations on different plant characters such as Growth studies, phenological traits, dry matter studies, various growth parameters, physiological parameters, protein and oil content, correlation studies and path analysis were recorded. Various morphological and yield contributing characters determine the productivity of the groundnut genotypes. The discussion reveals such characteristic which are important in respect of productivity of groundnut. The total dry matter accumulation in vegetative parts get declined and increased in reproductive parts. The harvest index is the best indicator of photosynthetic translocation efficiency of the genotype. The genotype TAG-24 maintained highest harvest index indicating the better translocation efficiency. The harvest index is considered as one of the criteria for selection of high yielding genotypes. The pod yield of the genotype ICG-8029 and ICG-8428 was mainly due to favorable yield contributing character like number of pods per plant, number of kernels and harvest index. AGR was higher at 60-80 DAS than 40-60 DAS which was declined towards maturity. RGR, NAR decreased progressively with the advancing age of the crop. The LAI increased progressively with the advancing age of the crop and it becomes rapid upto 100 DAS which was again slowed towards maturity. Therefore, The knowledge of crop physiology through various analysis technique, which involves tracing the history of growth and identifying growth and yield factors contributing for yield variation is a vital tool in understanding the crop behaviour. This would be vital to the breeder as well as agronomist in tailoring suitable genotype or management technology for boosting up the growth and yield factors of the crop.

Index Terms- Morpho-physiological traits, physiological parameters, Bio-chemical characteristics, yield and yield contributing characters.

I. INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is the fore most important oil seed crop of India. In terms of area and production, it occupies an important position among the oil seed crops in the world. It has been aptly described as nature's masterpiece of food values containing 36 to 54 per cent oil with 21.36 per cent protein and have an energy value of 2,363 KJ/100 g. The oil is

rich in unsaturated fatty acid (80 %), oleic acid and linoleic acid accounting for 38 to 58 per cent and 16 to 38 per cent, respectively. Among the saturated fatty acids, palmitic acid is the major one with the proportion of about 10 to 16 per cent, higher iodine value (82 to 106) and refractive index values (1.4697 to 1.4719 ND20) indicating its susceptibility to oxidation. Raw groundnut oil has very good stability (Nagraj, 1995). Yield is a complex trait, governed by many traits and there are ample evidences to show that selections directly for grain yield in plants are not easy. Thus, any morphological character that is associated with higher seed yield or which makes a significant contribution to yielding ability would be useful in the improvement of grain yield. The basic studies on the basis of morpho-physiological traits are needed to overcome the yield barriers within the genotypes. There are two physiological approaches to achieve the target of yield potential. One is Physio-genetic, which consists the genotypic differences in physiological traits and another one is the Physio-agronomic relates with the management practices. It is ultimately the morpho-physiological variations, which is important for realizing higher productivity as evident from very high and positive association within traits (Mathur, 1995). Therefore the present study was undertaken with the objectives to evaluate groundnut genotypes for physiological traits.

II. OBJECTIVES

- 1.To study the efficiency of physiological parameters of summer groundnut genotypes.
- 2.To study the dry matter accumulation and its partitioning in summer groundnut genotypes.
- 3.To correlate of physiological parameters with yield.

III. MATERIALS AND METHODS

Twenty two groundnut genotypes were evaluated in RBD with two replications during summer, 2011 at AICRP on Groundnut, MPKV, Rahuri. Dist. Ahmednagar (M.S.) in single row of 5 m length with the spacing of 30 x 10 cm under irrigated condition. FYM @ 10 cartloads hectare⁻¹ was uniformly spread in the field and mixed well by harrowing. The basal dose of N: P: K @ of 25:50:0 kg ha⁻¹ was given at the time of sowing. One weeding and one hoeing were carried out as and when required and field was kept free from weeds. Randomly five plants were selected for recording the observations on morpho-physiological traits. The observations on morphological traits, dry matter production and its distribution and physiological parameters were recorded. The photosynthetic rate (Pn), transpiration rate

(E; $\text{mmol m}^{-2} \text{s}^{-1}$) and stomatal conductance (g_s ; $\mu\text{mol H}_2\text{O m}^{-2} \text{s}^{-1}$) were measured using Infra-red Gas Analyser (IRGA; Model Portable Photosynthesis System LI 6400, LI-COR® Inc, Lincoln, Nebraska, USA). The E and G_s were measured continuously monitoring H_2O of the air entering and existing in the IRGA headspace chamber. Measurements were made at mid day, between 11:30 and 12:00 eastern day time ($1400\text{--}1800 \text{ mmol m}^{-2} \text{s}^{-1}$ PPFD), on top fully expanded third leaf blades. The flow rate of air in the sample line was adjusted to $500 \mu\text{mol s}^{-1}$. The water use efficiency (WUE) was calculated as the ratio of Pn to E. The protein and fat content from seed samples were estimated on NIR spectrometer (ZEUTECH, Germany Make), is a dual-beam near infrared spectrometer. In the NIR spectrometer, the sample is exposed near infrared light of specific wavelengths, selected from up to 19 high precision interference filters. The light penetrated the sample, interacted with sample molecules and is partly absorbed and partly diffusely reflected. The reflected light is measured by a lead sulfide (PbS) detector mounted in a gold coated integrating sphere located above the sample. The mean data analyzed for analysis of variance by Panse and Sukhatme (1985).

IV. RESULTS AND DISCUSSION

The knowledge of crop physiology through growth analysis technique, which involves tracing the history of growth and identifying the growth and yield factors contributing for yield variation, is a vital tool in understanding the crop behavior. This would be vital to the breeder as well as agronomist in tailoring suitable genotype or management technology for boosting up the growth and yield factors of the crop. Therefore, for a complete analysis of biological yield, it is necessary to investigate crop growth through computation of growth indices such as vegetative growth and source, dry matter production and growth analysis. In the present investigation, Plant height, Number of branches plant^{-1} and dry matter production and its distribution in component parts of plant increased progressively with the advancing age of the crop. The rate becomes rapid upto 80 DAS and rather slow after 80 to 100 DAS and 100 DAS to harvest. However, the number of leaves plant^{-1} , leaf area plant^{-1} and leaf area index was declined after 100 DAS due to defoliation of leaves and diversion of dry matter towards pod development (Table 1). The AGR, RGR and NAR were increased between 40-60 and 60-80 DAS and declined towards maturity. The results were conformity with Sahane *et al* (1994).

The vegetative phase governs the overall phenotypic expression of the plant and prepares the plant for next important reproductive phase. The root, stem, branches and leaves, all these parts constitute vegetative phase and perform specific functions. Early vegetative development of crop regulates the reproductive capacity (Awal and Ikeda, 2003). The data on morphological parameters influenced by groundnut genotypes are presented in Table 2 revealed that, the genotype, TAG 24 was found earlier for days to 50% flowering (40) and maturity (119), whereas, ICG-8401 (49) and TPG-41 (130) were late for days to 50% flowering (40) and maturity (119). TPG 41 (21.14 cm), ICG-8401 (24.59 cm) and ICG-8434 (24.74) were dwarf, while, ICG-8440 (30.91 cm), ICG-8444 (30.61 cm) and ICG-8333 (30.42 cm) were tall genotypes. ICG-8542 (11.8), ICG-8483 (10.5),

ICG-8434 (10.2) and ICG-8457 (9.8) had profuse branching genotypes. The number of leaves and leaf area are important in determining the size of photosynthetic system (Lopez *et al*, 1994). In the present study, ICG-8005 (420.9), ICG-8542 (407.4) and ICG-8455 (390.6) recorded higher number of leaves plant^{-1} . The genotype, TPG 41 (24.69 dm^2) maintained higher leaf area followed by ICG-8401 (22.19 dm^2) and ICG-8444 (22.98 dm^2). The results were in accordance with Rajmane (2001).

The pattern of the dry matter production and its distribution into component plant parts has been of phenomenal interest to the research workers engaged in yield analysis. This method has been accepted as one of the standard method of yield analysis. All the physiological processes results into a net balance and accumulation of dry matter and hence, the biological productivity of plant is judged from their actual ability to produce and accumulate dry matter. Rate of growth and growth duration are integrated into conceptual variables largely correlated with yield or total biomass accumulation (Yin *et al.*, 2004; Andrade *et al.*, 2005; Hammer *et al.*, 2005).

The genotype ICG-8434, TAG-24 and ICG-8496 (1.18 g) recorded minimum and genotype TPG-41 (1.84 g) recorded maximum dry matter of roots plant^{-1} (Table 3). Ghosh *et al.* (1997) stated that, there was negligible amount of dry matter partitioning into the roots. In spite of roots, the rate of dry matter production in stem was higher. The genotypes ICG-8354 (10.29 g), ICG-8428 (10.12 g) and ICG 8519 (9.97 g) exhibited higher dry matter partitioning plant^{-1} in stem. TPG-1 ($11.63 \text{ g plant}^{-1}$), TAG-24 ($11.54 \text{ g plant}^{-1}$), ICG-8437 ($11.28 \text{ g plant}^{-1}$) and ICG-8519 ($11.24 \text{ g plant}^{-1}$) recorded maximum dry matter accumulation in leaves. The above findings were in agreement with the results of Kumar and Kumar (1999). After the flowering dry matter was shared in reproductive parts. The total dry matter accumulation in vegetative parts get declined and increased in reproductive parts. The total dry matter accumulation increased in the pods with advancement of crop growth stage. These findings are in conformation with findings of Murthy *et al.* (2002). The genotypes ICG-8029 (19.24 g), ICG-8468 (17.83 g) and ICG-8444 (17.59 g) recorded highest dry matter of pods plant^{-1} at harvest. ICG-8029 (0.327 g/day), ICG-8542 (0.314 g/day) and TAG-24 (0.311 g/day) had higher daily rate dry matter efficiency. Amongst these, even though the genotype ICG-8029 had higher daily rate of dry matter efficiency recorded less amount of relative dry matter efficiency (39.9%), whereas, ICG-8542 (42.7%) and TAG-24 (42.7%) maintained higher percent of relative dry matter efficiency.

The photosynthetic rate (Pn), transpiration rate (E; $\text{mmol m}^{-2} \text{s}^{-1}$) and stomatal conductance (g_s ; $\mu\text{mol H}_2\text{O m}^{-2} \text{s}^{-1}$) were measured using Infra-red Gas Analyser (IRGA; Model Portable Photosynthesis System LI 6400, LI-COR® Inc, Lincoln, Nebraska, USA). The E and G_s were measured continuously monitoring H_2O of the air entering and existing in the IRGA headspace chamber. Measurements were made at mid day, between 11:30 and 12:00 eastern day time ($1400\text{--}1800 \text{ mmol m}^{-2} \text{s}^{-1}$ PPFD), on top fully expanded third leaf blades. The flow rate of air in the sample line was adjusted to $500 \mu\text{mol s}^{-1}$. Nautiyal *et al.* (2012) concluded that, the knowledge on physiological understanding in relation to rate of photosynthesis and productivity and wide genetic variability among various traits, as reported in this study, could be utilized in developing new

potential germplasm and designing ideotype for making the cultivars more adaptive for different water availability areas in semi-arid tropics. In the present investigation, the genotypes, ICG-8496 ($26.580 \mu \text{ mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$), ICG-8483 ($26.360 \mu \text{ mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$) and ICG-8437 ($26.200 \mu \text{ mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$) recorded higher rate of photosynthesis; ICG-8440 ($3.334 \text{ m mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$), ICG-8333 ($3.213 \text{ m mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$) and ICG-8535 ($3.013 \text{ m mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$) recorded higher transpiration rate; ICG-8519 ($0.514 \mu \text{ mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$), ICG-8333 ($0.473 \mu \text{ mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$) and ICG-8455 ($0.457 \mu \text{ mol CO}_2 \text{ m}^{-2} \text{ s}^{-1}$) recorded higher stomatal conductance and ICG-8434 (19.53), TAG-24 (14.83) and ICG-8005 (14.81) recorded higher water use efficiency (Table 4). The adaxial stomatal frequency was higher in ICG-8455 (18.61), ICG-8437 (18.20) and ICG-8333 (18.10), whereas, abaxial frequency was higher for ICG-8428 (12.70), ICG-8455 (12.40) and ICG-8050 (12.20).

The chemical compounds most important in the conversion of light energy to chemical energy are the pigments that exist within the chloroplast (B. Glass, 1961). The, chl 'a' and 'b' covers majority of the portion of chloroplast. These two pigments are responsible to absorb light energy in the form of quantum which is responsible for exchange of electron from their ground state to the excited state. The genotype ICG-8437 (2.417 mg g^{-1}), ICG-8333 (2.308 mg g^{-1}), ICG-8029 (2.234 mg g^{-1}) and ICG-8455 (2.166 mg g^{-1}) recorded significantly highest chlorophyll-a content over all the genotypes (Table 5). The highest chlorophyll-b content was recorded by the genotypes ICG-8457 (0.589 mg g^{-1}), ICG-8333 (0.515 mg g^{-1}), ICG-809 (0.486 mg g^{-1}) and ICG-8496 (0.484 mg g^{-1}). The total chlorophyll content was highest in the genotypes, ICG-8333 (3.201 mg g^{-1}), ICG-8029 (3.168 mg g^{-1}) and ICG-8437 (3.058 mg g^{-1}). Groundnut contains 46-52% oil, 17-25% protein and 15-20% carbohydrate and rich in vitamin B and E (Prathiba and Reddy, 1994). In the present investigation, protein content amongst the genotypes ranged between 23.51 to 25.90%, while oil content was ranged between 45.61 to 50.59%. The genotypes, ICG-8496 (25.90 %), ICG-8440 (25.25%), ICG-8050 (25.23 %), ICG-8457 (25.17 %), ICG-8455 (25.13 %), ICG-8406 (25.08 %) and TAG-24 (25.05 %) were found superior in respect of protein content, whereas, ICG-8444 (50.59 %) and ICG-8455 (49.55%) were superior for oil content.

The generative growth constitutes the development and growth of reproductive parts. From yield point of view, this phase assumes significance as the sink lies in the reproductive parts. Hence, the detailed observations were made on various aspects of generative growth at the stage of maturity. The number of flowers, pegs, and pods are the most important yield components that affect the yield potential of groundnut (Awal and Ikeda, 2003). Bell *et al.* (1991) reported that groundnut cultivars showed a wide range in the number of reproductive components at different developmental stages. In the present study, the genotype ICG-8029 (44) recorded the highest number of pods plant⁻¹ followed by ICG-8496 (31), ICG-8455 (29) and ICG-8519 (29). The genotype ICG-8029 (61.9 g/100 kernels), ICG-8542 (54.6 g/100 kernels), ICG-8444 (53.8 g/100 kernels) and TPG-41 (53.8 g/100 kernels) were found bold seed size. The highest dry pod yield (g) per plant was recorded by the genotypes ICG-8542 (21.6 g), ICG-8050 (21.1 g) and ICG-8005 (21.0 g). The genotypes, ICG-8029 (75.53 q ha^{-1}), ICG-8428 (68.77 q ha^{-1}),

ICG-8437 (66.05 q ha^{-1}) and ICG-8468 (65.08 q ha^{-1}) were superior for dry pod yield. The performance of different genotypes in respect of harvest index was statistically significant. It was ranged between 38.99 and 65.32 %. The lowest and the highest harvest index being in genotypes ICG-8406 and TAG-24, respectively. The shelling percentage was ranged between 67.5 and 73.00 %. The genotypes, ICG-8455 (73.00%), ICG-8483 (72.50%) and ICG-8468 (72.50%) recorded higher shelling percentage (Table 6). Jadhav and Sengupta (1991) reported that pod yield was significantly correlated with peg number per plant, total pod number per plant, filled pod number per plant, 100 seed weight and total reproductive biomass.

From the results obtained in the present investigation, it was concluded that, the morpho-physiological characters *viz.*, plant height, number of branches and leaf area are mainly responsible for growth in groundnut. The physiological processes like photosynthesis, stomatal conductance, transpiration rate etc. were found at highest rate in some genotypes which resulted in highest yielding. The genotype ICG-8029 shows highest dry pod weight at harvest. The genotypes ICG-8496 and ICG-8444 recorded highest protein and oil content.

The genotypes ICG-8029 and ICG-8428 recorded the highest dry pod yield may be due to photosynthetic rate, dry matter accumulation, and chlorophyll content. The genotypes ICG-8444 and ICG-8496 were rich in oil and protein content and also on account of phenological traits, dry matter accumulation, photosynthetic rate, stomatal frequency. The genotype ICG-8029 with highest pod dry matter partitioning at harvest is high yielding. Therefore, the genotypes ICG-8029 and ICG-8428 may be utilized for the yield heterosis in further breeding programme, whereas the genotypes ICG-8496 and ICG-8444 for improving protein and oil content in further breeding programme.

V. CONCLUSION

The genotypes ICG-8029 and ICG-8428 recorded the highest dry pod yield may be due to photosynthetic rate, dry matter accumulation, chlorophyll content.

The genotypes ICG-8444 and ICG-8496 were rich in oil and protein content and also on account of phenological traits, dry matter accumulation, photosynthetic rate, stomatal frequency.

The genotype ICG-8029 with highest pod dry matter partitioning at harvest is high yielding.

Therefore, the genotypes ICG-8029 and ICG-8428 may be utilized for the yield heterosis in further breeding programme, whereas the genotypes ICG-8496 and ICG-8444 for improving protein and oil content in further breeding programme.

REFERENCES

- [1] Andrade, F.H., Sadras, V.O., Vega, C.R.C. and Echarte, L. Physiological determinants of crop growth and yield in maize, sunflower and soybean: Their application to crop management, modeling and breeding. *J. Crop Impr.* 14:51-101 (2005).
- [2] Awal, M.A. and Ikeda, T. Controlling canopy formation, flowering, and yield in field-grown stands of peanut (*Arachis hypogaea* L.) with ambient and regulated soil temperature. *Field Crops Res.* 81: 121-132(2003).
- [3] Ghosh, P.K., Mathur, R. K., Ravindra, V. and Gor, H. K.. Dry matter accumulation, nitrogen uptake and their partitioning pattern in Virginia

- groundnut (*Arachis hypogaea* L.). *Indian J. Pl. Physiol.* 2(3): 234-236 (1997).
- [4] Glass, B. 1961. Summary. In W. McElroy and B. Glass (eds), *Light and life*. Johns Hopkins Press, Baltimore, Md. Gregory, F. G. 1926. The effect of climatic conditions on the growth of barley. *Ann. Bot.* 40: 1-26 (1926).
- [5] Hammer, G.L., Chapman, S., Oostero, E. van and Podlich, D.W. Trait physiology and crop modelling as a framework to link phenotypic complexity to underlying genetic systems. *Aust. J. Agr. Res.* 56:947–960(2005).
- [6] Jadhav, B.B. and Sengupta, V.K.. Effect of light stress on peanut productivity. *Ann. Pl. Physiol.* 5(2): 194-201 (1991).
- [7] Kumar, S. and Kumar, A.. Dry matter partitioning in different plant parts of Spanish and Virginia groundnut cultivars in mid-western plains of U.P.J. *Oilseed Res.* 16(2) : 354-357 (1999).
- [8] Lopez, F. B., Y. S. Chauhan and C. Johansen. Effects of timing of drought stress on short duration pigeonpea. III. Plant survival, leaf area and canopy light interception. *Field Crop Res.* (1994).
- [9] Mathur, R.. Genetic variability and correlation studies in segregating generations of cowpea. *Madras Agric. J.* 82: 150-152 (1995).
- [10] Nagraj, G.. Paper presented on soil and oil quality of Indian groundnut in ICRISSAT Seminar, Hyderabad. pp. 1-2 (1995).
- [11] Nautiyal, P.C., Ravindra, V., Rathnakumar, A.L., Ajay, B.C. and Zala, P.V.. Genetic variations in photosynthetic rate, pod yield and yield components in Spanish groundnut cultivars during three cropping seasons. *Field Crops Res.* 125: 83–91 (2012).
- [12] Panse, V. G. and Sukhatme, P. V.. *Statistical Methods for Agricultural Workers*. ICAR Rev. Ed. By Sukhatme, P. V. and Amble, V. N., pp. 145-156 (1985).
- [13] Prathiba, K.M. and Reddy, M.U.. Nutrient composition of groundnut cultures (*Arachis hypogaea* L.) in relation to their kernel size. *Plant Foods for Human Nutrition.* 45(4): 365-369 (1994).
- [14] Rajmane, V. S.. Crop physiological studies in kharif groundnut (*Arachis hypogaea* L.). M.Sc. (Agri.) thesis submitted to M.P.K.V., Rahuri (M.S.) (2001)
- [15] Sahane, D.V., Dhonukshe, B. L. and Navale, P. A.. Studies on physiological analysis of growth and yield in horsegram. *J. Maharashtra agric. Univ.*, 19 (1): 92-94 (1994).
- [16] Yin, X., Struik, P.C. and Kropff, M.J.. Role of crop physiology in predicting gene-to-phenotype relationships. *Trends Plant Sci.* 9:423–432 (2004).

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Table 1 Average performance of groundnut genotypes for morpho-physiological traits at various stages of growth

Name of the character	40 DAS	60 DAS	80 DAS	100 DAS	At Harvest
<u>Vegetative growth and source</u>					
Plant height (cm)	10.06	18.78	27.69	28.74	27.74
Number of branches plant ⁻¹	4.00	5.20	7.40	8.40	8.40
Number of leaves plant ⁻¹	53.8	133.7	214.4	323.4	310.9
Leaf area plant ⁻¹ (dm ²)	7.86	12.44	14.13	21.32	20.41
<u>Dry matter accumulation (g plant⁻¹)</u>					
Roots	0.17	0.32	1.27	1.45	1.30
Stem	1.62	3.47	7.98	9.78	9.36
Leaves	2.61	5.49	10.04	12.40	10.26
Pods	--	--	5.82	10.35	15.62
Total	4.40	9.28	25.11	33.98	36.54
Daily rate of dry matter production	0.110	0.155	0.314	0.339	0.296
<u>Growth parameters</u>					
Absolute growth rate (g day ⁻¹)	--	0.245	0.792	0.441	0.106
Relative growth rate (g day ⁻¹)	--	0.016	0.022	0.007	0.002
Net assimilation rate	--	0.012	0.026	0.010	0.007
Leaf area index (LAI)	2.63	4.15	4.72	7.11	6.78

Table 2. Morphological parameters influenced by groundnut genotypes.

Sr. No.	Genotype	Days for 50% flowering	Days of physiological maturity	Plant height (cm)	Number of branches plant ⁻¹	Number of leaves plant ⁻¹	Leaf area plant ⁻¹ (dm ²)
1.	TAG-24	40	119	29.96	8.3	347.6	20.07
2.	ICG-8434	43	122	24.74	10.2	338.5	20.27
3.	ICG-8483	45	124	28.40	10.5	319.0	20.69
4.	ICG-8455	47	120	25.35	7.0	390.6	21.29
5.	ICG-8005	45	124	29.85	8.0	420.9	20.55
6.	ICG-8542	45	123	29.01	11.8	407.4	21.93
7.	ICG-8440	48	121	30.91	8.4	344.5	19.56
8.	ICG-8519	45	120	28.14	7.7	374.6	20.58
9.	ICG-8428	43	124	28.07	9.8	342.7	21.76
10.	ICG-8401	49	122	24.59	8.0	341.1	22.19
11.	ICG-8029	43	123	29.20	7.3	331.7	21.09
12.	ICG-8496	45	120	25.87	7.0	321.1	20.50
13.	ICG-8468	43	123	25.67	9.6	295.2	20.80
14.	ICG-8333	45	121	30.42	6.1	267.0	20.70
15.	ICG-8437	43	125	28.19	9.0	266.2	21.61
16.	ICG-8444	45	127	30.61	9.4	284.0	21.98
17.	ICG-8457	43	123	29.89	9.8	265.4	21.86
18.	ICG-8535	44	120	28.64	7.4	254.6	21.28
19.	ICG-8406	45	128	29.49	6.8	263.6	21.73
20.	ICG-8354	43	127	27.31	7.3	291.8	21.91
21.	ICG-8050	44	123	25.78	7.4	281.7	21.92
22.	TPG-41	45	130	21.14	8.8	367.2	24.69
	Mean	44.5	124	27.74	8.4	323.4	21.32
	S.E. ±	1.201	0.736	1.774	0.943	25.867	0.319
	C.D. at 5 %	3.603	2.208	5.322	2.892	77.601	0.957
	CV %	3.81	1.00	9.04	15.87	11.30	2.12

Table 3. Dry matter production and it's distribution in component parts of plant in groundnut genotypes.

Sr. No.	Genotype	Dry matter accumulation per plant ⁻¹ (g)					Daily dry matter production	Relative dry matter efficiency (%)
		Roots	Stem	Leaves	Pods	Total		
1.	TAG-24	1.18	9.28	11.54	14.92	36.92	0.311	54.8
2.	ICG-8434	1.18	9.08	10.12	15.53	35.91	0.294	36.0
3.	ICG-8483	1.30	9.89	9.13	14.64	34.96	0.282	34.2
4.	ICG-8455	1.28	8.78	10.36	13.49	33.91	0.283	34.8
5.	ICG-8005	1.36	9.23	10.54	13.31	34.44	0.284	36.9
6.	ICG-8542	1.25	9.92	10.19	17.35	38.71	0.314	42.7
7.	ICG-8440	1.26	8.24	10.18	14.25	33.93	0.280	37.1
8.	ICG-8519	1.23	9.97	11.24	13.66	36.10	0.301	33.9
9.	ICG-8428	1.26	10.12	9.98	16.62	37.98	0.306	35.2
10.	ICG-8401	1.25	9.03	9.18	17.39	36.85	0.302	36.9
11.	ICG-8029	1.21	9.73	10.14	19.24	40.32	0.327	39.9
12.	ICG-8496	1.18	8.34	8.95	16.10	34.57	0.287	34.0
13.	ICG-8468	1.25	8.66	9.98	17.83	37.72	0.306	37.6
14.	ICG-8333	1.29	9.23	9.24	16.62	36.38	0.300	36.4
15.	ICG-8437	1.31	9.65	11.28	16.83	39.07	0.312	32.9
16.	ICG-8444	1.37	9.11	9.56	17.59	37.63	0.296	31.9
17.	ICG-8457	1.28	9.18	9.38	15.08	34.92	0.284	33.7
18.	ICG-8535	1.41	8.42	10.74	13.94	34.51	0.287	31.6
19.	ICG-8406	1.27	9.32	10.45	15.21	36.25	0.283	30.5
20.	ICG-8354	1.26	10.29	10.07	17.09	38.71	0.303	37.6
21.	ICG-8050	1.30	9.14	9.64	17.10	37.18	0.302	36.5
22.	TPG-41	1.86	8.34	11.63	14.56	36.39	0.279	34.0
Mean		1.30	9.32	10.16	15.84	36.62	0.296	36.3
S.E. ±		0.068	0.354	0.423	0.923	0.703	0.052	0.031
C.D. at 5 %		0.204	1.062	1.269	2.769	2.109	NS	0.093

Table 4. Physiological parameters as influenced by groundnut genotypes.

Sr. No.	Genotype	Photosynthetic rate (μ mol CO ₂ m ⁻² s ⁻¹)	Transpiration rate (m mol CO ₂ m ⁻² s ⁻¹)	Stomatal conductance (μ mol CO ₂ m ⁻² s ⁻¹)	WUE	Stomatal frequency	
						(mm ² /leaf area) Adaxial	Abaxial
1.	TAG-24	25.980	1.752	0.359	14.83	16.90	10.40
2.	ICG-8434	26.390	1.351	0.233	19.53	14.30	11.60
3.	ICG-8483	26.360	1.737	0.267	15.18	15.53	11.60
4.	ICG-8455	25.860	2.652	0.457	9.75	18.61	12.40
5.	ICG-8005	24.600	1.661	0.290	14.81	15.50	11.40
6.	ICG-8542	24.230	2.310	0.428	10.49	13.90	10.60
7.	ICG-8440	22.180	3.334	0.450	6.65	17.10	11.20
8.	ICG-8519	22.690	2.524	0.514	8.99	16.50	11.90
9.	ICG-8428	25.790	2.362	0.441	10.92	15.90	12.70
10.	ICG-8401	24.390	2.121	0.354	11.50	16.70	11.30
11.	ICG-8029	25.570	2.007	0.327	12.74	17.10	11.90
12.	ICG-8496	26.580	2.758	0.420	9.64	17.70	11.60
13.	ICG-8468	25.310	2.144	0.355	11.81	17.50	11.90
14.	ICG-8333	25.250	3.213	0.473	7.86	18.10	11.60
15.	ICG-8437	26.200	3.224	0.455	8.13	18.20	11.40
16.	ICG-8444	25.080	2.640	0.374	9.50	13.70	11.90
17.	ICG-8457	24.900	2.279	0.280	10.93	14.70	9.40
18.	ICG-8535	25.770	3.013	0.417	8.55	17.30	12.00
19.	ICG-8406	25.240	1.805	0.236	13.98	17.80	11.20
20.	ICG-8354	25.790	2.388	0.392	10.80	15.60	11.50
21.	ICG-8050	27.820	2.200	0.283	12.65	18.00	12.20
22.	TPG-41	25.620	2.089	0.264	12.26	16.00	11.40
	Mean	25.345	2.344	0.367	10.81	16.48	11.50
	S.E. \pm	0.301	0.344	0.041	--	0.241	0.268
	C.D. at 5 %	0.903	1.032	0.123	--	0.723	0.804

Table 5. Chlorophyll content and protein and oil percentage as influenced by groundnut genotype

Sr. No.	Genotype	Chlorophyll content (mg/g)			Protein content (%)	Oil content (%)
		Chl-a	Chl-b	Total		
1.	TAG-24	0.897	0.234	1.282	25.05	47.73
2.	ICG-8434	1.289	0.290	2.110	23.66	46.94
3.	ICG-8483	0.972	0.270	1.584	24.64	48.06
4.	ICG-8455	2.166	0.062	2.358	25.13	49.55
5.	ICG-8005	1.181	0.252	1.807	24.89	46.38
6.	ICG-8542	0.853	0.283	1.465	23.62	45.61
7.	ICG-8440	0.766	0.175	1.172	25.25	45.73
8.	ICG-8519	1.440	0.193	2.626	24.50	47.30
9.	ICG-8428	1.494	0.153	2.398	24.40	46.91
10.	ICG-8401	1.269	0.293	2.150	24.01	47.38
11.	ICG-8029	2.234	0.486	3.168	24.66	48.19
12.	ICG-8496	1.548	0.484	2.787	25.90	47.48
13.	ICG-8468	0.521	0.371	0.909	23.51	46.88
14.	ICG-8333	2.308	0.515	3.201	24.97	46.23
15.	ICG-8437	2.417	0.454	3.058	25.09	47.45
16.	ICG-8444	0.676	0.370	1.412	24.01	50.59
17.	ICG-8457	1.698	0.589	2.275	25.17	46.38
18.	ICG-8535	1.208	0.454	1.738	24.97	46.04
19.	ICG-8406	0.921	0.425	1.462	25.08	47.32
20.	ICG-8354	0.726	0.338	1.285	24.09	47.18
21.	ICG-8050	0.646	0.363	1.315	25.23	46.98
22.	TPG-41	1.136	0.290	2.308	24.53	48.39
	Mean	1.289	0.334	1.994	24.66	47.30
	S.E. \pm	0.087	0.034	0.142	0.321	0.473
	C.D. at 5 %	0.261	0.102	0.426	0.963	1.419
	CV %	9.56	14.66	10.03	1.85	1.41

Table 6. Yield and yield contributing characters as influenced by groundnut genotypes

Sr. No.	Genotype	Pods plant ⁻¹	100 kernel weight (g)	Dry pod yield plant ⁻¹ (g)	Dry pod yield (q/ha)	Harvest index (%)	Shelling percentage
1.	TAG-24	28	43.8	20.4	62.57	65.32	70.20
2.	ICG-8434	28	43.7	20.9	54.52	41.66	70.70
3.	ICG-8483	24	47.9	19.9	53.46	42.46	72.50
4.	ICG-8455	29	61.9	19.1	36.36	41.75	73.00
5.	ICG-8005	44	44.2	21.0	54.15	45.87	72.00
6.	ICG-8542	22	54.6	21.6	60.82	46.95	71.00
7.	ICG-8440	30	43.4	19.9	54.48	45.74	70.50
8.	ICG-8519	29	47.4	19.9	39.47	40.69	72.00
9.	ICG-8428	22	45.8	20.8	68.77	43.63	71.00
10.	ICG-8401	28	40.2	19.4	45.71	45.03	71.40
11.	ICG-8029	25	48.9	20.7	75.53	45.98	71.00
12.	ICG-8496	31	41.8	20.0	51.81	45.73	71.10
13.	ICG-8468	25	44.6	18.7	65.08	44.16	72.50
14.	ICG-8333	20	51.8	20.5	58.58	44.11	70.90
15.	ICG-8437	25	53.3	20.2	66.05	41.19	71.80
16.	ICG-8444	23	53.8	18.9	59.09	40.56	70.30
17.	ICG-8457	22	42.4	19.3	54.41	41.41	70.70
18.	ICG-8535	26	42.4	20.1	53.81	42.67	71.00
19.	ICG-8406	19	42.0	20.4	60.39	38.99	71.40
20.	ICG-8354	19	43.0	20.9	60.23	42.58	71.60
21.	ICG-8050	24	43.3	21.1	56.59	44.89	71.50
22.	TPG-41	28	53.8	20.3	55.93	49.21	67.50
Mean		26.0	47.1	20.2	56.72	44.57	71.65
S.E. \pm		3.404	0.916	0.501	2.021	1.514	0.534
C.D. at 5 %		10.212	2.748	1.503	6.063	45.42	1.602
CV %		18.51	3.15	3.51	5.04	4.80	1.06

Evaluation of Groundnut (*Arachis hypogaea* L.) Genotypes for Physiological Traits

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Abstract- Twenty two groundnut genotypes were evaluated in randomized block design (RBD) with two replications at AICRP on Groundnut, MPKV, Rahuri, Dist. Ahmednagar (M.S.) during summer, 2011 to study the physiological analysis of growth and yield variation in groundnut genotypes. The observations on plant height, number of branches, leaves, leaf area, LAI, dry matter production and its distribution in component parts of plant, photosynthetic rate, transpiration rate, stomatal conductance, water use efficiency, stomatal frequency, chlorophyll content, protein and oil content and yield and yield contributing characters were recorded. The genotypes were significantly differed for seed yield. The highest dry pod yield was recorded by the genotypes ICG-8420, ICG-8473 and ICG-8506 due to significant favourable yield contributing characters like number of pods per plant, pod yield (g) and kernel yield (g) per plant, shelling percentage and harvest index. On the basis of morpho-physiological traits and bio-chemical parameters, ICG-8420, ICG-8473, ICG-8506, ICG-0845, ICG-8316 and ICG-8525 were considered as promising genotypes for future breeding programme for yield improvement and protein and oil content.

Index Terms- Morpho-physiological traits, physiological parameters, Bio-chemical characteristics, yield and yield contributing characters.

I. INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is the foremost important oil seed crop of India. In terms of area and production, it occupies an important position among the oil seed crops in the world. It has been aptly described as nature's masterpiece of food values containing 36 to 54 per cent oil with 21.36 per cent protein and have an energy value of 2,363 KJ/100 g. The oil is rich in unsaturated fatty acid (80 %), oleic acid and linoleic acid accounting for 38 to 58 per cent and 16 to 38 per cent, respectively. Among the saturated fatty acids, palmitic acid is the major one with the proportion of about 10 to 16 per cent, higher iodine value (82 to 106) and refractive index values (1.4697 to 1.4719 ND20) indicating its susceptibility to oxidation. Raw groundnut oil has very good stability (Nagraj, 1995). Yield is a complex trait, governed by many traits and there are ample evidences to show that selections directly for grain yield in plants are not easy. Thus, any morphological character that is associated with higher seed yield or which makes a significant contribution to yielding ability would be useful in the improvement of grain yield. The basic studies on the basis of morpho-physiological traits are needed to overcome the yield barriers within the genotypes. There are two physiological approaches to achieve

the target of yield potential. One is Physio-genetic, which consists the genotypic differences in physiological traits and another one is the Physio-agronomic relates with the management practices. It is ultimately the morpho-physiological variations, which is important for realizing higher productivity as evident from very high and positive association within traits (Mathur, 1995). Therefore the present study was undertaken with the objectives to evaluate groundnut (*Arachis hypogaea* L.) genotypes for physiological traits.

II. OBJECTIVES

1. To study the physiological efficiency of summer groundnut genotypes.
2. To study the dry matter accumulation and its partitioning in summer groundnut.
3. To find out correlation of physiological parameters with pod yield.

III. MATERIAL AND METHODS

Twenty two groundnut genotypes were evaluated in RBD with two replications during summer, 2011 at AICRP on Groundnut, MPKV, Rahuri, Dist. Ahmednagar (M.S.) in single row of 5 m length with the spacing of 30 x 10 cm under irrigated condition. FYM @ 10 cartloads hectare⁻¹ was uniformly spread in the field and mixed well by harrowing. The basal dose of N: P: K @ of 25:50:0 kg ha⁻¹ was given at the time of sowing. One weeding and one hoeing were carried out as and when required and field was kept free from weeds. Randomly five plants were selected for recording the observations on morpho-physiological traits. The observations on morphological traits, dry matter production and its distribution and physiological parameters were recorded. The photosynthetic rate (Pn), transpiration rate (E; mmol m⁻² s⁻¹) and stomatal conductance (g_s; μmol H₂O m⁻² s⁻¹) were measured using Infra-red Gas Analyser (IRGA; Model Portable Photosynthesis System LI 6400, LI-COR® Inc, Lincoln, Nebraska, USA). The E and G_s were measured continuously monitoring H₂O of the air entering and existing in the IRGA headspace chamber. Measurements were made at mid day, between 11:30 and 12:00 eastern day time (1400–1800 mmol m⁻² s⁻¹ PPFD), on top fully expanded third leaf blades. The flow rate of air in the sample line was adjusted to 500 μmol s⁻¹. The water use efficiency (WUE) was calculated as the ratio of Pn to E. The protein and fat content from seed samples were estimated on NIR spectrometer (ZEUTECH, Germany Make), is a dual-beam near infrared spectrometer. In the NIR spectrometer, the sample is exposed near infrared light of specific wavelengths, selected

from up to 19 high precision interference filters. The light penetrated the sample, interacted with sample molecules and is partly absorbed and partly diffusely reflected. The reflected light is measured by a lead sulfide (PbS) detector mounted in a gold coated integrating sphere located above the sample. The mean data analyzed for analysis of variance by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

The vegetative phase governs the overall phenotypic expression of the plant and prepares the plant for next important reproductive phase. The root, stem, branches and leaves, all these parts constitute vegetative phase and perform specific functions. In the present investigation, the genotypes, ICG-8417 (27.800) and ICG-8521 (28.900) required minimum number of days for initiation of first flower, whereas, the genotype ICG-8525 (31.300) required highest number of days for appearance of flowering. The genotype ICG-8474 (124.70), ICG-8417 (124.80) and SB-XI (124.90) required minimum number of days for physiological maturity. The genotypes, ICG-8525 (130.00), ICG-8420 (129.30) and ICG-8518 (129.20) required maximum days to attend physiological maturity (Table 1). ICG-0845 (40.88 cm) and ICG-8075 (40.55 cm) were found to be taller, whereas ICG-8473 (27.40 cm) and ICG-8417 (27.43 cm) were dwarf genotypes. Mensah and Okpere (2000) showed the significant differences for plant height throughout the growth period. The genotypes, ICG-8473 (16.25), ICG-8417 (14.10), ICG-8472 (13.75), ICG-8328 (13.70) and ICG-8326 (13.45) had profuse branching, whereas TAG-24 (7.30) had less number of branches per plant. Deshmukh and Dev (1993) recorded the significant positive correlation between number of branches per plant with pod yield. ICG-8417 (925.60), ICG-8426 (7936.20) and ICG-8539 (755.40) recorded maximum number of leaves per plant. The genotype, ICG-8525 maintained higher leaf area (24.83 dm²) and LAI (8.28) followed by ICG-8462 (23.78 & 7.93 dm²) and ICG-8048 (23.44 & 7.81 dm²).

The pattern of dry matter production and its distribution into component plant parts has been of phenomenal interest to the research workers engaged in yield analysis. In view of this, in the present investigation, it envisaged to know the pattern of dry matter accumulation, its distribution in component parts of plant (Table 2). In the present investigation, the dry matter accumulation is less than that of other plant parts (Ghosh *et al.*, 1997). The genotype, ICG-8462 (54.07 g) maintained the higher dry matter production as an account of higher magnitude of dry matter in leaves (23.47 g), stem (15.96 g) and roots (1.92 g). In addition, ICG-8521 (51.37 g), ICG 8075 (50.75 g) and ICG-8048 (50.60 g) were also recorded the higher dry matter production per plant. The genotypes, ICG-8539 (2.05 g), ICG-8326 (2.04 g) and ICG-8316 (1.98 g) for roots; ICG-8048 (17.83 g), ICG-8539 (17.10 g) and ICG-8075 (16.26 g) for stem; ICG-8075 (23.47 g), SB-XI (22.19 g) and ICG-8521 (20.96 g) for leaves; ICG-8416 (17.00 g), ICG-8417 (15.52 (15.52 g) and ICG-8420 (15.36 g) for pod were promising for higher dry matter accumulation in component parts of plant.

The physiological parameters influenced by groundnut genotypes are presented in Table 3. The genotypes, ICG-0845 (29.29 $\mu\text{mol m}^{-2} \text{s}^{-1}$), ICG-8472 (28.12 $\mu\text{mol m}^{-2} \text{s}^{-1}$) and ICG-8439 (28.05 $\mu\text{mol m}^{-2} \text{s}^{-1}$) recorded the higher rate of

photosynthesis, while, ICG-8525 (4.76 $\text{mmol m}^{-2} \text{s}^{-1}$), ICG-8518 (4.36 $\text{mmol m}^{-2} \text{s}^{-1}$) and ICG-0845 (4.02 $\text{mmol m}^{-2} \text{s}^{-1}$) had higher rate of transpiration. The genotypes, ICG-8439 (0.36), ICG-8417 (0.35 $\mu\text{mol m}^{-2} \text{s}^{-1}$), ICG-8525 (0.34 $\mu\text{mol m}^{-2} \text{s}^{-1}$) and ICG-8473 (0.21 $\mu\text{mol m}^{-2} \text{s}^{-1}$) showed maximum stomatal conductance. The results are conformity with the results of Kalpana *et al.* (2003). As a result of higher rate of photosynthesis as compared with least amount of transpiration rate, the genotypes ICG-8316 (15.23), ICG-8328(11.86) and TAG-24 (11.54) had higher water use efficiency. The stomatal frequency is an important parameter which correlates with the water uptake, its losses and use efficiencies. In the present investigation, the genotypes, ICG-8539 (22.40 mm²), ICG-8506 (21.40 mm²) and ICG-8521 (20.60 mm²) for recorded maximum adaxial, whereas, ICG-8473 (10.50 mm²), ICG-8518 (10.50 mm²) and ICG-8316 (10.40 mm²) maximum abaxial stomatal frequency, respectively.

As Bently Glass (1961) has to aptly stated, "Life is a photochemical phenomenon." The chemical compounds most important in this conversion of light energy to chemical energy are the pigments that exist within the chloroplast/chromatophores of plants. The chlorophylls, the green pigment of the chloroplast, are the most important photosynthetic plant pigment, and today at least seven types may be distinguished. Amongst these, chl 'a' and 'b' covers majority of the portion of chloroplast. In the present investigation, the genotype, ICG-0845 recorded higher chlorophyll 'a' (0.73 mg/g), chlorophyll 'b' (0.55 mg/g) and total chlorophyll (1.43 mg/g). In addition to this, ICG-8316 also found rich in chlorophyll 'a' (0.65 mg/g), chlorophyll 'b' (0.49 mg/g) and total chlorophyll (1.27 mg/g).

Groundnut kernel considered as a rich source of oil and proteins. It has been aptly described as nature's master piece of food values containing 36 to 54 per cent oil with 21-26 per cent protein and have a energy value of 2,363 KJ/100 g (Adsule *et al.*, 1980). In the present investigation, the genotype ICG-0845 maintained higher protein (25.73%) and oil content (52.46%) in addition to higher chlorophyll content. The genotypes, SB-XI (50.00%) and ICG-8326 (49.64%) also found rich for oil content (Table 4). It may be concluded that the genotypes having higher chlorophyll content might be a higher concentration of carbon compounds.

The data on yield and yield contributing characters are presented in Table 5. The genotypes, ICG-8075 (43.90), ICG-8539 (42.00) and ICG-8506 (41.40) recorded highest number of pods per plant. The highest number of kernels per pod was recorded by ICG-8525 (3.30), ICG-8539 (3.10) and TAG-24 (3.00). The 100 kernels weight (g) was higher in ICG-8328 (58.54 g) followed by ICG-8521 (53.49), ICG-8439 (50.73) and ICG-8473 (49.60). The genotypes, ICG-8416 (24.35 g), ICG-8417 (23.83 g) and ICG-8420 (23.55 g) the highest dry pod yield per plant. The Genotypes, ICG-8420 (69.94 q/ha), ICG-8473 (68.23 q/ha) and ICG-8506 (68.08 q/ha) were significantly superior for dry pod yield. The pod yield of the genotype was mainly due to favorable yield contributing character like number of pods per plant, number of kernels and harvest index. These findings are on the similar lines to those reported by Mishra *et al.* (1991), Jadhav and Sengupta (1991) and Jayalakshmi *et al.* (2000). The genotypes, TAG-24 (66.17 %), ICG-8473 (61.03%) and ICG-8420 (60.57%) maintained higher harvest index. The

higher shelling percentage was recorded by the genotypes ICG-8462 (73.32 %), ICG-8525 (73.20 %) and TAG-24 (72.98 %).

From the result obtained in the present investigation, it was concluded that, the genotype ICG-8416 with highest pod dry matter partitioning percentage and lowest total dry matter at harvest is high yielding. The genotypes, ICG-8420, ICG-8473 and ICG-8506 showed highest dry pod yield per plot and dry pod yield per ha. The genotypes SB-XI, ICG-8326 and ICG-8462 with lowest harvest index indicated poor translocation of assimilate from source to sink. Therefore, these genotypes could be utilized in breeding programme for the high biological yield (dry matter) point of view. The physiological processes like photosynthesis, stomatal conductance, transpiration rate etc. were found at highest rate in some genotypes like ICG-8525 which resulted in highest yielding. The genotype ICG-0845, ICG-8316 and ICG-8525 recorded highest protein content, oil content, chlorophyll-a, chlorophyll-b and total chlorophyll which may be further useful for population improvement.

On the basis of relative ranking, the genotypes, ICG-8420 (69.94 q/ha), ICG-8473 (68.23 q/ha) and ICG-8506 (68.08 q/ha) were found superior in terms of morpho-physiological traits, whereas, ICG-0845, ICG-8316 and ICG-8525 were promising for maintaining chlorophyll content and protein and oil content. Therefore, these genotypes can be considered in future breeding programme for boosting up the yield heterosis and improvement in oil and protein content.

IV. CONCLUSION

1. From the result obtained in the present investigation, it was concluded that, the genotype ICG-8416 with highest pod dry matter partitioning percentage and lowest total dry matter at harvest is high yielding.

2. The genotype TAG-24 showed highest harvest index.

3. The genotypes like ICG-8420, ICG-8473 and ICG-8506 showed highest dry pod yield per plot and dry pod yield per ha.

4. The genotypes SB-XI, ICG-8326 and ICG-8462 with lowest harvest index indicated poor translocation of assimilates from source to sink. Therefore, these genotypes could be utilized in breeding programme for the high biological yield (dry matter) point of view.

5. The physiological processes like photosynthesis, transpiration rate etc. were found at highest rate in some genotypes which resulted in highest yielding.

6. The genotype ICG-0845, ICG-8316 and ICG-8525 recorded highest protein content, oil content, chlorophyll-a, chlorophyll-b and total chlorophyll which may be further useful for crop improvement.

7. Number of kernels/pod, photosynthetic rate and leaf area at harvest showed positive correlation association with dry pod yield per plant. Therefore, these traits could be considered for further breeding programme from the high dry pod yield per plant point of views.

8. Number of kernels/pod, photosynthetic rate and total dry matter at harvest exhibited direct positive effect on dry pod yield per plant. Suggesting direct selection based on these characters would be considered for further breeding programme and help in selecting high yielding genotypes in groundnut.

REFERENCES

- [1] Adsule, R.N., Kadam, S.S. and Salunke, D.K.. Peanut in handbook of world food legumes CRC Press, 1 FL, USA pp. 193-215(1980).
- [2] Deshmukh, D.D. and Dev, D.V.. Association of physiological traits with productivity and regression analysis in groundnut (*Arachis hypogaea* L.). *Ann. Pl. Physiol.* 7 (1) : 123-125 (1993).
- [3] Ghosh, P.K., Mathur, R.K., Ravindra, V. and Gor, H.K.. Dry matter accumulation, nitrogen uptake and their partitioning pattern in virginia groundnut (*Arachis hypogaea* L.). *Indian J. Pl. Physiol.* 2 (3) : 234-236 (1997).
- [4] Glass, B. (1961). Summary. In W. McElroy and B. Glass (eds), Light and life. Johns Hofkins Press, Baltimore, Md. Gregory, F. G.. The effect of climatic conditions on the growth of barley. *Ann. Bot.* 40: 1-26 (1926).
- [5] Jadhav, B.B. and Sengupta, V.K.. Effect of light stress on peanut productivity. *Ann. Pl. Physiol.* 5 (2) : 194-201 (1991).
- [6] Jayalakshmi, V., Reddy, C.R., Reddy, P.V. and Reddy, G.L.. Character association among morpho-physiological attributes in parental genotypes and groundnut hybrids. *Legume Res.* 23 (2) : 102-105 (2000).
- [7] Kalpana, M., Chetti, M.B. and Ratnam, B.P.. Phenological changes in photosynthetic rate, transpiration rate and stomatal conductance and their relationship with seed yield in cowpea (*Vigna unguiculata* L.). *Indian J. Plant Physio.* 8 (2): 160-164 (2003).
- [8] Mathur, R.. Genetic variability and correlation studies in segregating generations of cowpea. *Madras Agric. J.* 82: 150-152 (1995).
- [9] Mensah, J.K. and Okpere, V.E.. Screening of four groundnut cultivars from Nigeria for drought resistant. *Legume Res.* 23 (1): 37-41 (2000).
- [10] Mishra, R.K., Tripathi, A.K., Chaudhary, S.K. and Sharma, R.B.. Evaluation of characters responsible for high yield in groundnut. *Indian J. Pl. Physiol.* 24 (2): 300-303 (1991).
- [11] Nagraj, G.. Paper presented on soil and oil quality of Indian groundnut in ICRISAT Seminar, Hyderabad. pp. 1-2 (1995).
- [12] Panse, V. G. and Sukhatme, P. V.. *Statistical Methods for Agricultural Workers.* ICAR Rev. Ed. By Sukhatme, P. V. and Amble, V. N., pp. 145-156 (1985).

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Table 1 Phenological and morphological characters influenced by groundnut genotypes

Sr. No	Genotypes	Days appearance of flowering	for of physiological maturity	of Plant height (cm)	Number of branches plant ⁻¹	Number of leaves plant ⁻¹	Leaf area plant ⁻¹ (dm ²)	LAI
1.	TAG-24	29.80	125.10	27.63	7.30	262.50	22.50	7.50
2.	ICG-8474	28.70	124.70	36.18	10.20	364.90	23.28	7.76
3.	ICG-8326	29.70	125.60	36.49	13.45	395.50	23.28	7.76
4.	ICG-8328	29.50	126.90	36.17	13.70	358.00	21.77	7.25
5.	ICG-8472	29.20	127.00	28.67	13.75	406.60	22.86	7.62
6.	ICG-8462	29.20	127.30	29.59	7.40	364.20	23.78	7.93
7.	ICG-8439	29.70	125.70	32.97	10.65	362.00	22.48	7.49
8.	ICG-8426	29.70	127.80	32.67	9.80	793.20	22.72	7.57
9.	ICG-8518	29.30	129.20	37.05	11.95	443.40	21.57	7.19
10.	ICG-8525	31.30	130.00	33.60	8.00	390.50	24.83	8.28
11.	ICG-0845	29.50	128.90	40.88	8.60	291.30	22.88	7.63
12.	ICG-8416	29.60	128.30	34.52	11.10	425.20	23.40	7.80
13.	ICG-8420	29.20	129.30	32.36	11.45	591.10	22.70	7.57
14.	ICG-8417	27.80	124.80	27.43	14.10	925.60	22.88	7.63
15.	ICG-8473	29.70	127.00	27.40	16.25	611.20	21.65	7.22
16.	ICG-8506	29.10	126.40	34.44	12.65	560.80	22.10	7.36
17.	ICG-8539	30.10	126.80	38.84	8.70	755.40	22.16	7.39
18.	ICG-8075	29.60	127.90	40.50	8.15	365.20	22.83	7.61
19.	ICG-8521	28.90	128.00	32.70	8.60	303.70	22.20	7.40
20.	ICG-8316	29.50	127.70	34.21	7.40	269.20	23.20	7.73
21.	ICG-8048	29.20	128.50	35.96	9.75	360.20	23.44	7.81
22.	SB-XI	29.70	124.90	38.14	8.80	482.20	22.52	7.50
Mean		29.46	127.17	34.02	10.53	458.27	22.77	7.59
S.E. ±		0.30	0.76	0.63	0.92	1.13	0.51	0.17
C.D. at 5 %		0.88	2.23	1.86	2.70	3.33	1.49	0.50

Table 2 Dry matter production and it's distribution in component parts of plant influenced by groundnut genotypes.

Sr. No.	Genotypes	Dry matter accumulation per plant (g)				
		Roots	Stem	Leaves	Pods	Total
1.	TAG-24	1.63	12.18	16.14	12.34	42.29
2.	ICG-8474	1.70	13.85	19.04	11.80	46.39
3.	ICG-8326	2.04	15.82	17.81	11.40	47.07
4.	ICG-8328	1.74	15.14	18.19	12.34	47.41
5.	ICG-8472	1.54	12.79	13.71	12.71	40.75
6.	ICG-8462	1.92	15.96	23.47	12.72	54.07
7.	ICG-8439	1.82	15.65	17.11	11.71	46.29
8.	ICG-8426	1.73	12.99	14.61	12.24	41.57
9.	ICG-8518	1.54	13.39	16.85	13.81	45.59
10.	ICG-8525	1.78	11.65	16.05	14.12	43.60
11.	ICG-0845	1.70	13.91	17.37	12.95	45.93
12.	ICG-8416	1.73	12.51	13.70	17.00	44.94
13.	ICG-8420	1.63	13.78	17.12	15.36	47.89
14.	ICG-8417	1.72	11.86	14.80	15.52	43.90
15.	ICG-8473	1.74	14.81	16.41	13.41	46.37
16.	ICG-8506	1.56	13.57	13.18	13.87	42.18
17.	ICG-8539	2.05	17.10	19.12	11.96	50.23
18.	ICG-8075	1.94	16.26	20.32	12.23	50.75
19.	ICG-8521	1.80	15.98	20.96	12.63	51.37
20.	ICG-8316	1.98	14.58	16.08	13.70	46.34
21.	ICG-8048	1.65	17.83	18.41	12.71	50.60
22.	SB-XI	1.78	14.26	22.19	10.90	49.13
Mean		1.76	14.36	17.39	13.06	46.57
S.E. \pm		0.08	0.73	0.78	0.87	1.65
C.D. at 5 %		0.24	2.15	2.28	2.56	4.85

Table 3 Physiological parameters influenced by groundnut genotypes at 50 % flowering.

Sr. No.	Genotypes	Photosynthesis rate ($\mu\text{ mol m}^{-2} \text{ s}^{-1}$)	Transpiration rate ($\text{mmol m}^{-2} \text{ s}^{-1}$)	Stomatal conductance ($\mu\text{mol m}^{-2} \text{ s}^{-1}$)	Water use efficiency	Stomatal frequency (mm^2 leaf area)	
						Adaxial	Abaxial
1.	TAG-24	26.55	2.30	0.27	11.54	15.10	10.10
2.	ICG-8474	27.13	2.41	0.26	11.26	20.30	10.20
3.	ICG-8326	25.95	2.64	0.26	9.83	18.50	8.40
4.	ICG-8328	26.10	2.20	0.21	11.86	17.30	9.40
5.	ICG-8472	28.12	3.09	0.31	9.10	15.10	8.80
6.	ICG-8462	27.91	2.92	0.28	9.56	18.10	9.30
7.	ICG-8439	28.05	3.34	0.36	8.40	17.10	9.00
8.	ICG-8426	30.39	2.81	0.30	10.81	16.70	10.00
9.	ICG-8518	30.69	4.36	0.33	7.04	17.50	10.40
10.	ICG-8525	31.47	4.76	0.34	6.61	19.20	8.50
11.	ICG-0845	29.19	4.02	0.30	7.26	18.70	9.30
12.	ICG-8416	26.04	3.22	0.24	8.09	20.40	9.50
13.	ICG-8420	25.26	2.95	0.30	8.56	17.90	8.70
14.	ICG-8417	26.53	3.02	0.35	8.78	19.80	10.30
15.	ICG-8473	26.43	3.68	0.21	7.18	20.40	10.50
16.	ICG-8506	25.61	2.82	0.26	9.08	21.40	9.80
17.	ICG-8539	25.74	3.92	0.24	6.57	22.40	9.50
18.	ICG-8075	27.98	3.26	0.26	8.58	20.00	7.30
19.	ICG-8521	27.58	3.87	0.25	7.13	20.60	9.20
20.	ICG-8316	27.41	1.80	0.25	15.23	18.50	10.40
21.	ICG-8048	27.10	2.31	0.27	11.73	17.40	9.60
22.	SB-XI	27.25	1.81	0.23	15.06	19.30	8.60
Mean		27.48	3.07	0.28	9.51	18.71	9.40
S.E. \pm		0.59	0.24	0.02	2.46	0.78	0.39
C.D. at 5 %		1.74	0.71	0.07	2.45	2.29	1.15

Table 4 Bio-chemical parameters as influenced by groundnut genotype.

Sr. No.	Genotypes	Chlorophyll content (mg/g)			Protein content (%)	Oil content (%)
		Chlorophyll-a	Chlorophyll-b	Total Chlorophyll		
1.	TAG-24	0.37	0.25	0.74	25.01	50.00
2.	ICG-8474	0.57	0.41	1.17	25.28	49.40
3.	ICG-8326	0.46	0.38	1.06	24.84	49.64
4.	ICG-8328	0.37	0.24	0.72	24.44	45.08
5.	ICG-8472	0.49	0.36	1.08	24.77	49.50
6.	ICG-8462	0.41	0.29	0.83	25.20	47.53
7.	ICG-8439	0.53	0.46	1.25	25.36	47.89
8.	ICG-8426	0.45	0.34	0.82	24.56	47.53
9.	ICG-8518	0.32	0.26	0.64	25.52	48.03
10.	ICG-8525	0.56	0.44	1.23	25.60	45.66
11.	ICG-0845	0.73	0.55	1.43	25.73	52.46
12.	ICG-8416	0.52	0.43	1.05	24.79	45.40
13.	ICG-8420	0.45	0.37	0.86	24.61	46.19
14.	ICG-8417	0.48	0.35	0.83	24.48	48.42
15.	ICG-8473	0.52	0.35	1.03	24.87	48.95
16.	ICG-8506	0.47	0.37	0.94	24.42	45.82
17.	ICG-8539	0.63	0.43	1.16	24.41	49.31
18.	ICG-8075	0.41	0.33	0.84	24.74	44.85
19.	ICG-8521	0.49	0.34	0.98	24.85	47.67
20.	ICG-8316	0.65	0.49	1.27	24.84	47.49
21.	ICG-8048	0.48	0.40	1.06	24.97	47.56
22.	SB-XI	0.54	0.44	1.18	24.72	44.35
	Mean	0.50	0.37	1.01	24.91	47.67
	S.E. \pm	0.02	0.02	0.02	0.27	0.20
	C.D. at 5 %	0.06	0.06	0.06	0.79	0.58

Table 5. Yield and yield contributing characters as influenced by groundnut genotypes

Sr. No.	Genotypes	Number of pods per plant	Number of kernels per pod	100 kernel weight (g)	Dry pod yield (g) per plant	Dry pod yield (q/ha)	Harvest index (%)	Shelling %
1.	TAG-24	20.10	3.00	42.92	16.74	58.54	66.17	72.98
2.	ICG-8474	21.30	2.90	46.71	14.25	41.57	35.72	72.62
3.	ICG-8326	19.50	2.70	40.94	13.42	47.19	33.14	72.09
4.	ICG-8328	23.00	2.40	58.54	17.21	50.92	39.62	72.06
5.	ICG-8472	20.90	2.60	38.77	19.76	54.90	40.63	72.81
6.	ICG-8462	28.10	1.80	37.10	20.12	58.67	34.57	73.33
7.	ICG-8439	21.30	2.00	50.73	14.16	34.43	40.27	69.51
8.	ICG-8426	32.80	2.20	43.80	16.69	42.89	42.23	70.81
9.	ICG-8518	24.30	2.60	46.15	20.75	61.42	40.09	71.24
10.	ICG-8525	28.60	3.30	45.30	22.35	51.18	42.90	73.20
11.	ICG-0845	20.60	2.90	39.06	20.07	61.90	37.28	70.84
12.	ICG-8416	22.80	2.50	48.60	24.35	48.20	42.76	72.30
13.	ICG-8420	21.00	2.30	41.52	23.54	69.94	60.57	69.53
14.	ICG-8417	24.20	2.80	38.81	23.83	61.12	41.33	70.99
15.	ICG-8473	29.90	2.90	49.69	20.08	68.23	61.03	72.56
16.	ICG-8506	41.40	2.20	43.79	21.30	68.08	57.66	71.21
17.	ICG-8539	42.00	3.10	40.91	16.38	55.61	40.53	71.54
18.	ICG-8075	43.90	1.60	38.65	16.68	61.20	35.58	72.92
19.	ICG-8521	34.30	2.60	53.49	18.16	40.06	39.57	70.27
20.	ICG-8316	36.10	2.10	40.61	20.50	54.34	38.90	71.72
21.	ICG-8048	29.70	1.40	35.50	19.57	60.59	35.44	72.09
22.	SB-XI	34.40	2.20	45.47	12.98	48.57	32.94	70.84
Mean		28.19	2.46	43.96	18.77	54.52	42.68	71.70
S.E. \pm		1.29	0.14	3.25	0.68	5.14	1.08	0.74
C.D. at 5 %		3.79	0.42	9.55	1.99	15.12	3.17	2.17

Resource Constrained Leader Election Scheme for Intrusion Detection in Mobile Ad-Hoc Networks

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Abstract- Mobile Ad-hoc Network is a peer-to-peer wireless network that transmits data from computer to computer without the use of a central base station or access point. Intrusion detection techniques are used for the network attack detection process. The system is designed to handle leader election scheme for intrusion detection process. In this paper, we use leader election algorithm to find the globally optimal cost-efficient leader and it is devised to handle the election process for possibility of cheating and security flaws, such as replay attacks. The clustering scheme is optimized with coverage and traffic level. Cost and resource utilization is controlled under the clusters. The system development and analysis are carried out under the JiST (Java in Simulation Time) simulation environment.

Index Terms- Clustering, Leader Election, Detection Latency.

I. INTRODUCTION

A mobile ad-hoc network is a collection of wireless nodes that can dynamically be set up anywhere and anytime without using any pre-existing network infrastructure[5]. It is an autonomous system in which mobile hosts connected by wireless links are free to move randomly and often act as routers at the same time. Routing from one node to another node on mobile ad-hoc networks requires an "on-demand routing protocol," such as Dynamic Source Routing (DSR) or Adaptive On demand Distance Vector (AODV), which generates routing information only when a station initiates a transmission. The earliest mobile ad-hoc networks were called "packet radio" networks. In order to make our concept scalable, to avoid expensive long-range traffic, and to enhance availability by providing service locally, we partition an ad-hoc network into a number of clusters.

In each cluster, exactly one distinguished node, the Cluster Head (CH) is responsible for establishing and organizing the cluster. The CHs are responsible for sending CH beacons in their clusters, containing administrative information for the cluster members. Clustering is also used in some routing protocols for ad hoc networks. Routing is typically divided into two parts: Routing within a cluster (intra-cluster) and Routing between different clusters (inter-cluster). If a cluster-based routing protocol is used, the clusters established by the routing protocol can also be used for our security concept, and some additional advantages are to be expected.

1.1 Intrusion Detection

Intrusion Detection is one of key techniques behind protecting a network against intruders. An Intrusion Detection System is a system that tries to detect and alert on attempted intrusions into a system or network, where an intrusion is considered to be any unauthorized or unwanted activity on that system or network[15]. Extensive research has been done in this field and efficient IDS systems have been designed for wired networks. These systems usually monitor user, system and network-level activities continuously, and normally have a centralized decision-making entity.

Unlike traditional networks, the Mobile Ad-hoc Networks (MANETs) have no fixed chokepoints/bottlenecks where Intrusion Detection Systems can be deployed. Hence, a node may need to run its own IDS and cooperate with others to ensure security. This is very inefficient in terms of resource consumption since mobile nodes are energy limited. To overcome this problem, a common approach is to divide the MANET into a set of 1-hop clusters where each node belongs to at least one cluster. The nodes in each cluster elect a leader node to serve as the IDS for the entire cluster. The leader election process can be either random or based on the connectivity. Both approaches aim to reduce the overall resource consumption. With the random model, each node is equally likely to be elected regardless of its remaining resources. The connectivity index-based approach elects a node with a high degree of connectivity even though the node may have little resources left.

With both election schemes, some nodes will die faster than others, leading to a loss in connectivity and potentially the partition of network. Although it is clearly desirable to balance the resource consumption of IDSs among nodes, this objective is difficult to achieve since the resource level is the private information of a node. Unless sufficient incentives are provided, nodes might misbehave by acting selfishly and lying about their resources level to not consume their resources for serving others while receiving others services.

II. PROPOSED METHOD

The mobile ad-hoc networks are infrastructure less networks. The base station, routers and redirection switches are not used in the mobile ad-hoc network environment. Clustering techniques can be used to group up the mobile ad-hoc network nodes. The nodes are grouped with reference to the coverage values. The leader node is selected for the clusters. The energy level is considered in the leader node selection process.

The computational power and storage levels are also considered in the leader election process. The system is designed to handle leader election for intrusion detection process. The clustering scheme is optimized with coverage and traffic level. Cost and resource utilization is controlled under the clusters. Node mobility is managed by the system. The overall process is depicted in the following diagram:

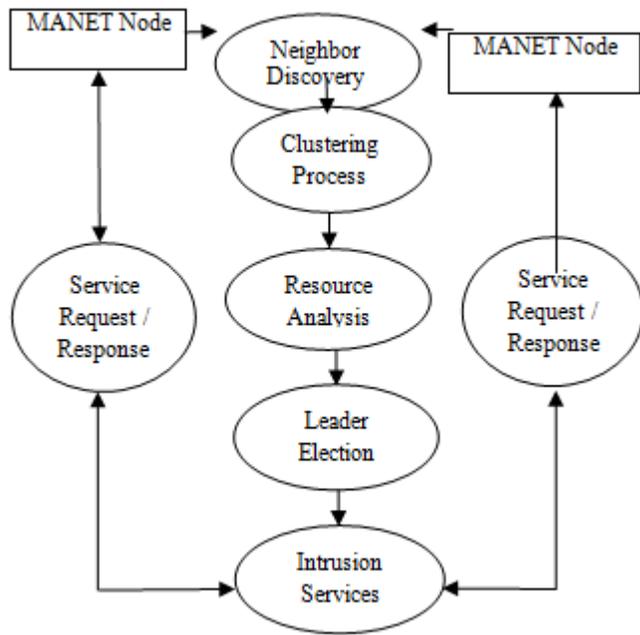


Fig 1. System Process

2.1 Leader Election Algorithm

To run the election mechanism, it is proposed that a leader election algorithm that helps to elect the most cost-efficient leaders with less performance overhead compared to the network flooding model. It devise all the needed the messages to establish the election mechanism taking into consideration cheating and presence of malicious nodes. The addition and removal of nodes to/from the network due to mobility reasons is considered. Finally, the performance overhead is considered during the design of the given algorithm where computation, communication, and storage overhead are derived.

To start a new election, the election algorithm uses four types of messages. Hello, used by every node to initiate the election process; Begin-Election, used to announce the cost of a node; Vote, sent by every node to elect a leader; and Acknowledge, sent by the leader to broadcast its payment, and also as a confirmation of its leadership. For describing the algorithm, the system uses the following notation:

- Service-table (k): The list of all ordinary nodes, those voted for the leader node k.
- Reputation-table (k): The reputation table of node k. Each node keeps the record of reputation of all other nodes.
- Neighbors (k): The set of node k's neighbors.
- Leadernode (k): The ID of node k's leader. If node k is running its own IDS, then the variable contains k.

- Leader (k): A Boolean variable that sets to TRUE if node k is a leader and FALSE otherwise.

Initially, each node k starts the election procedure by broadcasting a Hello message to all the nodes that are 1 hop from node k and starts a timer T_1 . This message contains the hash value of the node's cost of analysis and its unique identifier (ID). This message is needed to avoid cheating where further analysis is conducted.

```

    Executed by Elected leader node

    Step 1: Leader(i) := TRUE;
    Step 2: Compute Payment, Pi;
    Step 3: updateservice-table(i);
    Step 4: updatereputation-table(i);
    Step 5: Acknowledge = Pi + all the votes;
    Step 6: Send Acknowledge (i);
  
```

```

    Executed by every node

    Step 1: if (received Hello from all neighbors) then
    Step 2: Send Begin-Election (IDk; costk);
    Step 3: else if(neighbors(k) = φ) then
    Step 4: Launch IDS.
    Step 5: end if
  
```

```

    Executed by neighboring nodes

    Step 1: if (leaderk) = TRUE) then
    Step 2: Status := Costk;
    Step 3: else
    Step 4: Status := leadernode(k);
    Step 5: end if;
    Step 6: send Status(k, n);
  
```

III. RESULTS

The secure leader election system is tested under the simulation environment. The network transaction request data values are collected from University of California, Irwin (UCI) machine learning repository. The network transaction requests are initiated using the Defence and Research Project Agency (DARPA) data values. The benchmark data values are used in the intrusion detection process. All the intrusion detection

operations are handled under the detector applications. The detector is assigned with reference to the cluster and resource information. The system uses two types of detector assignment methods. They are Cluster based Detector Assignment (CDA) and Cluster Integrated Detector Assignment methods (CIDA). In the cluster based model the detectors are assigned under the leader nodes of all clusters. In the cluster integrated model the detectors are assigned for a group up clusters. The detector count is reduced in the cluster integrated model. The energy consumption and traffic rate performance metrics are used to evaluate the system performance.

The energy consumption analysis is performed with different node count levels. The traffic rate analysis is performed to measure the bandwidth usage level for the mobile ad-hoc networks. The detection period for attack detection is measured in all detectors. The average detection period is measured as detection latency for the entire network.

3.1 Energy Consumption

A base station moderates communication among mobile nodes, scheduling and buffering traffic so that the mobiles can spend most of their time in the sleep state. In an ad hoc environment, there are no base stations and nodes cannot predict when they will receive traffic. Therefore, the default state in an ad hoc network is the idle state, rather than the sleep state.

Table 1. Energy consumption analysis between CDA & CIDA

Nodes	CDA(%)	CIDA(%)
20	81.3	69.8
40	84.6	72.1
60	87.4	75.6
80	91.3	79.2
100	94.8	81.4

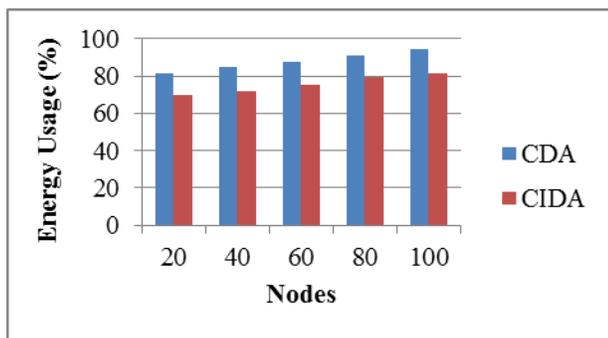


Fig 2. Energy consumption analysis between CDA & CIDA

The CIDA model reduces the energy consumption 10% more than CDA model.

3.2 Traffic Rate

The traffic rate analysis is used to evaluate the mobile ad-hoc network bandwidth usage levels. The bandwidth usage is

estimated with reference to the number of packets transferred within the network environment. The traffic rate is the ratio between the number of packets transferred through the network and the number of packets transferred for the clustering operations.

Table 2. Rate analysis between CDA & CIDA

Nodes	CDA(%)	CIDA(%)
20	75.8	57.4
40	79.2	59.7
60	83.6	62.1
80	85.9	65.8
100	89.1	68.5

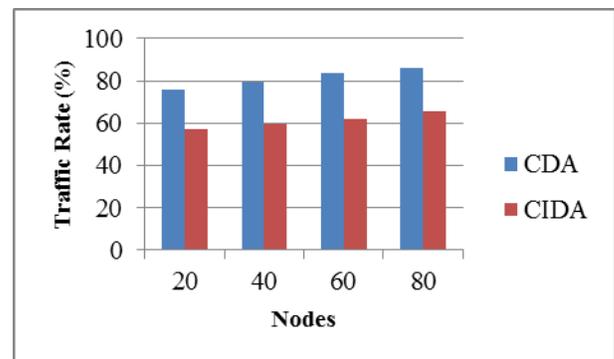


Fig 3. Rate analysis between CDA & CIDA

The CIDA model reduces the traffic rate 15% more than the CDA model.

3.3 Detection Latency

The detection latency analysis is used to measure the time taken for the intrusion detection process. The network request received time and request identification time difference is measured as delay period. The detection latency is the average time to detect the request type. The detection latency is measured in milli seconds.

Table 3. Detection Latency Analysis between CDA and CIDA

Nodes	CDA(%)	CIDA(%)
20	11.2	10.1
40	11.5	10.5
60	11.9	10.4
80	12.2	10.8
100	12.4	10.9

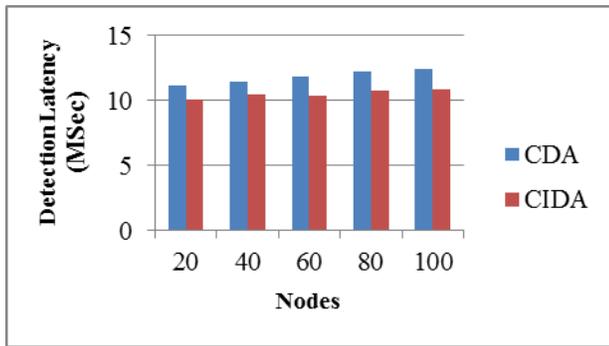


Fig 4. Detection Latency Analysis between CDA and CIDA

The CIDA model reduces the detection latency more than 15% then the CDA model. The detection latency is reduced in a considerable manner. The system reduces the energy consumption, traffic rate and detection latency measures.

IV. CONCLUSION

In this paper, we use a leader election algorithm to find the globally optimal cost-efficient leader. And it is devised to handle the election process for possibility of cheating and security flaws, such as replay attack. The clustering methods are used to group up the neighbor nodes. The CDA and Cluster CIDA models are used for the detector assignment process. The system reduces the energy consumption. Network traffic is reduced by the system. The system reduces detection latency in all network conditions. The leader election system can be adapted for the wireless mesh network environment. The intrusion detection system can be enhanced to manage key distribution process for data communication security. The signature based model can be integrated with the system to improve the accuracy levels.

REFERENCES

- [1] Arun K.Pujari, 'Data mining Techniques' University Press, First Edition, 2001.
- [2] Azzedine Boukerche, 'Algorithms and Protocols for Wireless, Mobile Ad-Hoc Networks (Wiley Series on Parallel and Distributed Computing)', Publisher: IEEE Press, 2008.
- [3] M.Bechler, H.Hof, D.Kraft, F.Pahlke and L.Wolf, "A Cluster Based Security Architecture for Ad Hoc Networks," Proc. IEEE INFOCOM, 2004.
- [4] K.Chen and K.Nahrstedt, "iPass: An Incentive Compatible Auction Scheme to Enable Packet Forwarding Service in MANET," Proc. Int'l Conf. Distributed Computing systems, 2004.
- [5] Elliotte Rusty Harold, 'Java Network Programming', O'Reilly, 2nd Edition.
- [6] S. Gwalani, K. Srinivasan, G. Vigna, E.M. Beding - Royer, and R. Kemmerer, "An Intrusion Detection Tool for ODV-Based Ad - Hoc Wireless Networks," Proc. IEEE Computer Security Applications Conf. (CSAC), 2004.
- [7] Herbert Schildt, 'Java™ 2: The Complete Reference, Fifth Edition' McGraw-Hill, 2002.
- [8] Y.Huang and W.Lee, "A Cooperative Intrusion Detection System for Ad Hoc Networks," Proc. ACM Workshop Security of Ad Hoc and Sensor Networks, 2003.
- [9] O.Kachirski and R.Guha, "Efficient Intrusion Detection Using Multiple Sensors in Wireless Ad Hoc Networks," Proc. IEEE Hawaii Int'l Conf. System Sciences, 2003.

- [10] Kegen Yu and Eryk Dutkiewicz, "Geometry and Motion- Based Positioning Algorithms for Mobile Tracking in NLOS Environments", IEEE Transactions on Mobile Computing, Vol. 11, no. 2, February 2012.
- [11] Mohammad Iyas, 'The Handbook of Adhoc Wireless Networks' CRC, 2002.
- [12] N . Mohammed, H . Otrok, L. Wang, M .Debbabi, and P.Bhattacharya, "A Mechanism Design-Based Multi-Leader Election Scheme for Intrusion Detection in Manet," Proc. IEEE Wireless Communication and Networking Conf. (WCNC), 2008.
- [13] Noman Mohammed, Hadi Otrok, Lingyu Wang, Mourad Debbabi and Prabir Bhattacharya, "Mechanism Design - Based Secure Leader Election Model for Intrusion Detection in MANET" IEEE Transactions On Dependable And Secure Computing, Vol. 8, No. 1, January-February 2011.
- [14] H. Otrok, N. Mohammed, L. Wang M. Debbabi, and P.Bhattacharya, "A Game - Theoretic Intrusion Detection Model for Mobile Ad-Hoc Networks," J. Computer Comm., vol. 31, no. 4, pp. 708-721, 2008.
- [15] Sudip Misra, Isaac Woungang and Subhas Chandra Misra 'Guide to Wireless Ad Hoc Networks (Computer Communications and Networks)', Publisher: Springer, 2009.
- [16] K.Sun, P.Peng, P.Ning, and C.Wang, "Secure Distributed Cluster Formation in Wireless Sensor Networks," Proc. IEEE Computer Security Applications Conf. (ACSAC), 2006.
- [17] Y.Thomas Hou, Yi Shi, Jia Liu , Sushant Sharma, Sastry Kompella and Scott F. Midkiff, "Network Coding in Cooperative Communications: Friend or Foe?", IEEE Transactions on Mobile Computing, vol. 11, no. 7, July 2012.
- [18] S.Vasudevan, B.DeCleene, N.Immerman, J.Kurose, and D.Towsley, "Leader Election Algorithms for Wireless Ad Hoc Networks," Proc. IEEE DARPA Information Survivability Conf. and Exposition (DISCEX III), 2003.
- [19] Y.S.Vasudevan, B.DeCleene, N.Immerman, J. Kurose, and D. Towsley, "Leader Election Algorithms for Wireless Ad Hoc Networks," Proc. IEEE DARPA Information Survivability Conf. and Exposition (DISCEX III), 2003.
- [20] Wenbo Mao "Modern IDS : Theory and Practice" Publisher: Prentice Hall PTR; 1st edition 2003.

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Performance evaluation of the CMOS Full adders in TDK 90 nm Technology

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Abstract- This paper presents power analysis of the full adder cells reported as having a low PDP (Power Delay Product), by means of speed, power consumption and area. These full adders were designed upon various logic styles to derive the sum and carry outputs. Two new high-speed and low-power full adder cells designed with an alternative internal logic structure and pass-transistor logic styles that lead to have a reduced PDP (Power-delay product). These all full adder cells designed using a TDK 90 nm CMOS technology.

Keywords- Adder circuits, pass transistor logic, power delay product, layout design.

I. Introduction

In portable electronic devices, it is important to prolong the battery life as much as possible. Adder is the core component of an arithmetic unit. The efficiency of the adder determines the efficiency of the arithmetic unit. Various structures have evolved trying to improve the performance of the adder in terms of area, power and speed. Low power design with high speed of operation is more essential.

The fundamental arithmetic operation is Addition and it is used extensively in many VLSI systems such as application-specific DSP architectures and microprocessors. In addition to its main task, which is adding two binary numbers, it is the nucleus of many other useful operations such as subtraction, multiplication, division, address calculation, etc. In most of these systems the adder is part of the critical path that determines the overall performance of the system.

The amount of energy spent during the realization of a determined task relates to PDP and stands as the more fair performance metric when comparing optimizations of a module designed and tested using different technologies, operating frequencies. The PDP exhibited by the full-adder would affect the system's overall performance.

The new full adder cell designed using an alternative logic structure that is based on the multiplexing of the Boolean functions XOR/XNOR and AND/OR, to obtain the SUM and CARRY outputs, respectively. These full adders show to be more efficient on regards of power consumption and PDP when compared with other ones reported previously as good candidates to build low-power arithmetic modules. And all these full adders designed using TDK 90 nm Technology and simulated using mentor graphics EDA tool with BSIMv3 (model 49). And the layouts of all these full adders designed in Icstation of Mentor Graphics.

II. STANDARD FULL ADDERS DESIGNS

Transmission function theory was used to build a full adder formed by three main logic blocks: a XOR-XNOR gate to obtain $A \oplus B$ and $A \odot B$ signals (Block 1), and XOR blocks or multiplexers to obtain the SUM (S_o) and CARRY (C_o) outputs (Blocks 2 and 3), as shown in Figure 1.

This logic structure is based on the full adder's true-table shown in Table I, and it has been adopted as the standard internal configuration in most of the enhancements developed for the 1-bit full adder cell. After a deep comparative study, the most efficient realization for block I was extracted: the one implemented with SR-CPL logic style. But another important conclusion has pointed out over there: the major problem on regards of propagation delay for a full adder built upon the logic structure shown in Figure 1 is that it is necessary to obtain the $A \oplus B$ and $A \odot B$ intermediate signals, which are then used to drive other blocks in order to generate the final outputs. Thus, the overall propagation delay and, in most of the cases, the power consumption of the full adder, depend on the delay and voltage swing of the $A \oplus B$ and $A \odot B$ signals, generated within the cell.

Therefore, to increase the operational speed of the full adder, it is necessary to look out for a new logic structure that avoids the generation of intermediate signals used to control the selection or transmission of other signals located on the critical path.

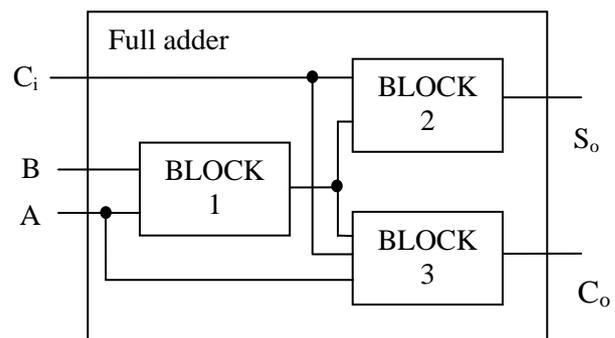


Fig.1. Full-adder cell formed by three main logical blocks.

III. ALTERNATIVE LOGIC STRUCTURE FOR A FULL ADDER

Examining the full-adder's true-table in Table I, it can be seen that the S_o output is equal to the $A \oplus B$ value when $C=0$, and it is equal to $A \odot B$ when $C=1$. Thus, a multiplexer can be used to obtain the respective value taking the C input as the selection signal. Following the same criteria, the C_o output is equal to the $A \cdot B$ value when $C = 0$, and it is equal to $A + B$ value when $C = 1$.

TABLE IV

True-Table For A 1-Bit Full-Adder: A, B, And C Are Inputs;
 So And Co Are Outputs

C	B	A	So	Co
0	0	0	0	0
0	0	1	1	0
0	1	0	1	0
0	1	1	0	1
1	0	0	1	0
1	0	1	0	1
1	1	0	0	1
1	1	1	1	1

Again, C can be used to select the respective value for the required condition, driving a multiplexer. Hence, an alternative logic scheme to design a full-adder cell can be formed by a logic block to obtain the $A \oplus B$ and $A \odot B$ signals, another block to obtain the $A \cdot B$ and $A + B$ signals, and two multiplexers being driven by the C input to generate the S_o and C_o outputs, as shown in Fig. 1 .

The features and advantages of this logic structure are as follows.

- There are not signals generated internally that control the selection of the output multiplexers. Instead, the C input signal, exhibiting a full voltage swing and no extra delay, is used to drive the multiplexers, reducing so the overall propagation delays.
- The capacitive load for the C input has been reduced, as it is connected only to some transistor gates and no longer to some drain or source terminals, where the diffusion capacitance is becoming very large for sub-micrometer technologies. Thus, the overall delay for larger modules where the C signal falls on the critical path can be reduced.
- The propagation delay for the S_o and C_o outputs can be tuned up individually by adjusting the XOR/XNOR and the AND/OR gates; this feature is advantageous for applications where the skew between arriving signals is critical for a proper operation (e.g., wave pipelining), and for having well balanced propagation delays at the outputs to reduce the chance of glitches in cascaded applications.
- The inclusion of buffers at the full-adder outputs can be implemented by interchanging the XOR/XNOR signals, and the AND/OR gates to NAND/NOR gates at the input of the multiplexers, improving in this way the performance for load-sensitive applications.

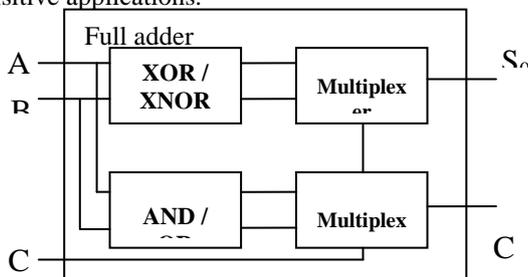


Fig. 2. Alternative logic scheme for designing full-adder cells.

Two new full-adders have been designed using the logic styles DPL and SR-CPL, and the new logic structure presented in Fig. 3. Fig. 4 presents a full-adder designed using

a DPL logic style to build the XOR/XNOR gates, and a pass-transistor based multiplexer to obtain the S_o output. In Fig. 4, the SR-CPL logic style was used to build these XOR/XNOR gates. In both cases, the AND/OR gates have been built using a powerless and groundless pass-transistor configuration, respectively, and a pass-transistor based multiplexer to get the C_o output.

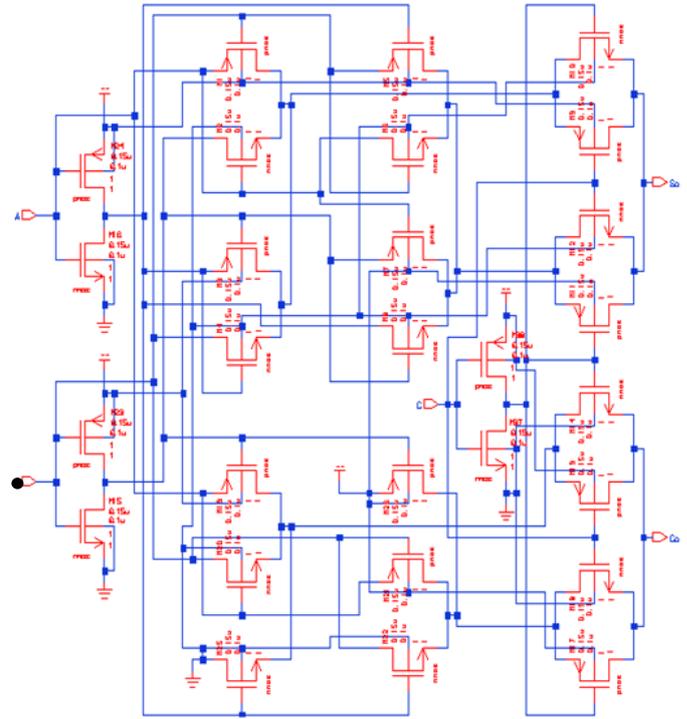


Fig. 3. Full-adder designed with a DPL logic style.

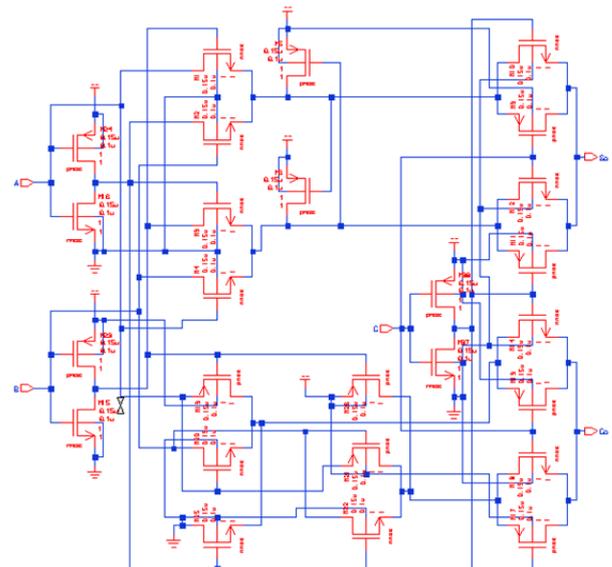


Fig. 4. Full-adder designed with the SR-CPL logic style.

IV. SIMULATION SETUP

The test bed used to simulate the full adders being compared is shown in Figure 5. This simulation environment has been commonly used to compare the performance of the full adders.

The advantage of using this test bed is that the Following power components are taken into account, besides the dynamic one:

The short-circuit dissipation of the inverters connected at the full adder inputs.

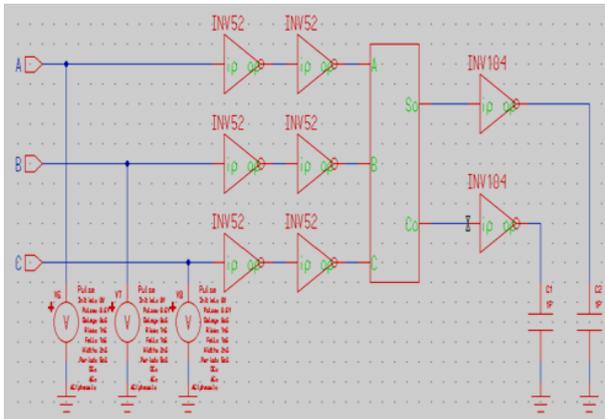


Fig 5. Test bed used for simulating the full-adders under comparison.

This power consumption varies according to the capacitive load that the adder module offers at the inputs. Even more, the energy required to charge and discharge the full adder internal nodes when the module has no direct power supply connections (such is the case of pass-transistor logic styles), comes through these inverters connected at the full adder inputs.

- The short-circuit consumption of the full adder itself, as it is receiving signals with finite slopes coming from the buffers connected at the inputs, instead of ideal ones coming from voltage sources.
- The short-circuit and static dissipation of the inverters connected to the outputs of the full adder due to the finite slopes and degraded voltage swing of the full adder output signals.

The importance of including the effects and power consumption of the buffers connected at the inputs and outputs of the full adder cell come from the fact that the module is always going to be used in combination with other modules to build a larger system, and these static inverters are a good generalization for any other module to be considered.

V. SIMULATION RESULTS

Seven full adders were compared on regards of power consumption and delay. They were named: new14T[1], HPSC[2], HYBRID[3], HYBRID CMOS[4], CPL[5], DPL and SR-CPL[6].

The schematics and layouts were designed using a TDK 90 nm CMOS technology, and simulated using the BSIM3v3 model (level 49) and the post-

layout extracted netlists containing R and C parasitics. Simulations were carried out using ICSTUDIO in Mentor Graphics EDA Tool. Table 2 shows the simulation results for full-adders performance comparison, regarding power consumption, propagation delay, PDP and area.

The ICSTUDIO in Mentor Graphics EDA Tool simulations showed that of 59.56% power savings and 57.51% for the PDP for the joint optimization at 5v. And 52.32% power savings and 48.83% for the PDP for the joint optimization at 1.8v.

TABLE VI
 SIMULATION RESULTS OF THE FULL-ADDERS COMPARED

VI. CONCLUSIONS

The design of high-speed low-power full adder cells based upon an alternative logic approach has been presented. MENTOR GRAPHICS EDA TOOL simulations have shown a great improvement on regards of power-delay metric for the proposed adders, when compared with previously published realizations designed with TDK 90 nm technology.

The full adders designed upon this logic structure and DPL and SR-CPL logic styles, exhibit a delay around 134.9 ps and power consumption around 4.22 μW at 1.8v and the delay is around 171.7 and power dissipation is 491.1 μW at 5v supply voltage, for an overall reduction of 81% respect to the best featured one of the other adders been compared, but in general about 50% respect to the other ones.

Some work can be done in the future on the design of 45 nm technology of high-speed low-power full adders.

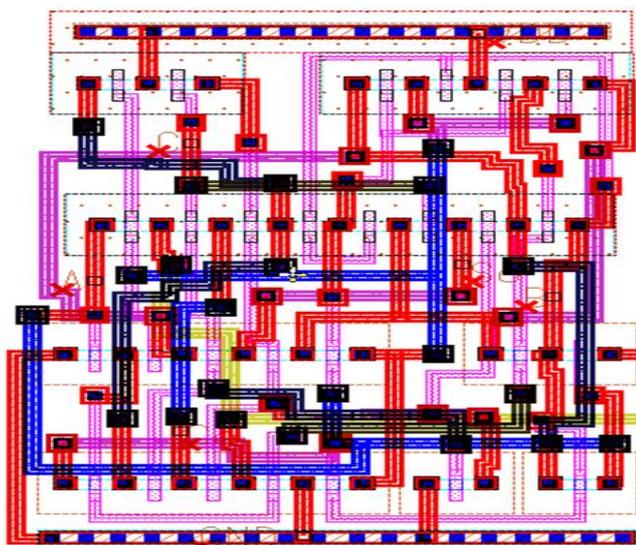
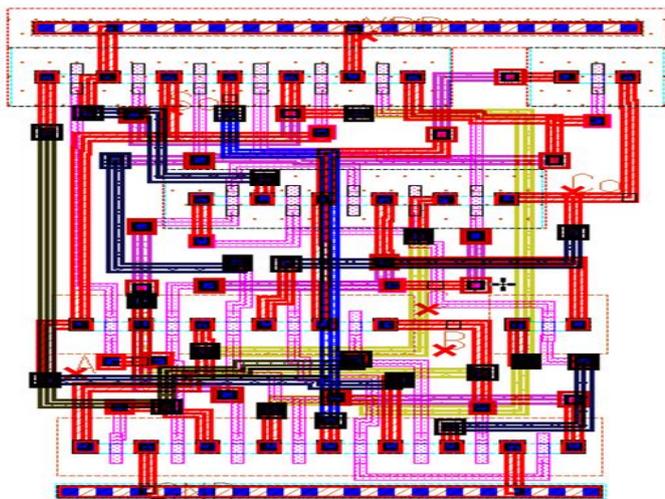


Fig. 6. Layout of the DPL full-adder.

S. N o.	Name of the full adder	No. of transistors	Frequency	Area (μm ²)		
				L	W	L*W
1	NEW14T	14	200 MHZ	5.14	7.75	39.83
2	HYBRID CMOS	24	200 MHZ	4.92	9.07	44.61
3	HPSC	22	200 MHZ	6.49	7.60	49.31
4	HYBRID	26	200 MHZ	5.76	9.57	55.11
5	CPL	28	200 MHZ	7.37	8.29	61.10
6	DPL	28	200 MHZ	4.89	7.95	38.87
7	SRCPL	26	200 MHZ	5.40	7.72	41.69
at 5v Supply voltage						
S. N o.	Name of the full adder	Power dissipation (uW)	Propagation delay (ps)			PDP (uw*ps)
			Sum	Carry	Average delay	
1	HYBRID	1206.5	147.1	160.59	153.8	185668.28
2	HPSC	1214.6	146.6	152.19	149.3	181455.16
3	HYBRID CMOS	912.2	205.4	171.19	188.3	171815.14
4	NEW14T	983.8	152.3	146.70	149.5	147081.88
5	CPL	540.3	205.7	204.79	205.2	110931.59
6	DPL	491.3	189.1	176.56	182.8	89837.66
7	SRCPL	490.9	139.9	181.49	160.6	78893.24
at 1.8v Supply voltage						
S. N o.	Name of the full adder	Power dissipation (uW)	Propagation delay (ps)			PDP (uw*ps)
			Sum	Carry	Average delay	
1	NEW14T	8.85	136.1	115.4	125.8	1113.33
2	HYBRID CMOS	6.13	153.9	131.8	142.9	876.65
3	HYBRID	6.57	108.3	133.3	120.8	793.54
4	HPSC	6.57	108.2	125.0	116.6	765.83
5	CPL	4.65	142.6	147.1	144.8	673.27
6	DPL	4.23	133.6	158.8	146.2	617.93
7	SRCPL	4.21	98.8	148.7	123.6	521.23



REFERENCES

- [1] D. Radhakrishnan, "Low-voltage low-power CMOS full adder," *IEE Proc. Circuits Devices Syst.*, vol. 148, no. 1, pp. 19–24, Feb. 2001.
- [2] M. Zhang, J. Gu, and C. H. Chang, "A novel hybrid pass logic with static CMOS output drive full-adder cell," in *Proc. IEEE Int. Symp. Circuits Syst.*, May 2003, pp. 317–320.
- [3] C. Chang, J. Gu, and M. Zhang, "A review of 0.18- μm full adder performances for tree structured arithmetic circuits," *IEEE Trans. Very Large Scale Integr. (VLSI) Syst.*, vol. 13, no. 6, pp. 686–695, Jun. 2005.
- [4] S. Goel, A. Kumar, and M. Bayoumi, "Design of robust, energy-efficient full adders for deep-submicrometer design using hybrid-CMOS logic style," *IEEE Trans. Very Large Scale Integr. (VLSI) Syst.*, vol. 14, no. 12, pp. 1309–1320, Dec. 2006.
- [5] S. Agarwal, V. K. Pavankumar, and R. Yokesh, "Energy-efficient high performance circuits for arithmetic units," in *Proc. 2nd Int. Conf. VLSI Des.*, Jan. 2008, pp. 371–376.
- [6] M. Aguirre and M. Linares, "CMOS Full-Adders for Energy-Efficient Arithmetic Applications," *IEEE transactions on very large scale integration (VLSI) systems*, vol. 19, no. 4, April 2011, pp. 718–721.

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MATLAB based Image Editing and Color Detection

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Abstract– This paper deals with the implementation of various MATLAB functions present in image processing toolbox of MATLAB and using the same to create a basic image processor having different features like, viewing the red, green and blue components of a color image separately, color detection and various other features (noise addition and removal, edge detection, cropping, resizing, rotation, histogram adjust, brightness control, etc.) that is used in a basic image editor along with object detection and tracking.

Keywords- Image processing toolbox, GUI, MATLAB, Bounding Box

I.INTRODUCTION

In this paper the authors presented a set of MATLAB applications useful for image processing[1][2] and color detection, each of which consists of user friendly graphical interface helpful for those not familiar with MATLAB programs running behind the image processor.

MATLAB based image processing[3] is a very convenient platform and very easy to construct an algorithm. An image is a matrix of pixel values. MATLAB considers every input as a matrix. For this reason MATLAB provides an easy tool for image processing as a user can easily access each and every pixel value from the image matrices and edit it. Moreover there is an 'image processing tool box' [4] built in MATLAB for this purpose.

Mainly users deal with three types of image, hence three different matrices. Black and white or binary image matrix consists of only zero and one, one being the brighter portion and zero being the dark part. Generally images are 8bit and

corresponding image matrix is 256x256. Gray scale image is also a 2 dimensional matrix with each element value varying from 0 to 256. Like gray scale image RGB image can be denoted by matrix with each pixel values varying from 0 to 256. In case of RGB image, three separate matrices for each red, green and blue components overlap to form a RGB image of 256x256x3 dimension. Since we are now well acquainted with image as a matrix, now any mathematical operations can be performed on an image that can be done with a matrix.

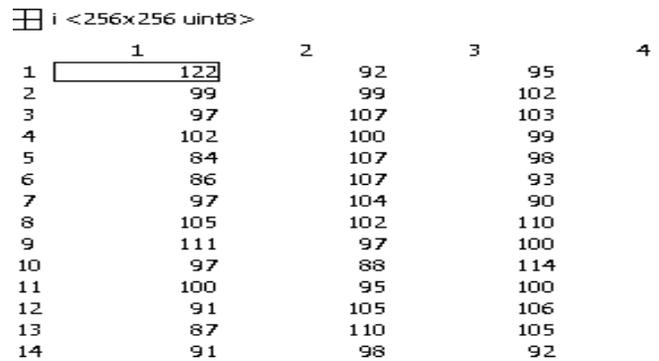


Figure 1: Gray scale image Matrix

II.IMAGE EDITOR

The image editor is created using the Graphical User Interface (GUI) [5][6] option available in MATLAB . The editor consists of three axis and the following options:

- Browse image
- Image input using camera
- Image addition
- Gray conversion

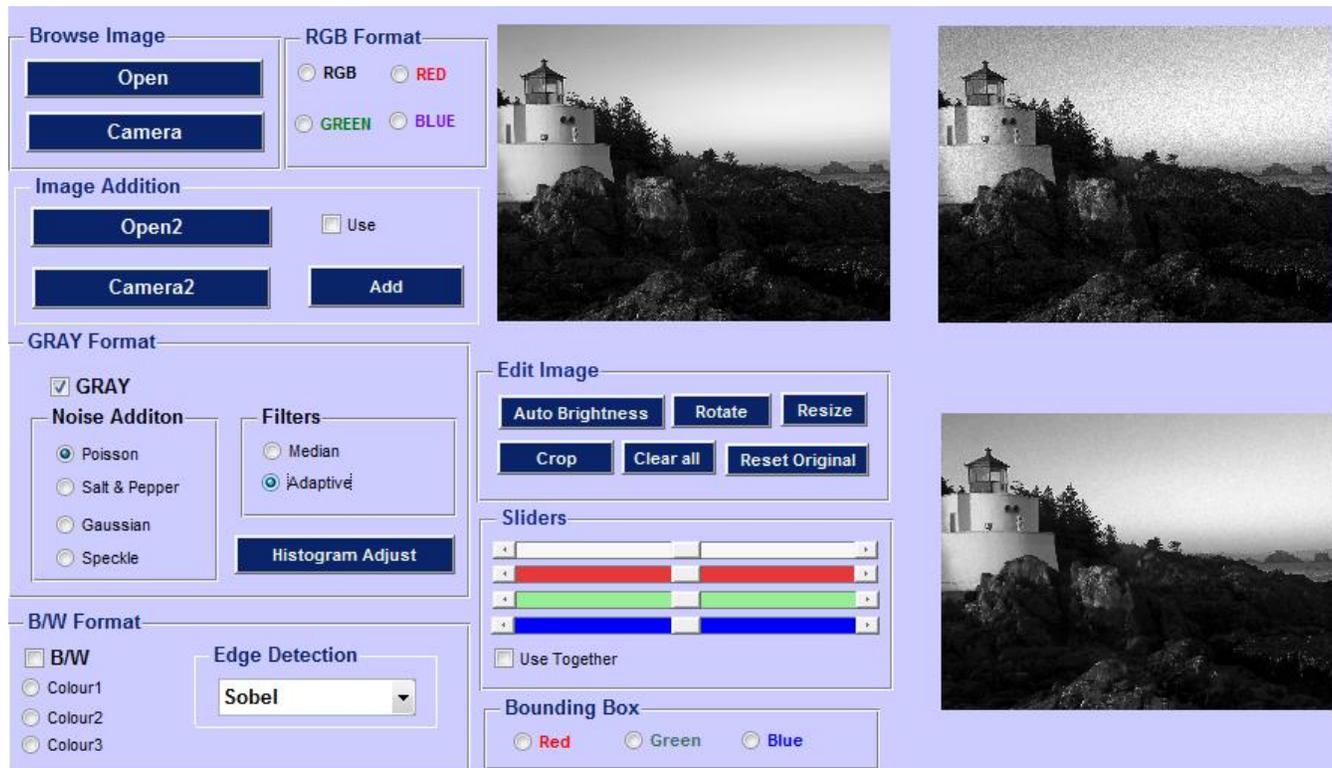
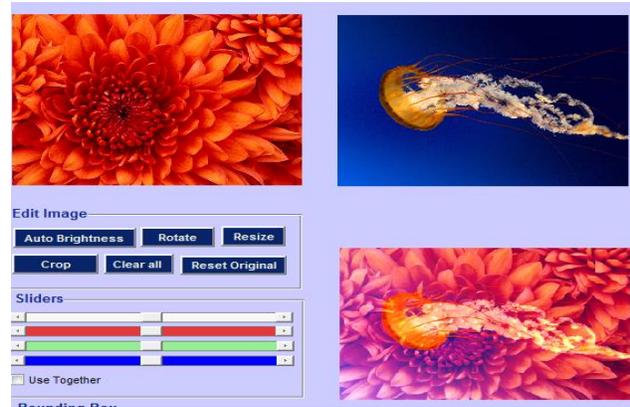


Figure 2: MATLAB GUI

- Noise addition
- Noise removal
- Histogram adjust
- B/W conversion
 - B/W to color image
 - Edge detection
- Auto brightness
- Image rotate
- Image Resize
- Crop
- Clear



- Reset original
- Sliders (4) to control brightness and R, G and B component.
- Panel to view RGB format and each component separately.

While creating the GUI, push button, slider, radio button, check box, pop-up menu, list box, panel and button group options available in MATLAB are used, (Figure. 2) Now each component is discussed separately.

A. Axis

Three axes are used in the GUI. The first axis is mainly for an input image. The second axis is mainly for any other effects on the original image (like after adding noise). The third axis is for the histogram or as in Figure 2 shows the image after removal of the noise. According to Figure 2, axis one shows the gray scale image (input image), second axis shows the noise added and the third axis shows the image after noise removal.

B. Browse Image

The browse image panel helps in selecting an image from hard disk or an image taken directly from camera for further processing.

C. Image Addition

Figure 3: Image addition

Image is a simple matrix. Since, addition can be performed on matrix, so that can also be applied on images. To do this a function 'imadd' available in MATLAB is used which performs addition of pixel values of first image to the second image.

D. Gray Conversion

Gray conversion is done mainly to convert a RGB image (three dimensional matrix) to gray scale (two dimensional matrix) having pixel values ranging from 0 to 255.

Noise Addition and Removal: Various types of noise get added to an image when a snapshot is taken. In order to get rid of these noises various types of filters are used. To illustrate this authors have added a noise to an image externally and then applied various filters to get rid of it and evaluated the results. Since noises are two dimensional and RGB images are three dimensional, dimensional mismatch has to be avoided while adding the noises. For this reason RGB image is converted to gray image and then noise addition and removal is performed.

Noises can be of various types such as Poisson, Salt and pepper, Gaussian and Speckle. Median and adaptive filter are mainly in use. Figure 2 shows that Poisson noise has been added to the image in axis 1, and the noise added image is in axis 2 and after applying Adaptive filter to the image we get the filtered image as shown in axis 3.



Figure 4: Salt and Pepper noise added image



Figure 5: Gaussian noise added image



Figure 6: Speckle noise added image

E. Black and White Image

Binary image (black and white) image is a two dimensional image with pixel values either 0(black) or 1(white).

1)Edge Detection: Edge detection technique is applicable only to binary images, so in case of an RGB or gray image it has to be first converted to a binary image and then edge detection technique has to be applied.

RGB image is not directly converted to B/W image. First it is converted to gray image then to B/W. This is done by applying 'graythresh' function on gray image and then 'im2bw' and 'bwareaopen' functions on the previous output consecutively.

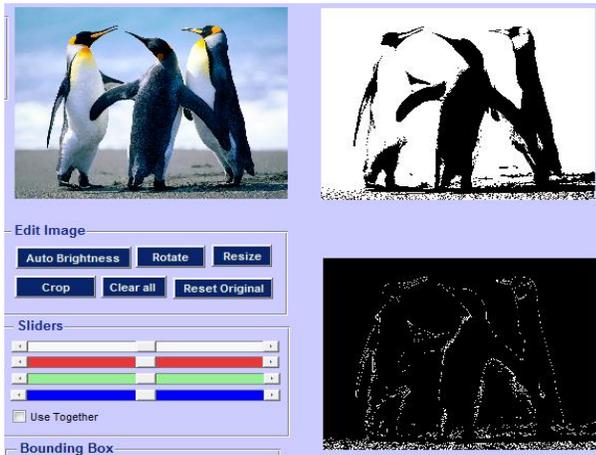


Figure 7: B/W conversion and edge detection(Sobel)

The various types of edge detection techniques are: Sobel, Prewitt, Roberts, LoG, Zerocross and Canny. Figure 7 shows Sobel technique of edge detection.



Figure 8: Canny edge detection technique used



Figure 9: LoG edge detection technique used

F. Image rotate

Image rotate is used to rotate the image to a specified degree. The command is 'imrotate'.

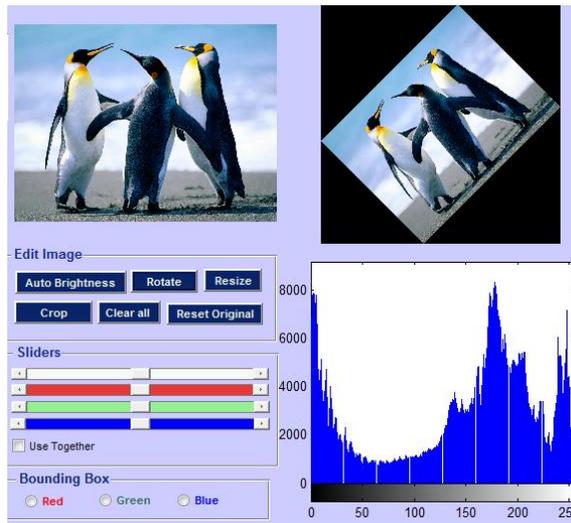


Figure 10: Image rotation

Axis 1 is the actual image, axis 2 is the rotated image and the axis 3 shows the corresponding histogram.

G. Image Crop

Image cropping is used to select any particular portion of the whole image. The syntax is 'imcrop'.

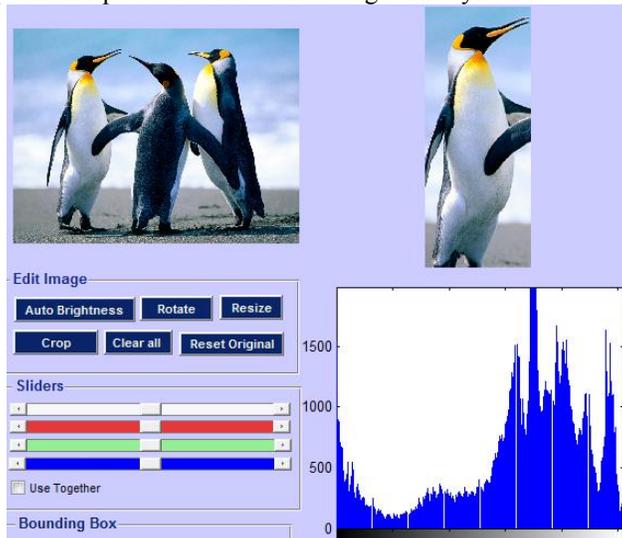


Figure 11: Image cropping

Axis 1 shows the actual image, axis 2 showing the crop portion and the intensity distribution of the cropped image is being shown on axis 3.

H. Image Resize

Image resize is being used to resize the actual image to certain multiples. The syntax is 'imresize'.

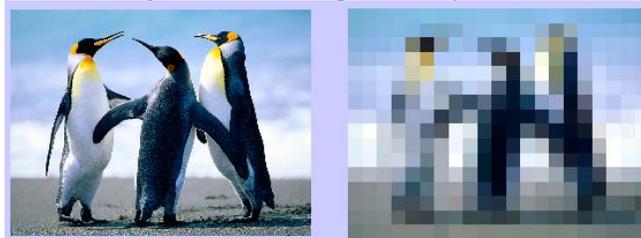


Figure 12: Image resize

I. Sliders

Here four sliders are used for each of red, green and blue components individually and another for brightness. Our main aim was to control each component (red, green & blue) intensity and also brightness of the original image.

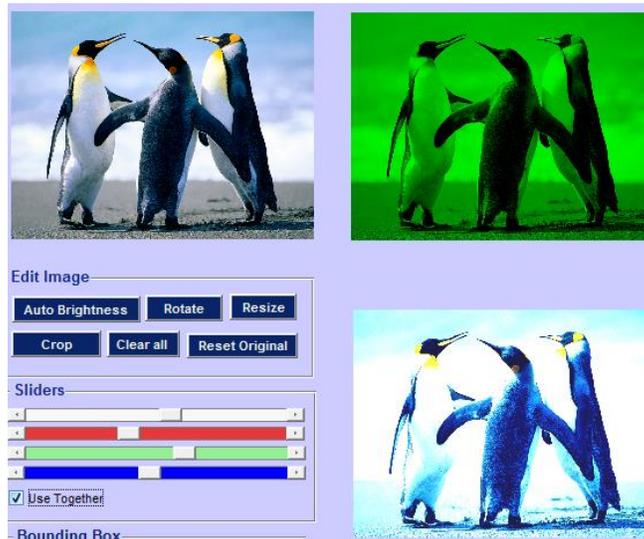


Figure 13: Sliders usage

The axis 1 is the original image, axis 2 shows a particular component change (here green) and the axis 3 is showing the result of it on the actual image.

J. RGB Format

This RGB panel is used to view the red, green and blue component of the image separately. It has already been mentioned that an RGB image is overlap of three two dimensional matrix.



Figure 14a: Red component



Figure 14b: Green component



Figure 14c: Blue component

K. Histogram adjust

Generally for certain images the histograms are not equally spaced or rather they are clotted to a particular intensity, hence, making the image dull or too bright. For this reason various histogram adjustment techniques are being used. Some of the well-known histogram adjustment functions are 'histeq', 'imadjust' and 'adapthisteq'.

L. Bounding Box

The bounding box concept is used in MATLAB to identify either the red, blue or green component of an image taken by the camera. It is a part of the 'regionprops' function[7].

'REGIONPROPS' measure different properties of a bounded image region, like area, axis and centroid.



Figure 15: Blue detection

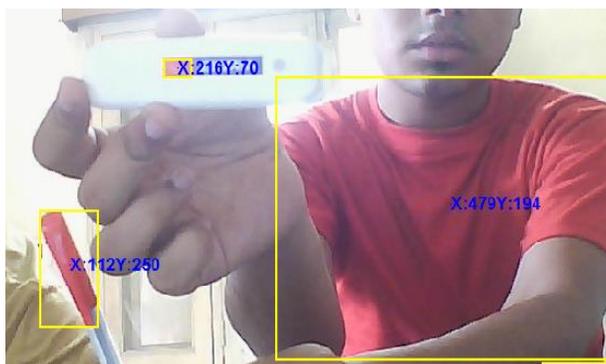


Figure 16: Green detection

Figure 17: Red detection

III. DISCUSSIONS AND CONCLUSION

Thus here various components of this MATLAB based image editor have been discussed. The authors have tried their level best to make the image editor as user friendly as possible. The purpose of the image editor is to bring the various image editing functions available in MATLAB tool box under one common platform and to make it easier for the understanding of any user. Future work can be aimed to expand the set of applications than what has been used here.



The authors have implemented the bounding box technique used in the image editor, to control the outputs of an Arduino and an 'iRobot Create' using color detection, which shall be illustrated in their next paper.

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REFERENCES

- [1] Rafael C. Gonzalez (University of Tennessee), Richard E. Woods (MedData Interactive) and Steven L. Eddins (The MathWorks, Inc.), in '*Digital Image Processing Using MATLAB*' Second Edition, 2009 by Gatesmark, LLC.
- [2] Alasdair McAndrew, in '*An Introduction to Digital Image Processing with Matlab, Notes for SCM2511 Image Processing 1*', School of Computer Science and Mathematics, Victoria University of Technology.
- [3] Justyna Inglot, '*Advanced Image Processing with Matlab*', in *Bachelor's Thesis Information Technology*, May 2012, Date of the bachelor's thesis 07.05.2010, Mikkel University of Applied Sciences.
- [4] <http://www.mathworks.in/help/images/index.html>
- [5] <http://www.mathworks.in/discovery/matlab-gui.html>
- [6] <http://www.mathworks.in/videos/creating-a-gui-with-guide-68979.html>
- [7] <http://www.mathworks.in/help/images/ref/regionprops.html>

Implementation of MATLAB based object detection technique on Arduino Board and iROBOT CREATE

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Abstract – This paper illustrates the application of the color detection technique using MATLAB algorithms, to control the state of the output pins of an Arduino (AT mega 328) and also to control the movements of an iROBOT CREATE [1]. This gives a very small example of implementing Bounding Box algorithm [2] and use of the simple color detection technique and other ‘REGIONPROPS’ [3][4] parameters we can control the outputs of an Arduino board [5] and also control an iROBOT CREATE.

Keywords – Color detection, MATLAB, iROBOT CREATE, Arduino AT Mega 328, Bounding box.

I. INTRODUCTION

In this paper, we are going to take advantage of the Bounding Box technique, present in image processing tool box [6], to detect the centroid of a particular colored image, and the change of the centroid co-ordinates will be detected, which will be applied to generate different commands. These commands would be fed to an Arduino to change the states of its output pins, and, to control the movement of an iROBOT CREATE in a particular direction. Here same logic has been implemented for both Arduino (AT mega 328) and iROBOT CREATE.

The main algorithm that is implemented is very simple and robust. A camera takes continuous snapshots and a particular colored region (predefined by user) of the images are bounded by a box. Then an algorithm is written that will sense the movement of the colored box and generate different commands, each command corresponds to movements in a particular direction of an iROBOT CREATE (that is fed wirelessly to the robot) or state change of certain output pins of an Arduino.

Arduino is basically an open source platform which is very easy to use, and, interfacing with Arduino is simple. The iROBOT CREATE that has been used is a programmable robot developed under Roomba platform in 2007, explicitly designed for robotics development.

II. HARDWARE PLATFORM

A. Imaging device

The web cam is used as image capturing device. Here the device takes snapshots continuously after a predefined very short interval of time. Due to human’s perception of vision these snapshots taken within a very short period of time and displayed continuously might look as a continuous image i.e. video. Depending on the processing speed of the computer being used, this interval for taking snapshots is adjusted.

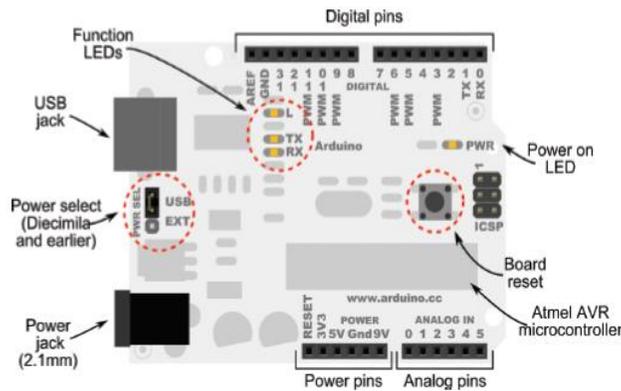
B. Arduino ATmega328

Arduino Atmega328 is used. The image of an Arduino board is shown in Figure 1(a) and the pin diagram is shown in Figure 1(b) which will help to know the detailed hardware configurations of the Arduino board used.

Arduino is an open-source electronics prototyping platform based on flexible, easy-to-use hardware and software. Arduino can be programmed according to users own need. The power supply can be via USB or external power supply. The power source is selected with a jumper, a small piece of plastic that fits onto two of the three pins between the USB and power jacks. There is sufficient number of pins for



(a)



(b)

Figure 1(a): Actual Arduino image, Figure 1(b): Arduino pin settings

	ATmega328
Flash Memory	32KB; 0.5KB used by boot loader
SRAM	2KB
EEPROM	1KB
Clock speed	16MHz
Digital I/O pins	14(of which 6 provides PWM output)
Analog Input pins	6

Table 1: Specifications for our Arduino

both analog and digital. Before programming is done on Arduino, the board used has to be selected (AT mega 328) from the ‘tools’ option of Arduino software. Serial port (COM1/COM2/COM3) in use has to be selected also from the ‘tools’ menu.

The platform is then set for programming. After the desired code is written it has to be uploaded to the microcontroller of the Arduino and then Arduino is expected to work as desired.

C. iROBOT CREATE

'iROBOT CREATE' is a [robot](#) manufactured by '[iROBOT](#)' that is based on the [Roomba](#) platform and was introduced in the year 2007. The iROBOT CREATE includes a cargo bay which houses a 25 pin port that can be used for digital and analog input and output. The CREATE also possesses a serial port through which sensor data can be read and motor commands can be generated using the "iROBOT Roomba Open Interface protocol" (a MATLAB based function dedicated to control iROBOT CREATE). In order to control the 'iROBOT CREATE' using MATLAB a toolbox named 'iROBOT CREATE toolbox' has to be used that is not present in MATLAB. The [iROBOT CREATE](#) simulator is a MATLAB toolbox designed to visualize the robot's movement in different environments. The user can control the robot manually, or by writing a program for autonomous behavior. The simulator is designed to accept autonomous programs written using the [MATLAB Toolbox for the iROBOT CREATE](#) (by Esposito and Barton) [7], thus allowing for seamless transitions between simulation and physical execution.



Figure 2(a)

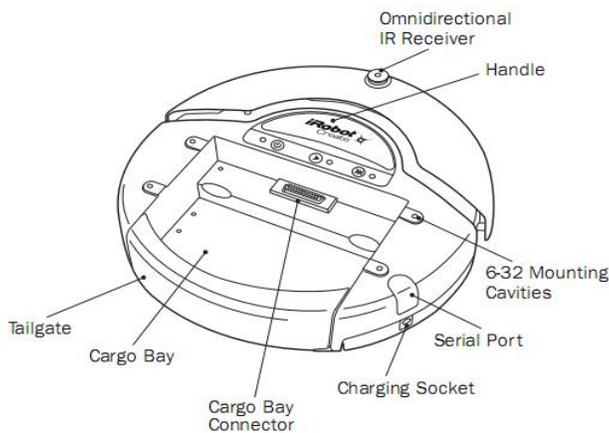


Figure 2(b)

Figure 2(c)

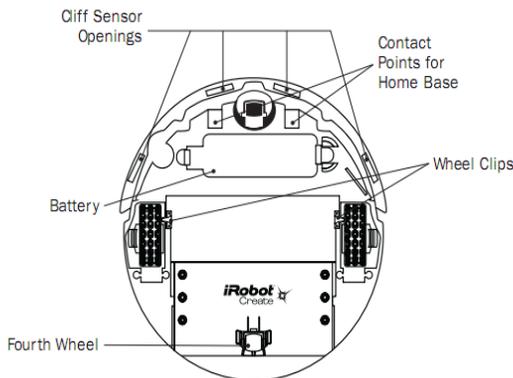
Figure 2 (a): iROBOT CREATE (b): Top view of the robot (c): Bottom view of the robot

Figure 2 shows the detailed hardware of the iROBOT that we are going to control using our MATLAB programming.

D. Bluetooth Adaptor Module (BAM)

Commands can be sent to the iROBOT either via wire or wireless medium (via Bluetooth or Wi-Fi or Serial Wired Communication). Here it is done wirelessly, by using a Bluetooth device connected to the iROBOT and then interfacing it with the computer's Bluetooth. For this purpose a Bluetooth Adaptor Module or BAM is used. The Element Direct BAM (Bluetooth Adapter Module) enables wireless control of the iROBOT CREATE from any Windows, Mac or Linux computer, or any other Bluetooth enabled device. The BAM connects to the CREATE's cargo port to CREATE a virtual serial port. The BAM is a wireless serial cable replacement that uses the Serial Port Profile (SPP) to provide a means to send and receive serial packets to the iROBOT CREATE mobile robot. The BAM allows the CREATE robot to be driven remotely with a PC hosted web server. It also allows user to run complicated algorithms on a host computer and communicate with the iROBOT in real time. The various specifications of the BAM is mentioned in Table 2 and Table 3.

Bluetooth Specifications	
Device Name	Element Serial
Available Services	SPP



RF power	Class 1 Bluetooth
Baud rate	57600
Data Bits	8
Stop Bits	1

Table 2: Specifications for our BAM

General Specifications	
Operating Frequency	2.4GHz
Voltage	5V
Current	100 mA maximum
Internal Antenna Multilayer Chip, Peak gain	0.5dBi
Operating range	91 meters
Operating temperature	0 to 50 degree centigrade
Size	55x55x16mm

Table 3: General Specifications for our BAM



Figure 3: Bluetooth Adaptor Module (BAM)

III. METHODOLOGY

The whole process can be divided into two parts. The first part being detection of the movements of the colored box using MATLAB image processing and the second being interfacing with the Arduino and the iROBOT CREATE to act accordingly.

A. Movement detection using MATLAB

Image acquisition is a crucial part for movement detection. To get the detail of the hardware device interfaced for imaging 'imaqhwinfo' command is used. Here 'winvideo' is a dedicated adapter for windows platform. Now it is possible that more than one imaging device is connected to the computer, to avoid this problem while taking snapshot from an imaging device its serial number is also mentioned. It is possible to take finite and infinite numbers of snapshot from the imaging device according to the requirement of the user. Now 'BoundingBox' algorithm is applied on the captured images.

The Bounding Box is a part of 'regionprops' function. The brief algorithm of 'BoundingBox' is explained below:

- Grab an image using Image Acquisition toolbox
- Run this image grabbing function inside a loop(while loop is recommended)
- From the required color index, perform image subtracting function.
- Apply median filter for noise cancelation and convert the image into black and white image as most of the image processing tool cannot be applied on color image.
- Calculate the 'regionprops' of each of the component of the image that is a function of MATLAB by which all details of the component of the image can be enlisted.

REGIONPROPS: Measure the properties of any particular image region.

STATS = REGIONPROPS (BW, PROPERTIES) measures a set of properties for each connected component (object) in the binary image BW, which must be a logical array, it can have any dimension.

STATS are an array of structures with length equal to the number of objects in BW, CC.NumObjects, or max (L(:)). The fields of the structure array denote different properties for each region, as specified by PROPERTIES.

PROPERTIES can be a comma-separated list of strings; a cell array containing strings; the string 'all'; or the string 'basic'.

Shape Measurements:

'Area', 'EulerNumber', 'Orientation', 'BoundingBox', 'Extent', 'Perimeter', 'Centroid', 'Extrema', 'PixelIdxList', 'ConvexArea'
'FilledArea', 'PixelList', 'ConvexHull', 'FilledImage', 'Solidity', 'SubarrayIdx', 'Eccentricity', 'MajorAxisLength',
'EquivDiameter', 'MinorAxisLength'.

In this project mainly three shape measuring function are used, they are bounding box, centroid, and area. Using the bounding box concept the red, blue or the green portions can be identified and at the same time the centroid of the detected portion can also be displayed.

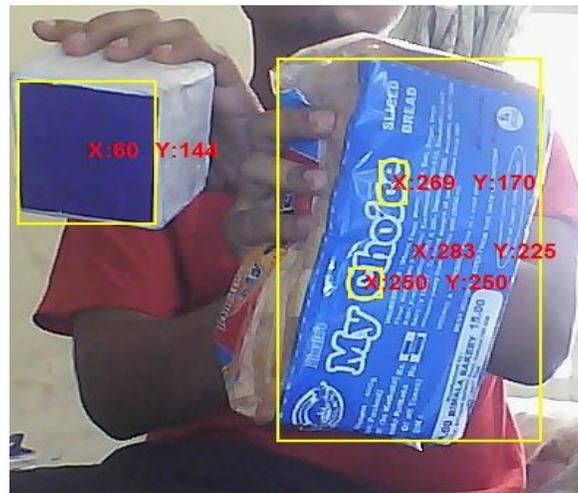


Figure 4: Bounding box showing the centroid.

Now tracking the centroid of the bounded region, the remaining program is executed. The main procedure is as follows:

- The difference or change in centroid of the object between two consecutive snapshots is noted.
- When an individual holds the colored object in front of the camera and as he gradually moves his hand from left to right (so does the centroid), his hands also move slightly up and down (due to shaking of hand, which is unintentional). So the change of centroid will be in both the axes (x and y), but movement in one particular direction is considered. For this reason one particular axis (x or y) where movement is greater is taken under consideration and it is regarded as the intentional movement of the user.
- Now after recognizing the axis in which the movement is intended, the direction of change is noted, i.e., whether it is positive or negative movement in that particular axis and a command corresponding to it is generated.
- After these above two steps, the generated command is fed to the input of an Arduino and the iROBOT.

B. Interfacing with Arduino and iROBOT

1) *Arduino Interfacing:* Arduino windows based software is used to program the microcontroller on the board. Arduino can be connected through Universal Serial Bus. In the software Interface firstly model name of the Arduino is selected. Embedded C program is used for programming the microcontroller. Arduino programming has a pre-defined pattern, there are three parts, declaring the variables, setup part (communicational command) and loop part. As per the name suggests variable declaring part initializes all the variables which are needed throughout the program. Setup part consists of communication port configuration and in this portion we have to declare the pin configuration of the Arduino. Loop part has an infinite loop under which the main operational statements are written.

Then bounding box program is applied to detect the colored box movement, and for a particular movement a particular LED glows (as a particular pin goes High). For this purpose two programs have to be executed. The first one is in the MATLAB and the second in Arduino.

In the MATLAB program the bounding box concept is used to detect red, blue or green component. Then for a particular movement in x and y axis a character (a command) is sent to the Arduino board using 'fprintf'. For example if the movement in x is positive then character 'r' is sent, meaning right. And if it is negative movement character 'l' can be sent, meaning left. Similarly for the y axis 'f' and 'b' for forward and backward movement can be sent respectively. One can send any character for any condition, according to his own choice

When from MATLAB the Arduino receives particular character via Universal Serial Bus, it is needed to be programmed to act according to a user's need. Here there are four LEDs to four different Arduino pins. For four different box movements (right, left, up and down) MATLAB sends the Arduino four different characters as commands and the programmed Arduino receives those commands and operates to set one out of four pins to HIGH and all the other three to LOW simultaneously. In this way movements of the box in a particular direction can be sensed by glowing a particular LED representing a definite direction.

2) *iROBOT Interfacing:* iROBOT is interfaced with computer wirelessly. For this purpose Bluetooth Adapter Manger (BAM) is connected to the cargo bay of the iROBOT.

After completing the Bluetooth setup the MATLAB program is executed. The iROBOT is accessed via Bluetooth.

The main idea of movement control of iROBOT is the same as that of glowing a LED tracking the box's movement using Bounding Box technique. For forward and backward movement y axis change is considered and for the left and right turning x axis change is considered.

IV. DISCUSSIONS AND CONCLUSION

The main aim of the project was to detect the colored box's movement and how that can be applied to control the movement of the iROBOT CREATEs. Since using MATLAB image processing red, green or blue color can be detected and MATLAB bounding box algorithm provided access to its centroid, it became easy to detect the hand movement of the person holding any of red, green or blue colored object in his hand and thereby controlling either an Arduino or iROBOT.

There are certain aspects of the paper that needs to be worked upon and improved. Those aspects include eliminating unwanted detection of color while execution of Bounding Box algorithm except the target object, multiple color detection other than red, green and blue .

The iROBOT CREATE can move left, right, front and backwards, but more detailed studies is to be done to rotate it in intermediate angles using the box movement more accurately.

In summary, this paper implies how hand movements can be implemented to control any robot using color detection technique. MATLAB provides easy methods for doing that. Moreover the interfacing between MATLAB and other external hardware devices such as Arduino and iROBOT, makes the work much easier.

ACKNOWLEDGMENT

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REFERENCES

- [1] Jason T. Isaacs, Daniel J. Klein, Joao P. Hespanha in '*A Guided Internship For High School Students Using iROBOT CREATE*'. Department of Electrical and Computer Engineering, University of California, Santa Barbara, CA 93106 USA(e-mail:fjtisaacs,djklein,hesperhag@ece.ucsb.edu).
- [2] V. Subburaman and S. Marcel. Fast Bounding Box estimation based face detection in '*Workshop on Face Detection of the European Conference on Computer Vision (ECCV)*', 2010.
- [3]<http://nf.nci.org.au/facilities/software/Matlab/toolbox/images/regionprops.html>
- [4] <http://www.mathworks.in/help/images/ref/regionprops.html>
- [5]<http://arduino.cc/en/Tutorial/HomePage>
- [6]<http://www.mathworks.in/help/images/index.html>
- [7] <http://www.usna.edu/Users/weapsys/esposito/roomba.matlab/>

Influence of Fine Aggregate Particle Size and Fly-ash on the Compressive Strength of Mortar for SCC

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Abstract- Self-compacting concrete (SCC) generally has higher powder content than normally vibrated concrete (NVC) and thus it is necessary to replace some of the cement by mineral admixtures such as fly-ash to achieve an economical and durable concrete. SCC contains a large mortar volume as compared to NVC. This work presents the influence of fine aggregate particle size and fly ash on the compressive strength of mortar for SCC. Mortar mixes consists of five different cement replacement percentage (CRP) by fly-ash are investigated for four different particle sizes of fine aggregate. The compressive strength of mortar cubes at the curing time of 7, 28 days was determined.

Index Terms- Self-Compacting Concrete, mortar, fly ash, compressive strength.

I. INTRODUCTION

Self compacting concrete (SCC), which flows under its own weight and does not require any external vibration for compaction, has revolutionized concrete placement. SCC has a higher powder content than normally vibrated concrete. In SCC, increasing the cement content alone to increase the quantity of powder material leads to a significant rise in material cost and often has other negative effects on concrete properties (e.g., increased thermal stress and shrinkage, etc.). Thus requirement for increased powder content in SCC is usually met by the use of mineral admixtures along with cement. Industrial by-products or waste materials such as limestone powder, fly ash, silica fume and granulated blast furnace slag are generally used as mineral admixtures in SCC. Besides the economical benefits, such usage of by-products or waste materials in concrete reduces environmental pollution. The compressive strength of mortar is an important property as mortar finally becomes a major part of concrete. SCC has a coarse aggregate content substantially less than that of normal concrete, typically (31-35% by volume). Therefore, mortar phase of SCC mix covers about 70% of total volume of concrete. The strength of mortar fraction of SCC influences the strength of concrete. In the present study, the influence of fine aggregate particle size on compressive strength of mortar at different cement replacement percentage (CRP) levels by fly ash was evaluated.

Self- Compacting mortars are being tested for the following reasons:

- It contains all of the materials except coarse aggregate and the effect of test variables will be similar to those in concrete.
- Assessing the properties of mortar is an integral part of many SCC mix design processes and therefore knowledge of mortar properties is itself useful.

- Batching and testing concrete involves significant efforts, particularly in a research laboratory and with mortar a greater number of combinations of variables can be investigated in a given time.
- The variables can be easily controlled, the test methods are similar to that for concrete and the properties can be easily measured.

II. MATERIALS AND EXPERIMENTAL PROCEDURE

- **Cement:-** Ordinary Portland cement (grade 53) was used and conforms to IS 12269- 1987. Its physical properties are as given in table 1.

Table 1 - Physical Properties of Cement

Characteristics	Values
Normal consistency	28 %
Setting Time- Initial set (min) Final set	99 Min. 184 Min.
Min. Compressive strength after 7 days 28days	51.0 MPa 74.3 MPa
Specific gravity	3.15

- **Fly-ash :-** Fly-ash and its chemical analysis report is obtained from Sanjay Gandhi thermal power station, Birsinghpur, dist. Shahdol, M.P., India. The chemical and physical properties of fly-ash are given in the table 2 and table 3 respectively.

Table 2 - Chemical Properties of fly-ash

Elemental Oxides	Percentage
------------------	------------

Silicon Di-oxide (SiO ₂)	63.41 %
Aluminium oxide (Al ₂ O ₃)	25.88 %
Calcium Oxide (CaO)	0.34 %
Magnesium Oxide (MgO)	1.13 %
Manganese oxide	none detected
Sodium Oxide (Na ₂ O)	1.19 %
Potassium Oxide (K ₂ O)	1.22 %
Iron Oxide	3.14 %
Phosphorus Pentoxide	1.65 %
Sulphur Trioxide (SO ₃)	0.53 %
Titanium Di-oxide	1.51 %

Table 3 - Physical properties of fly ash

Physical Properties	Test Result
Colour	Grey Blackish
Specific Gravity	2.27

- Chemical Admixtures:-** Superplasticiser or high range water reducing admixtures are an essential components of SCC. Conplast SP430 confirms to ASTM-C-494 Type "F" was used as superplasticiser. It is based on Sulphonated Naphthalene polymers and supplied as a brown liquid instantly dispersible in water.

Table 4 - Properties of Conplast SP430

Specific gravity	1.220 to 1.225 at 30 ⁰ C
Chloride content	Nil to IS 456
Air entrainment	Approx 1% additional air is entrained

- Fine Aggregate:-** The sand conforming to IS 650: 1966 was used as fine aggregate. Four fine aggregates, based on particle sizes was analysed, viz.

Particle size 1 in between 90 μ to 300 μ , denoted as 90 μ < PS-1 < 300 μ

Table 6 - Mortar mix proportions

Mortar Mix Designation	Particle Size of fine aggregate	Powder 'p' (2 kg)			Water 0.3 x p (ltr.)	admix. (1.5%) (kg)	fine aggregate (3 kg)			
		OPC (kg)	Fly-ash (kg)	Ratio			PS-1	PS-2	PS-3	PS-4
PS-1/10	90μ<PS<300μ	1.80	0.20	90:10	0.600	0.030	3 kg			
PS-2/10	300μ<PS<500μ	1.80	0.20	90:10	0.600	0.030		3 kg		
PS-3/10	500μ<PS<710μ	1.80	0.20	90:10	0.600	0.030			3 kg	
PS-4/10	710μ<PS<1mm	1.80	0.20	90:10	0.600	0.030				3 kg
PS-1/20	90μ<PS<300μ	1.60	0.40	80:20	0.600	0.030	3 kg			
PS-2/20	300μ<PS<500μ	1.60	0.40	80:20	0.600	0.030		3 kg		
PS-3/20	500μ<PS<710μ	1.60	0.40	80:20	0.600	0.030			3 kg	
PS-4/20	710μ<PS<1mm	1.60	0.40	80:20	0.600	0.030				3 kg
PS-1/30	90μ<PS<300μ	1.40	0.60	70:30	0.600	0.030	3 kg			

Particle size 2 in between 300 μ to 500 μ , denoted as 300 μ < PS-2 < 500 μ

Particle size 3 in between 500 μ to 710 μ , denoted as 500 μ < PS-3 < 710 μ

Particle size 4 in between 710 μ to 1 mm , denoted as 710 μ < PS-4 < 1 mm

Table 5 - The physical properties of sand

Physical properties of fine aggregate	
Colour	Grayish White
Specific Gravity	2.64
Absorption in 24 hours	0.80%
Shape of grains	Sub angular

- Water:-** Ordinary potable water available in the laboratory was used.

Experimental procedure for SCC Mortar:-

The compressive strength of various mix proportions (mix design) as given in table was determined by preparing 120 nos., 70.7 mm size cubes. The mortar cubes were demoulded 1 day after casting and cured in water at normal room temperature for 7 days and 28 days. The cubes were tested in compression testing machine as per IS 4031:1988.

III. MORTAR MIX PROPORTIONS

Table 6 gives the mortars proportion details. The mortar mixtures contains powder which composed of five weight proportions of OPC and fly ash, i.e. 90:10,80:20,70:30,60:40,50:50. The water to powder ratio (w/p) was 0.3 and the superplasticiser dosage was 1.5 percent by weight of powder. The quantities except particle size of fine aggregate in the SCC mix is kept constant to avoid any other variation on the compressive strength due to quantities and quality of any ingredient in the mortar mix.

PS-2/30	300 μ <PS<500 μ	1.40	0.60	70:30	0.600	0.030		3 kg		
PS-3/30	500 μ <PS<710 μ	1.40	0.60	70:30	0.600	0.030			3 kg	
PS-4/30	710 μ <PS<1 mm	1.40	0.60	70:30	0.600	0.030				3 kg
PS-1/40	90 μ <PS<300 μ	1.20	0.80	60:40	0.600	0.030	3 kg			
PS-2/40	300 μ <PS<500 μ	1.20	0.80	60:40	0.600	0.030		3 kg		
PS-3/40	500 μ <PS<710 μ	1.20	0.80	60:40	0.600	0.030			3 kg	
PS-4/40	710 μ <PS<1mm	1.20	0.80	60:40	0.600	0.030				3 kg
PS-1/50	90 μ <PS<300 μ	1.00	1.00	50:50	0.600	0.030	3 kg			
PS-2/50	300 μ <PS<500 μ	1.00	1.00	50:50	0.600	0.030		3 kg		
PS-3/50	500 μ <PS<710 μ	1.00	1.00	50:50	0.600	0.030			3 kg	
PS-4/50	710 μ <PS<1mm	1.00	1.00	50:50	0.600	0.030				3 kg

Mortar mix with sand PS -1 and 10 % cement replacement percentage (CRP) by fly-ash designated as PS-1/10
 Mortar mix with sand PS -2 and 20 % cement replacement percentage (CRP) by fly-ash designated as PS-2/20
 Mortar mix with sand PS -3 and 30 % cement replacement percentage (CRP) by fly-ash designated as PS-3/30
 Mortar mix with sand PS -4 and 40 % cement replacement percentage (CRP) by fly-ash designated as PS-4/40
 Mortar mix with sand PS -1 and 50 % cement replacement percentage (CRP) by fly-ash designated as PS-1/50 and so on....

water was determined by testing cubes of each sample by compression testing machine in MPa, are given in the table 7.

IV. EXPERIMENTAL RESULTS

The compressive strength of SCC mortar cubes of 70.7 mm size of different mix proportions after 7 and 28 curing time in

Table 7 - Results of compressive strength of SCC mortar

Mortar mix designation	Compressive strength of mortar cubes in MPa after	
	7 days	28 days
PS-1/10	33.36	53.17
PS-2/10	32.38	54.95
PS-3/10	33.36	52.99
PS-4/10	32.38	53.17
PS-1/20	29.44	49.06
PS-2/20	29.44	51.02
PS-3/20	27.48	51.02
PS-4/20	28.46	50.04
PS-1/30	25.51	47.10
PS-2/30	24.53	45.14
PS-3/30	25.51	45.14
PS-4/30	23.55	44.16
PS-1/40	23.55	42.19
PS-2/40	21.59	43.17
PS-3/40	22.50	42.19
PS-4/40	21.59	42.19

PS-1/50	18.64	38.27
PS-2/50	19.63	39.25
PS-3/50	17.66	38.27
PS-4/50	17.66	39.25

Graphical representations of compressive strength of mortar cubes:-

samples v/s different particle size of fine aggregate are given in Fig. 1 and Fig. 2.

The graphical representations of the relationship between the compressive strength for 7days and 28 days curing time of the

- Particle size 1 in between 90 μ to 300 μ , denoted as 90 μ < PS-1 < 300 μ
- Particle size 2 in between 300 μ to 500 μ , denoted as 300 μ < PS-2 < 500 μ
- Particle size 3 in between 500 μ to 710 μ , denoted as 500 μ < PS-3 < 710 μ
- Particle size 4 in between 710 μ to 1 mm , denoted as 710 μ < PS-4 < 1 mm

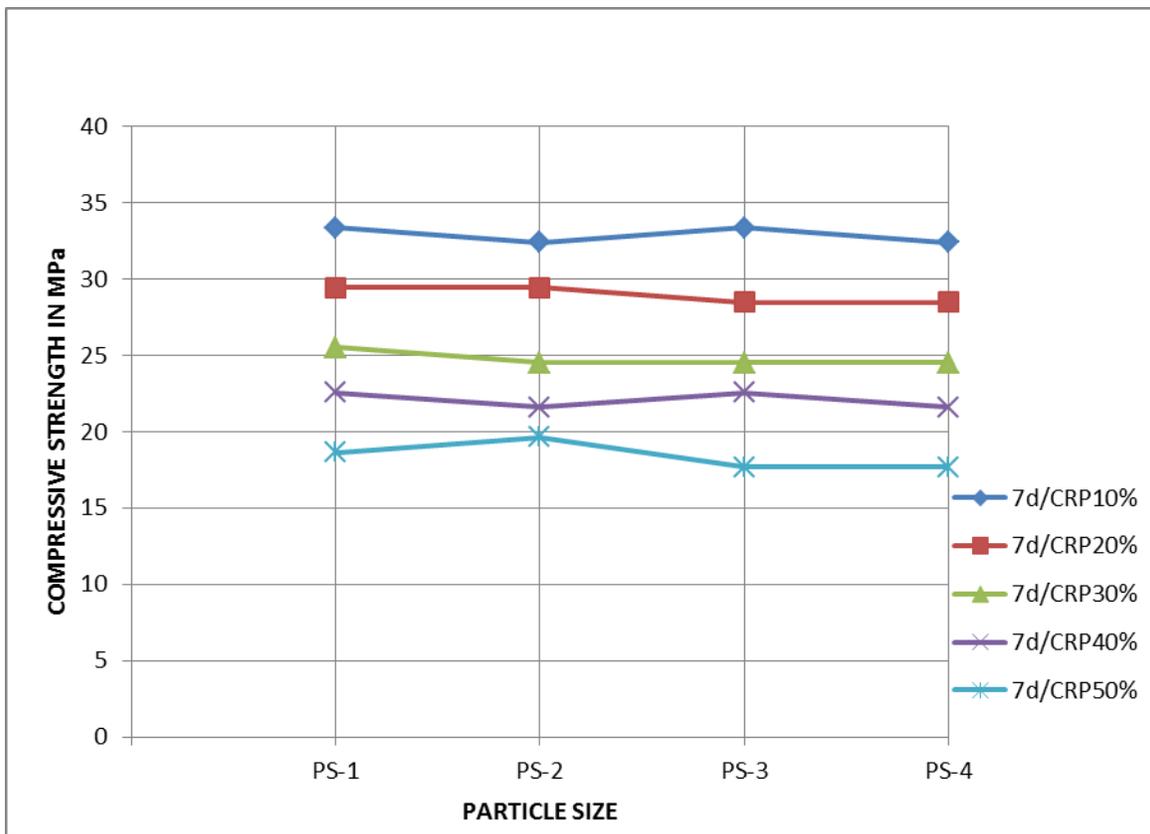


Fig 1 – Compressive strength of mortar cubes after 7 days curing time

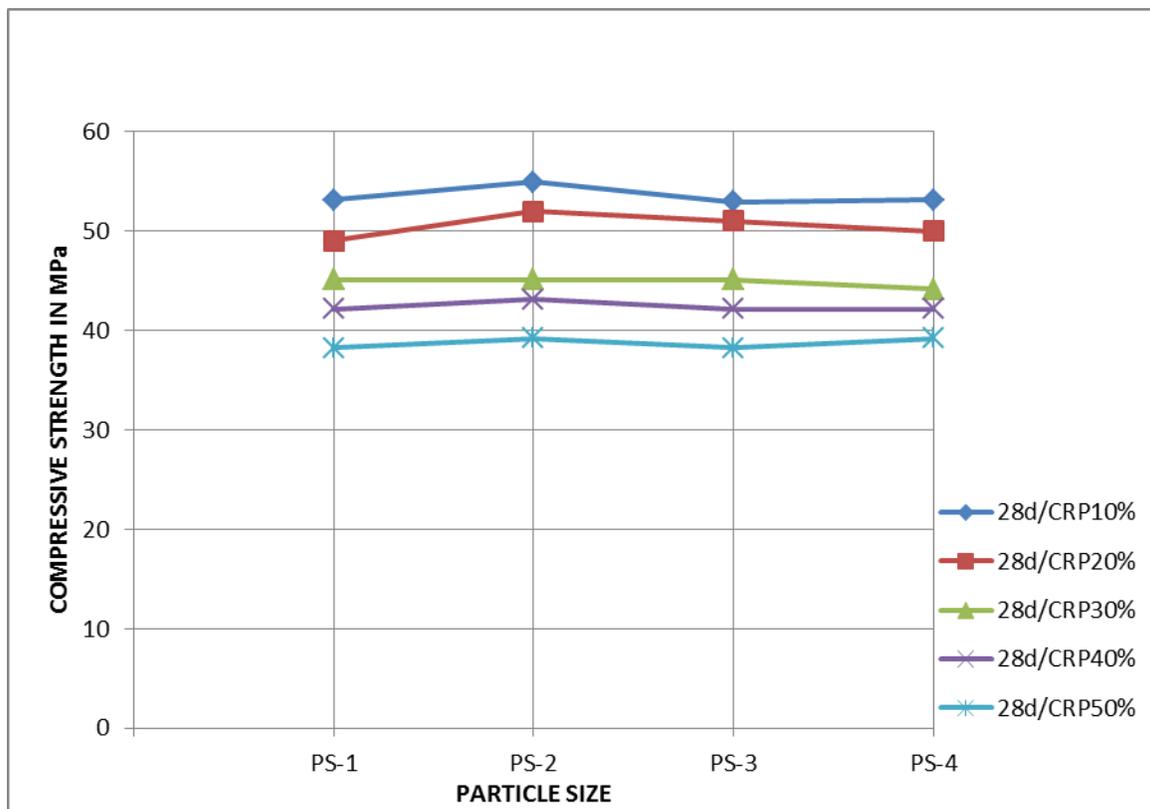


Fig 2 – Compressive strength of mortar cubes after 28 days curing

V. DISCUSSION OF RESULTS

The relationship between the compressive strength for 7 days and 28 days curing time of the samples having different particle size of fine aggregate are given in Fig. 1 and Fig. 2. Strength increases with increase in curing time for all mixes. The strength is more for mix having 10% CRP; whereas the strength is lowest for mix having 50% CRP. In the present investigation increase in the fly ash content replacing cement from 10% to 50% resulting in the decrease of compressive strength of mortar cubes from 33.36 MPa to 17.66 MPa for 7 days and from 53.17 MPa to 39.25 MPa for 28 days of curing time. The mortar's compressive is almost the same for particle sizes PS-1, PS-2, PS-3, PS-4 with same CRP. The increase in fly ash reduces the compressive strength at all curing time.

VI. CONCLUSION

Thus we conclude from the Fig. 1 and Fig. 2, that the fine aggregate particle size does not influence the compressive strength of mortar cubes at any given curing time. The compressive strength of mortar cubes is more influenced by its powder composition at any particular curing time.

REFERENCES

[1] _____ Specification and guidelines for Self-Compacting concrete, EFNARC, U.K., February 2002.

[2] Gettu Ravindra, Shareef Shaik Nawaz, Ernest Kingsley JD.; Evaluation of the robustness of SCC, Indian Concrete Journal, Volume 83, Number 6, June 2009, P. 13-19.

[3] Sengupta Anirwan and Santhanam Manu; Influence of aggregate characteristics on Uniformity of SCC, Indian Concrete Journal, Volume 83, Number 6, June 2009, P. 50-60.

[4] Okamura Hajime and Ouchi Masahiro; Self Compacting concrete, Journal of Advanced Concrete Technology, Japan Concrete Institute Vol-1, No.1, 5-15, April 2003.

[5] Nepemuceno Miguel and Oliveira Luiz; Parameters for self-compacting Concrete Mortar Phase.

[6] Krishna Murthy.N. Narasimha Rao, A.V. Ramanna Reddy I.V. and Vijaya Shekhar Reddy. M.; Mix Design Procedure for Self-Compacting Concrete , IOSR Journal of Engineering Vol. 2, Issue 9, Sept 2012, P. 33 - 41.

[7] Dubey Rahul and Kumar Pradeep; Effect of Fly-ash on Water/ Powder ratio and Superplasticiser Dosage in Self- Compacting Mortars, International Journal of Architecture, Engineering and Construction, Vol. 2, No. 1, March 2013, 55-62.

[8] Domone P.; Proportioning of Self- Compacting concrete – the UCL method, UCL, Department of Civil, Enviromental and Geomatic Engineering, November 2009.

[9] Jayashree C., Santhanam Manu and Gettu Ravindra; Cement-Superplasticiser Compatibility - Issues and challenges, Indian Concrete Journal, Volume 85, Number 7, July 2011, P. 48-60.

[10] _____EFNARC European project group; The European Guidelines for Self-Compacting Concrete Specification, Production and use, May 2005.

[11] Chowdhury Subrato, Kadam Sandeep and Keskar Sandeep; Impact of fine aggregate Particle size on rheology and compressive strength of mortar for SCC, The Indian Concrete Journal , April 2011, P. 51-59.

[12] _____Methods of physical tests for hydraulic cement, IS 4031: 1988, Bureau of Indian standards, New Delhi, India, 1988.

[13] _____Specification for standard sand for testing of cement IS 650: 1966, Bureau of Indian standards, New Delhi, India, 1966.

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Quality Teaching & Higher Education System in India

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Abstract- The paper studies on Quality Teaching & Higher education system in India. The system aims to provide a theoretical background to the OECD-IMHE policy quality of teaching in higher education. It highlights the main debates on the topic to date, hoping to present the different perspectives that exist on the topic of quality in teaching. The review of the literature is organized in three main parts as to address three major questions: 1) "What is Quality Teaching and why is it important in higher education?" 2) "How can teaching concretely be enhanced?" 3) "How can one make sure Quality Teaching initiatives are effective?"² Quality teaching has become an issue of importance as the landscape of higher education has been facing continuous changes: increased international competition, increasing social and geographical diversity of the student body, increasing demands of value for money, introduction of information technologies, etc. 3. But quality teaching lacks a clear definition, because quality can be stakeholder relative. The impact of research, of the "scholarship of teaching" and of learning communities on teaching quality is discussed here.⁴ Quality teaching initiatives are very diverse both in nature and in function. The role of the professors, of the department, of the central university and of the state is analyzed, as well as the goals and the scope of this initiatives.⁵ Choosing reliable and quantifiable indicators to assess the quality of one's teaching and the efficiency of teaching initiatives remains challenging. Various methods and their efficiency are discussed here. The factors that determine whether appropriate use is made of the feedback provided are also brought into discussion.

Index Terms- Quality teaching, quality assurance, method of quality teaching

I. INTRODUCTION

Indian Colleges and universities are facing major changes as they navigate the 21st century and make decisions that will not only impact higher education but will also contribute to our country's future competitiveness in the global marketplace. This article examines various influences on institutions of higher learning as they move toward a customer-oriented focus. It also stresses the importance of balancing the needs of various customer groups while continuing to serve as purveyors of educated human resources in a global economy. This article identifies and evaluates outcomes from efforts to modify quality standards in higher education. While change is unavoidable and higher learning faces difficult choices, we can choose to make proactive decisions and become agents of change. The financial obligations of running an institution today are a major concern. While not a new concept, there is a trend for public institutions to redefine their identity as service organizations and businesses.¹

Due to increased financial demands, there has also been a dramatic rise in the cost of attending post-secondary schools.² The Delta Project,³ which focuses on postsecondary costs, productivity, and accountability, points out that while students are paying more of the total costs associated with higher education, less of the tuition-generated revenue is actually going into the classroom. In the 1990s, student tuition paid for approximately 24% of the operating costs at public colleges and universities, in 1998 that percentage rose to 37%, and in 2005 it was nearly 50%.⁴ Today, institutions rely on increasingly large numbers of students to help balance expenditures. As institutions face growing financial constraints due to recent economic events, there is even greater concern that institutions will defer to the value of the monetary benefits of increased enrolments, especially in the face of fewer state resources. Given the importance of enrolment monies, it is not surprising that universities have become very savvy in marketing their institutions to the student customer.^{5,6,7} If the focus is directed at attracting larger numbers of potential students even when it is necessary to modify admission standards, there is an associated risk of also negotiating academic standards to create easier courses and modify academic requirements.¹ The reputation of the institution becomes the most costly casualty of all when academic standards that underlie scholarly integrity are compromised. Higher education in India suffers from several systemic deficiencies. As a result, it continues to provide graduates that are unemployable despite emerging shortages of skilled manpower in an increasing number of sectors. The standards of academic research are low and declining. Some of the problems of the Indian higher education, such as – the unwieldy affiliating system, inflexible academic structure, uneven capacity across various subjects, eroding autonomy of academic institutions, and the low level of public funding are well known. Many other concerns relating to the dysfunctional regulatory environment, the accreditation system that has low coverage and no consequences, absence of incentives for performing well, and the unjust public funding policies are not well recognised. Driven by populism and in the absence of good data, there is little informed public debate on higher education in India. Higher education in India has expanded rapidly over the past two decades. This growth has been mainly driven by private sector initiatives. There are genuine concerns about many of them being substandard and exploitative. Due to the government's ambivalence on the role of private sector in higher education, the growth has been chaotic and unplanned. The regulatory system has failed to maintain standards or check exploitation. Instead, it resulted in erecting formidable entry barriers that generate undesirable rents. Voluntary accreditation seems to have no takers from amongst private providers and apparently serves little purpose for any of its stakeholders.

Despite, its impressive growth, higher education in India could maintain only a very small base of quality institutions at the top. Standards of the majority of the institutions are poor and declining. There are a large number of small and non-viable institutions. Entry to the small number of quality institutions is very competitive giving rise to high stake entrance tests and a flourishing private tuition industry. The stakes are so high that quota-based reservation of seats in such institutions in the name of affirmative action has come to occupy centre stage in electoral politics. Despite some merit, it has resulted in fragmentation of merit space and further intensified competition for the limited capacity in quality institutions.

II. HIGHER EDUCATION SYSTEM IN INDIA

Education in ancient India was highly advanced as evident from the centres of learning that existed in the Buddhist monasteries of the 7th century BC up to the 3rd century AD Nalanda (Perkin, 2006). In these centres, gathering of scholars--Gurukula-- used to be engaged in intellectual debates-- parish ads-- in residential campuses. A few of these centres were large and had several faculties. Historians speculate that these centres had a remarkable resemblance to the European medieval universities that came up much later. The ancient education system in India slowly got extinguished following invasions and disorder in the country. Till the eighteenth century, India had three distinct traditions of advanced scholarship in the Hindu Gurukulas, the Buddhist Viharas, and the Quranic madaras as, before the British set up a network of schools to impart western education in English medium (Perkin, 2006) The first such college to impart western education was founded in 1818 at Serampore near Calcutta. Over the next forty years, many such colleges were established in different parts of the country at Agra, Bombay, Madras, Nagpur, Patna, Calcutta, and Nagapattinam. In 1857, three federal examining universities on the pattern of London University were set up at Calcutta, Bombay and Madras. The existing 27 colleges were affiliated to these three universities. Later, more universities were established. At the time of independence in 1947, there were 19 universities and several hundred affiliated colleges (CABE, 2005a). The higher education system in India grew rapidly after independence. By 1980, there were 132 universities and 4738 colleges in the country enrolling around five per cent of the eligible age group in higher education. Today, while in terms of enrolment, India is the third largest higher education system in the world (after China and the USA); with 17973 institutions (348 universities and 17625 colleges) is the largest higher education system in the world in terms of number of institutions. The number of institutions more than four times the number of institutions both in the United States and entire Europe. Higher education in China having the highest enrolment in the world (nearly 23 million) is organized in only about 2,500 institutions. Whereas, the average enrolment in a higher education institution in India is only about 500-600 students, a higher education institution in the United States and Europe would have 3000-4000m students and in China this would be about 8000-9000 students. This makes system of higher education in India as a highly fragmented system that is far more difficult to manage than any other system of higher education in world.

III. QUALITY TEACHING

Quality teaching has become an issue of importance as the landscape of higher education has been facing continuous changes. The student body has considerably expanded and diversified, both socially and geographically. New students call for new teaching methods. Modern technologies have entered the classroom, thus modifying the nature of the interactions between students and professors. The governments, the students and their families, the employers, the funds providers increasingly demand value for their money and desire more efficiency through teaching.

Quality Teaching lacks of clear definitions and to some extent can't be disconnected from debates on Quality or Quality culture in higher education that remain controversial terms. Some scholars regard quality primarily as an outcome, others as a property. Some consider teaching as the never ending process of reduction of defects and so Quality Teaching can never be totally grasped and appraised. In fact, conceptions of quality teaching happen to be stakeholder relative: students, teachers or evaluation agencies do not share the definition of what "good" teaching or "good" teachers is.

The literature stresses that "good teachers" have empathy for students, they are generally experienced teachers and most of all they are organized and expressive. "Excellent teachers" are those who have passions: passions for learning, for their field, for teaching and for their students. But research also demonstrates that "good teaching" depends on what is being taught and on other situational factors.

Research points out that quality teaching is necessarily student-centred; its aim is most and for all student learning. Thus, attention should be given not simply to the teacher's pedagogical skills, but also to the learning environment that must address the students' personal needs: students should know why they are working, should be able to relate to other students and to receive help if needed. Adequate support to staff and students (financial support, social and academic support, support to minority students, counselling services, etc) also improves learning outcomes. Learning communities – groups of students and/or teachers who learn collaboratively and build knowledge through intellectual interaction – are judged to enhance student learning by increasing students' and teachers' satisfaction.

IV. ASSURANCE OF QUALITY TEACHING

There are in fact, no widely accepted methods for measuring teaching quality, and assuring the impact of higher education on students is so far an unexplored area as well" moreover argues that the culture of measurement that has trivialized teaching excellence in recent years and the language of business that has turned it into a product need to be replaced by appropriate forms of judgment and expression.

Class evaluation: - A tool for change and identification of best practices?

One of the most used tools today to evaluate teaching quality and identify Quality Teaching is undoubtedly peer in-class evaluations. The literature on Quality Teaching recognizes several advantages to peer evaluations. Pagani (2002) describes peer review as a tool for change, allowing individuals to improve

their performance, ensuring that standards are being met, and helping to identify best practices.

Focusing on the process and not merely the outcome: - Erstad (1998) points out that student questionnaires measure the outcomes of teaching and not the process, whereas mystery customers and peer in-class evaluation measure the process rather than the outcome. The use of peer evaluation may be preferred to that of mystery students, because many professors view mystery students as threatening. A common conception is that their use is linked to disciplinary action (Telford & Masson, 2005). Peer in-class evaluation may promote conformity, hamper teaching innovation **However**, the use of peer in-class evaluation may also not be free of risks. Cox and Ingle by (1997) found that peer review through peer observation of teaching can produce conformity of teaching. Indeed the professor being evaluated may not dare to be innovative. Or the professor evaluating his colleague may be influenced by his or her conservative methods of teaching. Moreover, Bingham and Ottewill (2001) recognize that the assessment of peers might be too self-congratulatory. According to Green (1993) the “traditional peer review based assurance system” is currently breaking down, a breakdown which is “clearly” correlated with “the increasingly market orientated culture of higher education”.

Evaluation of teachers’ portfolio

Another possible method to assess teaching quality and identify best practices is the use of teachers’ portfolio. The teacher’s portfolio evaluation is a valuable technique because it is based on multiple sources of evidence and multiple levels of scrutiny (Webb stock, 1999). However, as it was noticed by Webb stock, who was working on the assessment of teaching quality at the University of Natal, the problem is that it is difficult to agree on which items should be included in the portfolio and on how much each of these items should be waited. The question remains whether quantitative weighs should be attributed to each item of the portfolio to increase the transparency of the process or whether this would transform the portfolio evaluation process into a mechanical task, thus hampering teaching creativity.

The example of the three-legged stool

The Departmental Teaching and Learning Committee of the Hong Kong Polytechnic University used all three methods-student questionnaires, peer in-class evaluation and evaluation of teacher’s portfolio)- to assess the quality of their teachers (Macalpine, 2001). The department decided to design a Teaching Evaluation Index which comprised a weighted sum of the three indicators. This methodology’s goal was to balance the defects of each of three methods of evaluation when they are used separately by creating a “three-legged stool”. The Teaching Evaluation Index weighted student questionnaires for 50% of the total result, in-class peer evaluation for 30% and the teaching portfolios for 20%. Interestingly, Macalpine notes that there was a reasonable degree of consistency between the three indices, particularly for extremes. As an outcome of the evaluation process, the weaker lecturers were linked with the higher scoring lecturers in a trial scheme.

New indicators for better assessment of Quality Teaching

There are various Indicators of quality teaching collecting qualitative and decentralized feedback: Student awards, joint research, and workshop.

Teaching concretely can be enhanced

Quality teaching initiatives are very diverse both in nature and in function. Some of these initiatives are undertaken at teachers’ level, others at departmental, institutional or country level. Some quality initiatives aim to improve pedagogical methods while others address the global environment of student learning. Some are top-down process, other induce grass-root changes. The most currently used quality initiatives seem to aim to enhance teamwork between teachers, goal-setting and course plans. However scholars have developed holistic theoretical models of how quality teaching initiatives should unfold. Gathering information and reading the literature – looking outside the classroom – are important tools to improve quality teaching, but they are still under-employed. Another important point to keep in mind is that in order for student learning to be enhanced, the focus of quality teaching initiatives should not always be on the teacher. Rather it should encompass the whole institution and the learning environment. One of the major drivers for enhancement of quality teaching concerns teachers’ leadership – most quality teaching initiatives are actually launched by teachers. However the role of the department, of the educational support divisions and that of the central university – which can make quality culture part of its mission statement – are central. Scholars proved that bottom-top 5

Make sure quality teaching is effective

It is essential to measure the impact of the quality teaching initiatives in order to be able to improve these initiatives. However assessing the quality of one’s teaching remains challenging. This difficulty may in part explain why the two most famous international rankings rely heavily on research as a yardstick of the universities’ value and leave aside the quality of teaching. This may however change in the future, as the concerns about quality teaching and student learning are increasing. The choice of indicators to measure quality teaching is crucial, because it has been shown that assessment drives learning: how the teacher is judged will undoubtedly impact his or her teaching methods. Indicators to assess the quality of teaching (the value of graduates, satisfaction of teachers, retention rates, etc.) of an institution proved of use but carry various meanings and can even lead to misunderstandings. Researchers agree that reliable indicators should be chosen, and not just the most practical ones. Moreover, room should always be left for discussion of the figures obtained. Other tools than indicators exist. Using student questionnaires can seem logical, because students are the individuals that are the most exposed to and the most affected by the teacher’s teaching. However, many teachers give little credit to the answers of the students that they perceive as biased. The answering students tend to blame teachers for all problems, forgetting the role of the administration or the infrastructures. Measurement should clarify its own aims (improvement or punishment?) before implementation.

Quality Human Performance—the Requirements

A key component of quality in teaching and learning involves quality human performance by the learner. Substantial financial outlays by companies and the government for training are made in attempts to address problems in the quality of human performance. These efforts have met with minimal success, and major gaps in the standards to which humans have been trained and their resulting performance remain.^{27,28} Swart and Duncan²⁹ note that the expected performance in a work setting is generally dictated by a set of valid and appropriate expectations and is attained through proper education and training. When performance consistently adheres to the appropriate expectations, then quality human performance is achieved. If there is a discrepancy in performance and appropriate expectations, then it must be investigated, causes identified, and appropriate corrective action taken. To achieve quality human performance, we posit that three components must be present:

- A clearly defined set of tasks to perform.
- An individual that has the capacity/ability to perform the required task.
- A clear set of standards that define successful performance.

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V. SUMMARY

If colleges and universities focus on satisfying students as their primary customers, they may negatively affect another customer group—employers—because the two customer groups have significantly different ways of defining and measuring expectations. There are no easy solutions to addressing the negotiation of standards that undermine quality human performance. All customers of higher education deserve the best we can offer, as higher education, business/industry, and the economic success of the United States are intricately connected and are dependent upon one another. As noted in the Delta Project,³ the United States is quickly losing ground in the global race for talent. Institutions of higher education, faculty, students, and businesses can serve as contributing architects in ensuring education establishes quality standards. They are all consumers, and they all have a vested interest in maintaining standards.

REFERENCES

- [1] Derek Bok, *Universities in the Marketplace: The Commercialization of Higher Education*, Princeton University Press, 2004.
- [2] Karen L. Webber and Robert G. Boehmer, "The Balancing Act: Accountability, Affordability, and Access in American Higher Education," *New Directions for Institutional Research*, S2, winter 2008, pp. 79-91.
- [3] Jane Wellman, Donna Desrochers, Colleen Lenihan, Rita Kirshstein, Steve Hurlburt, and Steve Honegger, "Trends in College Spending: Where Does the Money Come From? Where does it go?" A Report of the Delta Project, 2009, retrieved Feb. 13, 2009, from www.deltacostproject.org.
- [4] Eric Kelderman, "Tuition Rises as Spending on Instruction Slows," *The Chronicle of Higher Education*, May 9, 2008, p. A14.

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ECONOMIC EFFICIENCY AND TECHNIQUES

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Abstract: Present paper studies the Economic Efficiency and Gain technologies. Most of the literature related to the measurement of economic efficiency has based its analysis either on parametric or on non-parametric Gain methods. This Article thus argues that, while Technique economy tends to be a powerful force, it is possible for concerns of Economic efficiency. The aim of this paper is to provide a critical and detailed review of both core Gain methods. In our opinion, no approach is strictly preferable to any other. Moreover, careful consideration of their main advantages and disadvantages, of the data set utilized, and of the intrinsic characteristics of the framework under analysis will help us in the correct implementation of these techniques. Recent developments in Gain techniques and economic efficiency measurement such as Bayesian techniques, bootstrapping, duality theory and the analysis of sampling asymptotic properties are also considered in this paper.

Index Terms- Economic Efficiency, CRR, MPEP Techniques, Multiple Input & output models

Introduction

The measurement of economic efficiency has been intimately linked to the use of frontier functions. The modern literature in both fields begins with the same seminal paper, namely Farrell (1957). Michael J. Farrell, greatly influenced by Koopmans (1951)'s formal definition and Debreu (1951)'s measure of technical efficiency¹ introduced a method to decompose the overall efficiency of a production unit into its technical and allocate components. Farrell characterized the different ways in which a productive unit can be inefficient either by obtaining less than the maximum output available from a determined group of inputs (technically inefficient) or by not purchasing the best package of inputs given their prices and marginal productivities. These efficiency measurement techniques may be classified in different ways. Our criterion has been to distinguish between parametric and non-parametric methods. A vast literature has treated the measurement of economic efficiency by means of both parametric and non-parametric approaches. In our opinion, and the above empirical studies seem to confirm it, no approach is strictly preferable to any other. As has been shown throughout this survey, each of them has its own advantages and disadvantages. A careful consideration of them, of the data set utilized, and of the intrinsic characteristics of the industry under analysis will help us in the correct implementation of these techniques. The technical efficiency of public education is using both parametric and non parametric methods. They define an educational production function for 40 school districts in Utah with a single output, a set of school inputs associated with the instructional and no instructional activities under the control of the school management, and non school inputs including status of the students and other environmental factors that may influence student productivity. The stochastic specification assumes half and exponential distributions for the inefficiency error term while the deterministic specification uses a two-stage DEA model in which efficiency levels from an output-oriented DEA using controllable school inputs only are regressed on the non school inputs using to bit regression model.

Literature Review

There is a considerable dearth of literature on this topic, with one notable exception, which is discussed starting in the following paragraph. The other references to the topic are found, in the main, in media reports, campus publications, and Web publications. A sample of these references is also referenced below. The research in this area, however, tends to emphasize either direct labor displacement effects without considering the changes in the nature of work (for example Ayres and Miller, 1983). The modern literature in both fields begins with the same seminal paper, namely Farrell (1957). Michael J. Farrell, greatly influenced by Koopmans (1951)'s formal definition and Debreu (1951)'s measure of technical efficiency¹ introduced a method to decompose the overall efficiency of a production unit into its technical and allocate components. Farrell characterized the different ways in which a productive unit can be inefficient either by obtaining less than the maximum output available from a determined group of inputs (technically inefficient) or by not purchasing the best package of inputs given their prices and marginal productivities.

Models Analysis

Parametric models analysis

The Basic Model 1.1

The method developed in Charnes, Cooper and Rhodes (1981) named the method introduced in Charnes, Cooper and Rhodes (1978) Data Envelopment Analysis. They also described the duality relations and the computational power that Charnes, Cooper and Rhodes (1978) made available. This technique was initially born in operations research for measuring and comparing the

relative efficiency of a set of decision-making units (DMUs). Since that seminal paper, numerous theoretical improvements and empirical applications of this technique have appeared in the productive efficiency literature. The aim of this non-parametric approach⁴ to the measurement of productive efficiency is to define a frontier envelopment surface for all sample observations. This surface is determined by those units that lie on it, that is the efficient DMUs. On the other hand, units that do not lie on that surface can be considered as inefficient and an individual inefficiency score will be calculated for each one of them. In terms of a cross-sectional production function, a parametric frontier can be represented as:-

$$Y_i = f(X_i; \beta) \cdot TE_i$$

Where $i=1, \dots, n$ indexes the producers, Y is the scalar output, X represents a vectors of inputs and $f(\cdot)$ is the production function. TE_i indicates the output-oriented technical efficiency of producer i . It is defined as the ratio of the observed output to maximum feasible output.

$$TE_i = \frac{Y_i}{f(X_i, \beta)}$$

Farrell (1957) assumed what later literature has termed a deterministic frontier function. In terms of this specification, equation 3.1.1 can be rewritten as:-

$$Y_i = f(X_i; \beta) \cdot \exp(-u_i) \quad u_i \geq 0$$

where u_i represents the shortfall of output from the frontier (technical inefficiency) for each producer. The additional restriction imposed on u_i ($u_i \geq 0$) guarantees that $TE_i \leq 1$, which is consistent with equation 3.1.2. Next, assuming that the productive technology adopts a log-linear Cobb-Douglas form,¹⁷ the deterministic frontier production function becomes:-

$$\ln Y_i = \beta_0 + \sum_{N=1}^n \beta_n \ln X_{ni} - u_i$$

Once the production structure has been parameterized, both goal programming and econometric techniques can be applied to either calculate or estimate the parameter vector and also to obtain estimates of u_i and so of TE_i . Goal programming techniques calculate the technology parameter vector by solving deterministic optimization problems. The main drawback of these approaches is that the parameters are not estimated in any statistical sense but calculated using mathematical programming techniques. This complicates statistical inference concerning the calculated parameters, and precludes any hypothesis testing. It is at this stage when econometric analysis of frontier functions comes into its

own. In an attempt to accommodate econometric techniques to the underlying economic theory,¹⁸ a wide and challenging literature related to the estimation of frontier functions has proliferated over the last three decades. These attempts can be classified into two main groups according to the specification of the error term, namely deterministic and stochastic econometric approaches.

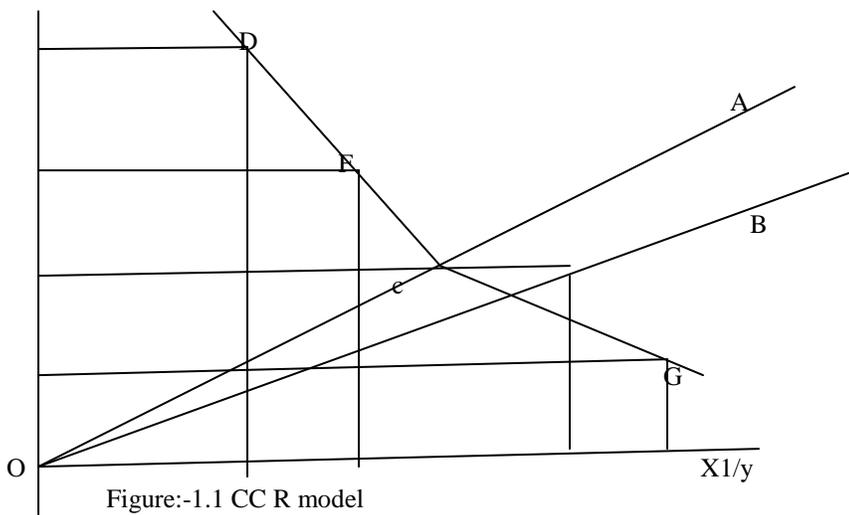
Non-parametric Model Analysis

The Basic Model 1.2

The method developed in Farrell (1957) for the measurement of productive efficiency is based on a production possibility set consisting of the convex hull of input-output vectors. This production possibility set was represented by means of a frontier unit-isoquant. According to that specification and the fact that

Farrell's efficiency measures are completely data-based, no specific functional form needed to be predefined. The single-input/output efficiency measure of Farrell is generalized to the multiple inputs/ output case and reformulated as a mathematical programming problem by Charnes, Cooper and Rhodes (1978). Charnes, Cooper and Rhodes (1981) named the method introduced in Charnes, Cooper and Rhodes (1978) Data Envelopment Analysis. They also described the duality relations and the computational power that Charnes, Cooper and Rhodes (1978) made available. This technique was initially born in operations research for measuring and comparing the relative efficiency of a set of decision-making units (DMUs). Since that seminal paper, numerous theoretical improvements and empirical applications of this technique have appeared in the productive efficiency literature. The aim of this non-parametric approach⁴ to the measurement of productive efficiency is to define a frontier envelopment surface for all sample observations. This surface is determined by those units that lie on it, that is the efficient DMUs. On the other hand, units that do not lie on that surface can be considered as inefficient and an individual inefficiency score will be calculated for each one of them. Unlike stochastic frontier techniques, Data Envelopment Analysis has no accommodation for noise, and therefore can be initially considered as a non statistical technique where the inefficiency scores and the envelopment surface are 'calculated' rather than estimated. The model developed in Charnes, Cooper and Rhodes (1978), known as the CCR model, imposes three restrictions on the frontier technology: Constant returns to scale, convexity of the set of feasible input-output combinations; and strong disposability of inputs and outputs. The CCR model is next interpreted through a simple example on the basis of Figure 1.1.

X_2/y



Here A, B, C, D, E and G are six DMUs that produce output Y with two inputs; X1 and X2. The line DG in Figure 2.1.1 represents the frontier unit iso-quant derived by DEA techniques from data on the population of five DMUs,5 each one utilizing different amounts of two inputs to produce various amounts of a single output. The level of inefficiency of each unit is determined by comparison to a single referent DMU or a convex combination of other referent units lying on the frontier iso-quant line and utilizing the same proportions of inputs. Therefore, the technical efficiency of A would be represented by the ratio OA^*/OA where A^* is a linear combination of referents B and C ('peer group') that utilizes the inputs in the same proportions as A, since both A and A^* lie on the same ray. The efficiency of E could be directly measured by comparison with C, which is located on the efficient iso-quant and on the same ray as C. The ratio OC/OE determines the technical efficiency of E. Finally, although unit G is situated on the efficient frontier, it cannot be considered as technically efficient in a Pareto sense, since it is using the same amount of input X2 as B, but more input X1, to produce the same level of output. The main attributes of Data Envelopment Analysis techniques are their flexibility and adaptability. Indeed, this adaptability has led to the development of a large number of extensions to the initial CCR model and of applications in recent years. We next briefly review some of the most relevant contributions. The CRS specification given by Charnes Cooper and Rhodes (1978) yields misleading measures of technical efficiency in the sense that technical efficiency scores reported under that set of constraints are biased by scale efficiencies. This important shortcoming is corrected by Fare, Gross kop and Lovell (1983), Byrnes, Fare and Gross kop (1984) and Banker, Charnes and Cooper (1984)10 who extended DEA to the case of Variable Returns to Scale (VRS). Variable Returns to Scale are modeled by adding the convexity constraint to the model formulated in (1.1). This final constraint simply guarantees that each DMU is only compared to others of similar size. This mode of operation avoids the damaging effect of scale efficiency on the technical efficiency scores. That efficiency score can be calculated by means of the following mathematical programming formulation,

$$TECRS \frac{1}{4} \min \mu \Omega 0$$

S.T.

$$\sum_{j=1}^n \mu_j X_{ij} \leq \Omega X_i \quad i=1 \dots m$$

$$\sum_{j=1}^N \mu_j y_j \geq Y_r \quad r=1, \dots, s$$

The solution of this linear program reports the peer group that for each DMU analyzed, yields at least the same level of output (second constraint) but consuming just a proportion () of each of the inputs used by the DMU (first constraint). The final objective is therefore to determine the linear combination of referents that for each DMU minimizes the value of . The technical efficiency scores will be determined by the formula. The econometric literature of 'average' functions has developed several alternative methods to estimate the structure of the production set coherent with the main insights of duality theory developed by Nerlove (1963) estimates the parameters of a single cost function by OLS. This technique is attractive from the point of view of its

simplicity but it ignores the additional information that cost share equations can introduce into the estimation process. Berndt and Wood (1975) estimate those cost shares as a multivariate regression system. This approach also presents some deficiencies. Finally Christensen and Greene (1976) introduced the joint estimation of the cost share equations and the cost function. This procedure allows for the estimation of all relevant parameters that define the production structure. Dual econometric Gain approaches have also evolved from the estimation of single cost functions³⁸ to multiple equation systems.³⁹ However, as we shall next see, serious specification and estimation problems arise as one moves far from the traditional, well-behaved, and self-dual Cobb-Douglas functional forms. With respect to the specification problem, the work of Schmidt and Lovell (1979) can be regarded as the first attempt to analyze the duality between stochastic production and cost functions. They exploit the self-duality of the Cobb-Douglas functional form to provide estimates of input-oriented technical inefficiency and input a locative in efficiency.

Summary

We have analyzed a wide range of different techniques dedicated to the measurement of economic efficiency. The main issue throughout was to determine an efficient frontier function or envelopment surface, in order to compare the performance of different units with the one that characterizes the efficient geometric site. These efficiency measurement techniques may be classified in different ways. Our criterion has been to distinguish between parametric and non-parametric methods. A vast literature has treated the measurement of economic efficiency by means of both parametric and non-parametric approaches. In our opinion, and the above empirical studies seem to confirm it, no approach is strictly preferable to any other. As has been shown throughout this survey, each of them has its own advantages and disadvantages. A careful consideration of them, of the data set utilized, and of the intrinsic characteristics of the industry under analysis will help us in the correct implementation of these techniques. In any case, the present survey calls for more research. The implementation of comparative analysis between parametric and non parametric frontier techniques – such as the ones described in previous section – the integration of the two types of approaches through two-step models like the one used in Sen Gupta (1995), further research on misspecification problems (e.g. Smith, 1997) and on the quality (e.g. Pedraja, Salinas and Smith, 1999) of Data Envelopment Analysis, and extra investigation on the measurement of economic efficiency in a dynamic context as the one presented in Sen Gupta (1999 and 2000) might constitute the basis for future theoretical and applied research. In summary, it would be desirable to introduce more flexibility into the parametric frontier approach, as well as to go more deeply into the analysis of stochastic non-parametric methods and their statistical properties. In this respect, some new routes are explored in Kumbhakar and Lovell (2000), Fernandez, Koop and Steel (2002,a 2002b), or Sickles, Good and Getachew (2002) regarding the former, and in Sen Gupta (2000a), Simar and Wilson (2000a, 2000b) and Huang and Li (2001) concerning the latter. These studies constitute a set of alternative, complementary and challenging attempts to achieve better and more reliable efficiency measures. The lunch is served.

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References

- 1.Adams, R., Berger, A. and Sickles, R. (1999). Semi parametric Approaches to Stochastic Panel Frontiers with Applications in the Banking Industry. *Journal of Business and Statistics*, 17: 349–358.
2. Afriat S.N. (1972). Efficiency Estimation of Production Functions. *International Economic Review*, 13(3): 568–598.
- 3.Ahmad, M. and Bravo-Ureta, B.E. (1996). Technical Efficiency Measures for Dairy Farms Using Panel Data: A Comparison of Alternative Model Specifications. *Journal of Productivity Analysis*, 7(4): 399–415.
- 4.Ahn, S.C., Lee, Y.H. and Schmidt, P. (1994). GMM Estimation of a Panel Data Regression Model with Time-Varying Individual Effects. Working Paper, Department of Economics, Michigan State University, East Lansing, MI.
- 5.Aigner, D.J. and Chu, S.F. (1968). On Estimating the Industry Production Function, *American Economic Review*, 58(4): 826–39.
- 6.Aigner, D.J., Lovell, C.A.K. and Schmidt, P.J. (1977). Formulation and estimation of stochastic frontier production function models. *Journal of Econometrics*, 6: 21–37.
- 7.Ali, A.I. and Seiford, L.M. (1993). The Mathematical Programming Approach to Efficiency Analysis, in *The Measurement of Productive Efficiency: Techniques and Applications*, Harold O. Fried, Lovell, C.A.K. and Schmidt, S.S. (Eds.), Oxford: Oxford University Press: 121–159.
- 8.Amaza, P. and Olayemi, J.K. (2002). Analysis of Technical Inefficiency in Food Crop Production in Gombe State, Nigeria. *Applied Economics Letters*, 9(1): 51–54.
- 9.Atkinson, S.E. and Cornwell, C. (1993). Estimation of Technical Efficiency with Panel Data: A Dual Approach. *Journal of Econometrics*, 59: 257–262.
- 10.Atkinson, S.E. and Cornwell, C. (1994a). Estimation of Output and Input Technical Efficiency Using a Flexible Functional Form and Panel Data. *International Economic Review*, 35(1): 245–256.

11. Atkinson, S.E. and Cornwell, C. (1994b). Parametric Estimation of Technical and Allocative Inefficiency with Panel Data. *International Economic Review*, 35(1): 231–243.
12. Atkinson, S.E., Fare, R. and Primont, D. (1998) Stochastic Estimation of Firm Inefficiency Using Distance Functions. Working Paper, Department of Economics, University of Georgia.
13. Banker, R.D., Charnes, A. and Cooper, W.W. (1984). Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis. *Management Science*, 30(9): 1078–92.
14. Banker, R.D., Charnes, A., Cooper, W.W. and Maindiratta, A. (1988). A Comparison of DEA and Translog Estimates of Production Frontiers Using Simulated Observations from a Known Technology. In *Applications of modern production theory: Efficiency and Productivity*: Kluwer Academic Publishers. 223-320
15. Banker, R.D., Gadh, V.M. and Gorr, W.L. (1990). A Monte Carlo Comparison of two Production Frontier Estimation Methods: Corrected Ordinary Least Squares and Data Envelopment Analysis. Paper presented at a conference on New Uses of DEA in Management, Austin, Texas.

QR Based Advanced Authentication for all Hardware Platforms

Dipika Sonawane*, Madhuri Upadhye**, Priyanka Bhogade**, Prof. Sanchika Bajpai

Abstract- This paper seems quite obvious that nowadays we are able to do transactions, shopping, banking, sharing and storing confidential data like other online services which aims to highly secured. The design and implementation of QR is easy to use and read, combined with multifactor (ID/Password which only user knows, Detail information that only the user has, Unique QR code that shows only the user is), camera based all hardware. The information is in the QR code is transmitted in the encryption form. It is portable and cost efficient. The system uses QR codes which are small two-dimensional pictures that en-code digital data. This can be used for all hardware camera equipped platforms that are for tablets, personal computers, laptops, cell phones. QR is readable even if it is partially damage. It provides high level of security and authentication with untrusted devices. Its versatility has made them quite popular, where these are today widely used as a way to quickly store by scanning it with a camera-based mobile device.

Index Terms- Secured Authentication, QR code, One Time Password, for all hardware platforms, camera based, Cash Card.

I. INTRODUCTION

Over an unauthorized public networks client authentication is fundamental process to ensure security for communication as well as sharing user's confidential data and resources. For securing the network system, we required simple and efficient authentication mechanism in distributed systems. To avoid unauthorized access generally ID/password based authentication is provided. The main purpose of using one time password is to create it much difficult to get unauthorized access to restricted resources. Mostly we are using the ID/password as a conventional authentication system, many systems implement one time password schemes using smart card, debit card, ATM card and short messages services to reduce the risk of maintenance cost and tempering. These schemes are impractical due to infrastructure requirements. To overcome these weaknesses, QR code techniques introduced into one time password protocol. As most internet users already have smart phones above proposed schemes based on QR code eliminates usage of password verification as well as cost effective solution. Instead of using demand draft and cheque, it is convenient to use Cash Card. The Cash Card is similar to demand draft and cheque, having unique QR code for only the transactions details. The Cash card is look as given below

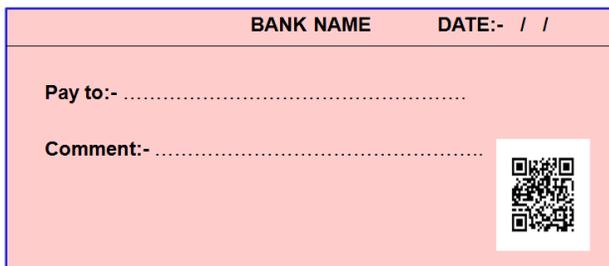


Fig. 1 Cash Card

II. RELATED WORK

In 2002, Clarke et al. were probably one of the first to suggest the usage of camera-based devices as an alternative, more secured authentication method for critical transactions, such as banking operations, and most particularly when connecting from untrusted computers [1]. The amount of camera equipped smart phones around us is increasing so rapidly that mobile based authentication might become a popular method to authenticate in a short time.

In traditional Barcode data capacity is around the only 16 digit.

QR Code Data Capacity:

Numeric Code = 7,089 characters max.

Alphanumeric code = 4,296 characters max.



Fig.2 Comparisons of QR and Barcode

QR codes (Quick Response codes) were introduced in 1994 by Denso-Wave [2], a Japanese company subsidiary of Toyota. Initially, these codes were conceived as a quick way to keep track of vehicle parts, being nowadays extremely popular in Asian countries like Japan, South Korea, China or Taiwan and becoming more and more popular in western countries by the day.

The enhanced version of one dimensional barcode is the QR code. Roughly QR code (Two dimensional) contains 350 times more amount of information than the one dimensional barcode. QR code is matrix form or 2D because it contains the rows and columns for storing the information in two directions. Countries like Japan use the QR code for storing the sensitive information. Nowadays United States also use the QR code. It is popular over the worldwide that will use for future uses.

As we can see the use of QR code is really just the beginning. At this point, we can implement the authentication using the QR code for all platforms such as PC, tablet and mobile phones. We get the idea from the paper, related to our project and we use multi factor authentication. Also by using this project we can replace the demand draft and cheque by Cash Card.

III. GENERATION OF QR CODE

Traditional One dimensional barcode mechanically scanned by narrow beam of light, 2D QR code is detected by the inbuilt auto focus camera and digitally analyzed by programmed processor. The inbuilt camera focuses three (multiple) distinctive square at the corner of QR code image. The small dots in QR code image later on converted to binary representation and validation is done with error correcting code. The data can be stored in QR code depends on version (1...40 indicating number of rows and columns), data type and error correction level. The maximum storage capacity of QR code for version 40 having 177x177 rows and columns respectively.[3][4] The QR code version 1 contains 21x21, version 2 contains 25x25, version 3 contains 29x29, version 4 contains 33x33, version 10 contains 57x57 and version 25 contains 117x117 rows and columns respectively.



Fig.3 After the scanning of QR code by smart phone (QR code version 10).

There are four error correction levels and 8 bit code is used to detect error correction level. The less storage capacity, higher the error correction level. Part of robustness of QR code in the real or broad environment is their ability to resist damage and continues to function even when part of QR code image is defected is happened due to error correction.

The below structure of QR code red color indicates format information. Density of QR code is detected by using the

format information. Light and dark grey shows the fixed pattern. This pattern always present in all QR code and this cannot change. The D indicates the data and E error in QR code, X indicates unused. The collection of data indicates different pattern.

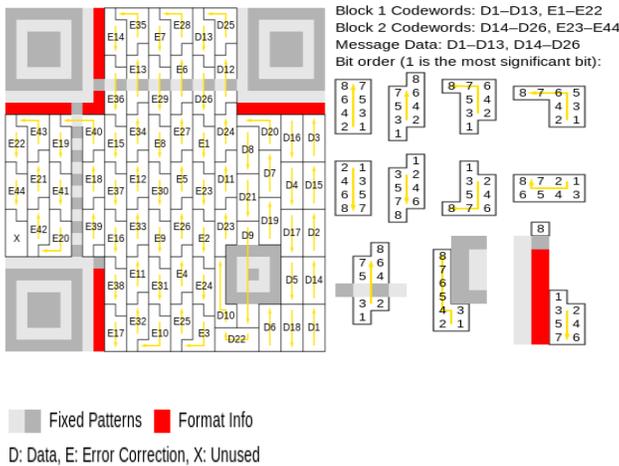


Fig.4 Structure of QR code

IV. SYSTEM FEATURES

Following system features will be facilitated:

A. Sign up

1) User information:

User must enter his naming details, address and valid mobile and valid email. The valid mobile and valid email is mandatory for user.

2) System Generated information:

After entering the naming details by the user according to the system will generate automatically unique QR code and OTP to the mobile and email. After the reentering the OTP the registration is successful.

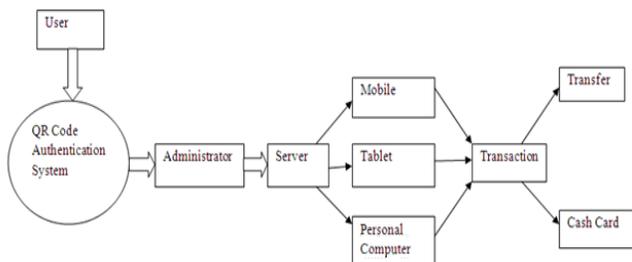


Fig. 5 System Architecture

B. Authentication

In order to provide same level of security as a web application, the system shall provide login screen on the user's hardware device. The login entered by the user shall be user ID, password and scan his unique QR code. After matching the user ID, password and QR code OTP will be sent on user's correspondence number and then OTP was reentered by user. The values shall be verified by the system prior the user having access to the system.

C. Transaction

Transaction can be done in two modes,

1) Transfer:

In this mode we select To Transfer, Amount to be transfer and the comment that will be the reason for what to transfer. Then QR code will be scanned if it matches then only transfer will do successfully.

2) By Using Cash Card:

Instead of Demand Draft and Cheque we can use the Cash Card. In this mode we select pay to, amount pay to and comment that will be the reason for what to pay.

System will generate OTP, Unique QR code for Cash Card ,that QR Code will be scanned ,if it matches then only transfer will done successfully by using Cash Card.

V. TECHNICAL SPECIFICATIONS

A. Advantages

1) Portable:

Portability is one of the most noticeable benefits of QR code. As our system is support to all hardware platform devices. Mobiles are Handy and Tablets, Laptops, PCs can be carried anywhere easily.

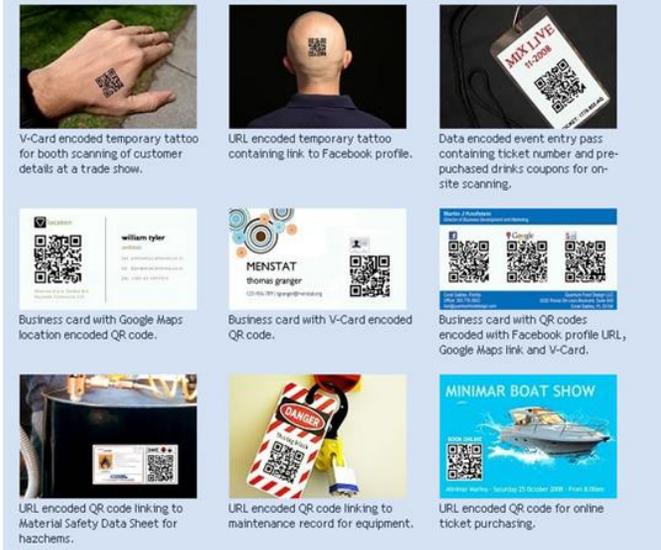


Fig.6 Portable QR code

2) Real Time:

This application System provides real time data about the users interested in QR code.

3) Low Cost:

As QR code can be scanned on any hardware device, it requires low cost and maintenance. All that is maintenance is cell phones with internet access.

4) Easy to carry:

QR code is easy to carry as it can be scan from anywhere to get our authentication and transaction successful.

5) Great deal Resistance to damage:

If the QR code is partially damage then it can also readable.



Fig.7 partially damage QR code

B. Limitations

The only disadvantage of QR code based authentication is that it can easily copy, but we provide other supportive activity.

C. Applications

1) Can replace Smart Card:

It requires the separate scanner to scan the smart card. Smart card has less storage as compare to QR code.

2) Can replace Swipe Card:

Swipe card can be cloned, but QR code can't be cloned. Swipe Card has no memory compared to QR code.

3) Secure way of transaction:

QR code is scanned through camera equipped with hardware device therefore our system provides the more secure transaction.

4) Cash Card:

Transfer can be also done using Cash Card which is replicable to Demand Draft and Cheque. System will generate Cash Card with QR code providing secure authentication.

VI. CONCLUSION

This paper actually is a survey paper which discusses the system features to be implemented for the working of the project. The mentioned system features are for obtaining the Secured multi factor authentication. Various mathematical notations are used to compute the generation of QR code. This paper mainly focuses on the system features to be implemented.

REFERENCES

- [1] Clarke, Dwaine; Gassed, Blaise; Kotwal, Thomas; Burnside, Matt; van Dijk, Marten: *"The Untrusted Computer Problem and Camera-Based Authentication"*. Lecture Notes in Computer Science, 2002, Volume 2414, Pervasive Computing, Pages 114-124, Jan.2002.
- [2] *"QR Code features"*. Denso-Wave. Archived from the original on 2012-09-15. Retrieved 3 October 2011.
- [3] *"QR Code — About 2D Code"*. Denso-Wave. Archived from the original on 2012-09-15. Retrieved 3 October 2011.
- [4] *"Version and Maximum capacity table"*. Denso-Wave. Archived from the original on 2012-09-15.
- [5] *"2D Barcode: QR-Code"*. Archived from the original on 2012-09-15. — TEC-IT
- [6] Orli Sharaby (18 October 2010). *"Form Meets Function: Extreme Makeover QR Code Edition"*. Archived from the original on 2012-07-08. Retrieved 29 July 2011.
- [7] *"QRP: An improved secure authentication method using QR codes"*. David Pintor Maestre Universitat Oberta de Catalunya 08018, Barcelona, Spain dpintor@uoc.edu June 8, 2012
- [8] Hamilton Chan (18 April 2011). *"HOW TO: Make Your QR Codes More Beautiful"*. Archived from the original on 2012-07-10. Retrieved 29 July 2011.

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Informal Economy as a Source of Livelihood in Zimbabwean Urban Areas: The Case of Bulawayo Metropolitan Province

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Abstract: One of the major development concerns in recent years, particularly in sub-Saharan African countries, has been the rapid growth of urban population coupled with low industrial growth. This mismatch has led to high unemployment levels as most companies have either scaled down or completely shut down. High poverty levels have intensified in urban areas and this has facilitated the mushrooming of the informal economy such as vending, operating tuck-shops and various micro enterprises as an adaptation strategy to failing economies. This study took a micro-level approach by exploring the role of the informal economy as a source livelihood in the city of Bulawayo. The study used qualitative methodology in the gathering and analysis of data. Data collection was done using the interview method. Purposive sampling was used to select twenty participants both male and female who are registered with the local authority. Information was also collected using document analysis and review of relevant literature on current debates on the role of the informal economy as a source of livelihood for the urban poor. The research showed that the informal economy plays a vital role as a livelihood strategy by employment creation for the unemployed and the retrenched labour force. It is a source of livelihood as the majority of the participants indicated that they can afford basic food stuffs and services. It is recommended that the central government and local authorities should provide an enabling environment for the development of the informal economy as it is shown that currently it is the highest employer of the labour force, particularly in Bulawayo.

INTRODUCTION

Two key studies that examined the evolution of the informal economy during the first decade of independence namely, the ILO/SATEP study of 1985 and the Gemini study of 1991 reveal that the share of informal economy employment grew from less than 10% of the labour force in 1982 to 20% by 1986/87 and 27% by 1991 (Kanyenze et al, 2003). Economic slump intensified in 1998 and reached its peak towards the end of 2007 as a result of the adoption of Economic Structural Adjustment Programmes (ESAPs) under the guidance of the international financial institutions. This resulted in many thousands of formal sector workers, mainly civil servants and workers in state-owned enterprises, being retrenched and rendered unemployed (International Labour Organization, 2004). The failure of ESAP to shift the economy onto a superior and sustainable growth path, and especially its underperformance in terms of employment creation left a legacy of poverty and marginalization (Kanyenze et al, 2003). The other factors that led to economic meltdown are targeted sanctions imposed on Zimbabwe due to the fast track land reform and successive droughts. The period between 1998 and 2008 has been referred to as the lost decade by some scholars. Poverty levels intensified in urban areas and this facilitated the mushrooming of the informal economy such as vending, operating tuck-shops and various micro enterprises. What this implies is that economic downturns are associated with the growth of informal economy and vice versa (Kanyenze et al, 2003).

Economic revival in Zimbabwe, especially in Bulawayo, is taking place at a very slow rate. It is estimated that more than 20 000 people have been pushed out of employment after nearly 100 companies either scaled down or completely shut down in Bulawayo over the last few years (Masvora, 2013). According to Kasanzu and Chiutsi (2013) at least 22 milling companies in Bulawayo have temporarily closed as they are being pushed out of business by cheap imports that are flooding the country from neighbouring South

Africa and Botswana, for example, National Foods is now operating four days per week. This is a result of the influx of mealie-meal from South Africa and Botswana into the country especially Bulawayo largely due to its proximity to the two neighbouring countries. According to the Confederation of Zimbabwe Industries (CZI) manufacturing survey released in September 2013, imports increased by about 18,8 percent from January to July compared to the same period in 2012 and exports fell by 3,4 percent between January and July 2013 compared to 2012 (Kasanzu and Chiutsi, 2013).

De-industrialisation in the city has forced many people into the informal economy since the informal economy tends to be driven by unemployment and retrenchment. Almost everyone is trying to get money from setting up some small business to fill the gap that was created by massive de-industrialisation of the city (Masvora, 2013). However, there is controversy on the actual level of unemployment in the country. The real level of unemployment is almost impossible to gauge as countless Zimbabweans are making a living in the informal sector. According to John Robertson (2013), a prominent Zimbabwean economist, Zimbabwe's unemployment rate remains very high at more than 70 percent with less than 900 000 people formally employed out of a 13 million population. He further asserts that an estimated 100 000 jobs have been lost from 2004 up to date as government fails to create new jobs and it is the informal economy that has borne the brunt of absorbing the masses of unemployed people. This assertion has been opposed by other sections who claim that unemployment rate has been overstated to tarnish Zimbabwe's international standing. Only 7,7 percent of economically active Zimbabweans are unemployed (Mukarati, 2013). The Zimbabwe National Statistics Agency (ZIMSTAT) has pegged the country's unemployment rate at 10.7 percent - a figure that has been dismissed as grossly misleading by economists and the country's largest labour union (Mukarati, 2013). ZIMSTAT defines unemployment as lack of any means of contributing to the country's gross domestic product (ibid). This is interesting, when read in comparison to the latest African statistics that peg the rate of unemployment in Namibia at 51,2 percent, 48 percent for Senegalese, Kenya 40 percent, Nigeria 23,9 percent, South Africa 22,7 percent, Tunisia 18,8 percent, Botswana 17,8 and 10 percent in Algeria (Mukarati, 2013). At provincial level, the highest rate of unemployment is in Harare and Bulawayo where 24,6 and 24 percent of the economic active population respectively are jobless (ibid). Unemployment in Bulawayo has been exacerbated by de-industrialisation.

Therefore, organizing the informal economy and recognizing its role as a profitable activity may contribute to the economic development as asserted by Financial Express (2013) that the informal economy contributes around 19,5% of Zimbabwe's Gross Domestic Product (GDP) and informal non-farm activities contribute \$810 million. This can also improve the capacity of informal workers to meet their basic needs by increasing their incomes and strengthening their legal status.

According to Rogerson (1997), since the late 1970s, the focus of informal sector research has shifted from definitional concerns to whether the sector constitutes an arena for increasing income and employment, the relationship between the formal and the informal sectors and, what role, if any, should the government play. Therefore, the objective of this study is to critically analyze the role of the informal economy in the livelihood of Bulawayo residents. Ellis (2000) points out that livelihood strategies are composed of activities that generate the means of household survival. The informal economy is a livelihood strategy because it enables people to make a living (Mugisha, 2000).

METHODOLOGY

The study used qualitative methodology in the gathering and analysis of data. Qualitative research uses a naturalistic approach that seeks to understand phenomena in context-specific settings, such as "real world setting (where) the researcher does not attempt to manipulate the phenomenon of interest" (Patton, 2002). Data collection was done using the interview method. According to Kitchin and Tate (2000), the interview method allows the researcher to produce a rich, deep and varied data set in an informal setting. It provides a thorough examination of experiences, feelings or opinions that closed questions could never hope to capture (Ibid).

Purposive sampling was used to select twenty participants both male and female who are registered with the local authority. Information was also collected using document analysis and review of relevant literature on current debates on the role of the informal economy as a source of livelihood for the urban poor.

The research took a micro level approach by focusing on Entumbane bus terminus in Bulawayo Metropolitan. The area has a lot of economic activities since it is located near the bus terminus, shopping mall and high density suburbs.

RESULTS

Ownership

The ownership demographics show that the informal sector is dominated by females, that is, 55% females and 45% males. The sector is dominated by people in the age cohort of 31-40 years as they constituted 40% of the total respondents while the age of 51+ are the least involved in the informal sector constituting a mere 10%. It is also dominated by married people as they constituted 60% of the respondents with the second being the unmarried constituting a 25% and the widowed and the divorced only accounted for 15% of the total population as shown by the results. The findings indicate that 80% of the respondents had reached Ordinary level certificate while Advanced level holders constituted 10%. It was also found that 7% of the participants had primary education and 3% had a tertiary qualification.

Employment creation

It was found that the informal economy provides employment as 50% of the respondents were employees and the other 50% were the owners of the businesses. The results also revealed that 60% of the businesses have been in operation for more than two years and 40% for less than two years. The types of goods sold include cloth vending, agricultural produce, electronic goods, cosmetics, kitchen utensils, spices, fast foods vending and farm implements.

Income generated per month

The monthly incomes generated per month as shown by the findings indicate that 45% of the business owners get US\$400, 30% raise US\$251-\$399, 15% generate US\$100-\$200 and 10% raise less than \$100. This is illustrated by the bar graph below:

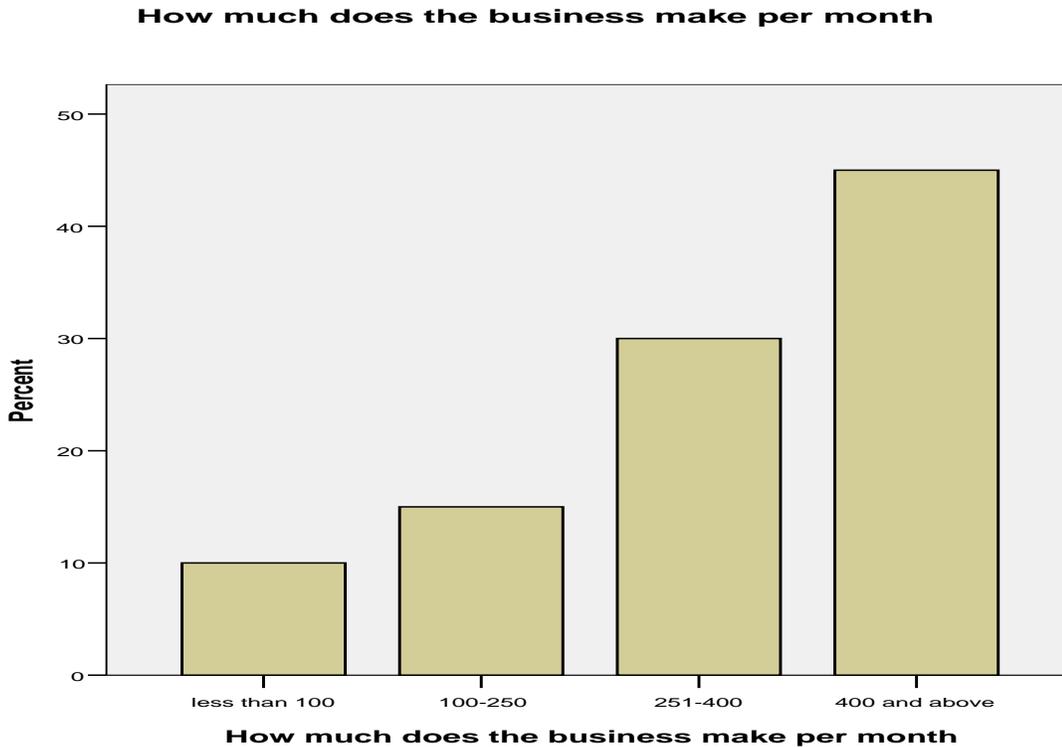


Fig 1: Bar graph showing how much is earned from sales in the informal sector on a monthly basis

The cash obtained is used for education, remittances, rentals and buying food and 50% of the respondents revealed that the amount obtained from sales is insufficient to cater for their basic household needs while the remaining 50% revealed that the amount can sustain their household needs.

From the study all respondents revealed that they have no alternate source of income apart from selling and also the study shows that all businesses are registered with the Bulawayo City Council and they pay \$14 per month for the right to sell.

DISCUSSION

The results obtained in this study clearly show that women tend to constitute the majority of the urban poor because of constraints imposed by socio-economic, cultural and political factors. Like their rural counterparts, women in urban areas are further disadvantaged because most of them often lack the formal education and training and these are bases for accessing formal employment. Surveys show that Non-Governmental Organisations (NGOs) addressing women's issues in towns have tended to focus on their domestic roles.

The study revealed that women tend to make up the greatest portion of the vendors in the informal sector since the majority lack formal education and skills because of a patriarchal nature of the society. The pre-ESAP surveys carried-out by Kanyenze et al (2003) in Zimbabwe indicate that women accounted for 67% of all micro-enterprises in 1991 and constituted 57% of the total informal economy employment and the average age of participants was 37-38 years. According to Bhana et al (2009) in the African context girls are often marginalised, the benefits of education including increased economic opportunities are given to the males. A study on the role of the informal sector in coping with economic crisis which was carried out in Thailand and Zambia by the International Labour Organisation in 2004 reflect that in Zambia both women and men increased their participation in the informal economy,

particularly in urban areas, due to massive formal sector retrenchment, a fall in real wages, the rising cost of living, and increased mortality due to HIV and AIDS. It is further shown that women tended to undertake such culturally defined activities as vending foodstuffs, running mini-restaurants and tailoring, while men tended to engage in furniture making, welding and metal fabrication and trading, which yield higher income. These findings are in agreement with this study. Men are very particular in the choice of business under the informal economy. Men prefer to remain unemployed rather than do work they considered only suitable for women, such as selling food or engaging in piece-rate activities (ILO, 2004).

The research showed that the sector is dominated by people in the age cohort of 31-40 years as they constituted 40% of the participants. This is attributed to the 2007/8 near collapse of the Zimbabwean economy that almost saw the total shutdown of the formal sector. On this context, most of the economically dropped from learning institutions and others were left jobless and resorted to the informal sector. However, it is difficult to come up with real figures of the people employed in the informal economy because most studies assume that the informal sector is the preserve of the poor (Rakowski, 1994). These assumptions make it impossible to capture the increasing number of people in some African cities who operate in the formal and informal sector simultaneously because many formal sector employees join the informal sector as an income supplementing and/or income-diversification strategy (Kaseke, 1998).

From the research, 80% of the participants did O-level while A-level holders were 10% and tertiary together with primary education holders were also 10%. This is because Zimbabwe's education system is currently suffering from a detrimental decline in public funding in conjunction with political unrest. In 2007 O-level pass rate crashed from 72% to 11%. This was fuelled by teachers having one on strike and this explains why the formal sector is dominated by the people with low education levels (Raath, 2008).

From the study the informal sector has helped in livelihood strategies i.e. money obtained for various purposes such as education, remittances, rentals and groceries. According to ILO (2004) the poverty datum line is at \$541 for a family of 5, the results of this study show that the participants make less money (45% make \$400) which is below the poverty datum line amount. Therefore the informal sector is unsustainable. Carr and Chen (2001) observed that the relationship between the informal sector and poverty is uncasual. There is a negative association between increased informal sector and economic growth because it was observed that there is a higher proportion of impoverished employees working in the informal sector.

The study revealed that the informal sector in Entumbane is the only viable source of livelihood for those involved as all the participants have no second sources of income. They are not involved in multiple livelihood strategies as they indicated that their businesses needed more attention. However, some studies have described the informal sector as a poor creator of employment and thus not a reliable sector for job creation opportunities as well as the basis for a sound national economy. From a technical point, the informal sector is a replica of the formal sector in that most of the activities carried out in the informal sector are similar to those carried out in the formal sector and people engaged in the informal sector are former employees of the formal sector. The only discernible difference is that informal sector activities are more subsistence oriented hence the reason for unsustainability in the sector (Carr and Chen, 2001)

Although the informal sector helps in livelihood strategies and increasing the GDP of the country, it faces various challenges. Firstly, there is shortage of capital to start a business or to expand. Most participants argued that they are operating below capacity because they have no access to loans from financial institutions since they do not have collateral security. This concurs with the assertion of the renowned Zimbabwean economist John Robertson who stated that it is difficult for people in the informal sector to secure credit facilities because they do not have evidence to secure such services since their incomes are erratic and low with little production involved and they lack things like payslips and bank account statements as an indication to the lender that one can pay or service

credit facilities, (Robertson, 2013. The results of the two studies carried out in Thailand and Zambia reveal that even where micro-finance programmes exist or have existed in the past, only a very small percentage of those in the informal economy have had access to or have benefited from them (ILO, 2004). It is also shown that in Thailand most people take-out loans from friends or relatives where interest rates are lower and they also have traditional moneylenders who charge much higher interest rates and do not hesitate to use strong-arm tactics to ensure repayment. This is a major challenge in boosting the informal economy to be sustainable as cash inflows are erratic.

Secondly, there is high competition from unregistered operators. Many people are operating without licenses from the Bulawayo City Council (BCC). It is argued that it takes a very long time for one to get a licence, for example 4 – 6 months. The researchers observed that within the Entumbane informal economy only forty out of 51 businesses were registered with the BCC. The unregistered operators tend to sell their goods at a lower price creating stiff competition amongst other sellers. The prices of the goods of unregistered operators are very flexible because they do not pay rentals to the responsible authority. The other challenge was the lack of built in structures for unfavourable weather conditions and government loans of funds to hoard the goods.

According to Timalina (2007) urban street vending is not only a source of employment but it provides affordable goods and services to the majority of the urban poor. This implies that the government through the Ministry of Small and Medium enterprises can mobilise and organise informal economy participants into industrial business associations (Informal Sector Associations – ISAs). Efforts have been made to come up with the Zimbabwe Apex of Informal Sector Associations (ZAISA). The idea was to co-ordinate all stakeholders in the informal economy, ranging from Finance Institutions, Training Providers, and Suppliers of Technology to organised markets and to link them in a manner that unlocks economies of scale and associations such as the Cross Border Traders, Tuck shop Operators, and Arts and Craft were facilitated (Kanyenze et al, 2003). A study on street vendors shows that the lower income groups spend a higher proportion of their income in making purchases from street vendors, mainly because their goods are cheap and thus affordable (Bhowmik, 2005) Therefore, urban authorities should not take street vending as an illegal and unproductive sector but as an important livelihood securing sector for the urban poor.

CONCLUSION

The research reflected in this study was an analysis of the role of the informal economy in the livelihood of Bulawayo residents. As such, the study showed that the informal sector plays an important role as the source of livelihood for the people in Bulawayo. It has created employment, mainly for vulnerable groups of the population such as women who are disadvantaged in getting formal employment and it contributes to the GDP of the country. For most people involved in the sector it is the only source of livelihood. The informal economy faces various challenges such as shortage of capital to expand the sector, competition from unregistered operators. However the government should continue supporting the sector since it lies within the ruling Party's manifesto which states that: "Indigenise, Empower, Employ and Develop" and the informal sector is a strong form of indigenisation.

RECOMMENDATIONS

Based on the findings the following recommendations are made:

- The government should incorporate the informal activities into the national budget i.e. loan facilities,
- Training and education should be provided for the business entrepreneurs
- Proper structures should be provided by the local authorities

- Vendors should join hands with stakeholders (EMA, BCC, police), in creating a safe and clean environment for business activities as the site is an environmental and health time bomb.
- The informal sector are subject to a number of constraints especially that of competition due to unregistered businesses, the researchers therefore recommend that sellers should inform the local authority of such activities in a curb to reduce corruption.

References

Bhana, D., Morrel, R and Pattman, R (2009). Gender and Education in Developing Contexts: Postcolonial Reflections on Africa Springer international handouts on education.

Bhowmik, S. K. (2005), "Street Vendors in Asia: A Review", Economic and Political Weekly, May 28-June 4 pp.2256-2264, in www.worldbank.org, accessed on 12-12-06.

Carr, M and Chen, M.A. (2001). "Globalization and the Informal Economy: How Global Trade and Investment Impact on the Working Poor". Geneva, Switzerland: International Labour Office.

Castillo G, Frohlich M. and Orsatti A, 2002: "Union education for informal workers in

Chikowore, E (2008). Development Perspectives in Zimbabwe: The Informal Sector as a Potential Reservoir in the National Transformation Process, Zimbabwe

Ellis, F. (2000), Rural Livelihoods and Diversity in Developing Countries Oxford: Oxford University press.

Gemini (1998) Zimbabwe: A Third Nationwide Survey of Micro and Small Enterprises USAID, PriceWaterhouseCoopers, September.

International Labour Organisation (ILO), 2004: "Unprotected labour: What role for unions in the informal economy?" Labour Education 2002/2 Number 127, ILO, Geneva.

Kanyenze, G., T. Chitiyo., T. Mahere., T. Makwavarara., P. Mbire and E. Moyo (2003) Giving Voice to the Unprotected Workers in the Informal Economy in Africa: The case of Zimbabwe: Paper Prepared for the ILO/SRO

Kasanzu, E and Chiutsi, N "Imports have negative impact on milling companies" Sunday News 27

Kaseke, Edwin. 1998. Structural adjustment programmes and the problem of urban poverty: an African perspective. International Social Work 41(3):311-320

Kitchin, R. and Tate, J. (2000), Conducting Research into Human Geography: Theory, Methodology and Practice Pearson Education Limited, Edinburgh Gate, England.

Masvora, G "Stop harassing informal traders" Sunday News 27 October-2 November 2013

Mugisha, P. T. (2000), The Role of Informal Sector (Micro Enterprises) in Development, A Case Study of Katwe Small Metal Industries in Kampala (Uganda) Master Thesis in Development Studies, Specialising in Geography, NTNU, Trondheim Norway.

Mukarati, T (2013) Sunday News 20 – 26 October 2013

Patton, M.Q. (2002), *Qualitative Research and Evaluation Methods*(3rd ed.), Sage Publication, London.

Raath, J (2008). Zimbabwe chaos wipes out education for 4.5 million pupils.Times Online 2008>(http://www.timesonline.co.uk/tol/news/world/africa/article4902920.ece). Retrieved 13 October 2013

Rakowski, C.A (1994). Convergence and Divergence in the Informal Sector Debate: A focus on Latin America, 1984-92. World Development 22(4):501-516.

Robertson John Business Daily 22 April 2013

Rogerson, C.M (1997). Globalization or Informalization? African Urban Economies in the 1990s. In The Urban Challenge in Africa: Growth and Management of its Large Cities. ed C. Rakodi, 337-370 Tokyo: United Nations University Press

Timalsina, K.P (2007) Rural Urban Migration and Livelihood in the Informal Sector: A Study of Street Vendors of Kathmandu Metropolitan CityNepal Master of Philosophy Thesis in Development Studies Submitted to the Department of Geography Norwegian University of Science and Technology (NTNU) (Unpublished)

HASBE: A Hierarchical Attribute-Based Solution for Flexible and Scalable Access Control in Cloud Computing

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Abstract- In several distributed systems using a certain set of attributes, a user should only be able to access data. Currently, the only method for enforcing such policies is to employ a trusted server to store the data. To keep the shared data confidential against any kind of misuse, a natural way is to store only the encrypted data in a cloud. The key problems of this approach include establishing access control for the encrypted data. Previous Attribute - Based Encryption systems used attributes to describe the encrypted data. While in our system attributes are used to describe a user's credentials, and encrypting data determines a policy for who can decrypt. However, when organization users outsource confidential data for sharing on cloud servers, the adopted encryption system should not only support fine-grained access control, but also provide high performance, practicability, and scalability to best serve the needs of accessing data anytime and anywhere. This paper, proposes a scheme to help the organization to efficiently view and access confidential data on cloud servers. We achieve this goal by first combining the hierarchical identity-based encryption (HIBE) system and the CP-ABE system. The proposed scheme not only achieves scalability due to its hierarchical structure, but also inherits flexibility and fine-grained access control in supporting compound attributes of ASBE.

Index Terms- Cloud computing, Flexibility, Scalability, Data Security

I. INTRODUCTION

With the emergence of sharing confidential corporate data on cloud servers, it is imperative to adopt an efficient encryption system with a fine-grained access control to encrypt outsourced data [7]. Cloud is a platform to store, retrieve, utilize multiple user's data. Benefits of using cloud computing involve reduced cost, easy and better operational facility, efficient database use and immediate response time. Though cloud is having multiple advantages, security in cloud is still a major issue. The contribution of paper involves creating a single cloud for multiple branches of the multiple countries providing hierarchy. User can easily store their data on the cloud and for providing security and privacy to this data stored on the cloud we are using encryption and decryption methods. We are implementing a system to achieve flexible and fine-grained access control of the users of the trusted cloud. The previous systems had proposed hierarchical attribute-based encryption (HABE) to achieve fine-grained access control in cloud storage services by combining hierarchical identity-based encryption (HIBE) and CP-ABE. In our paper, we are proposing hierarchical attribute set based

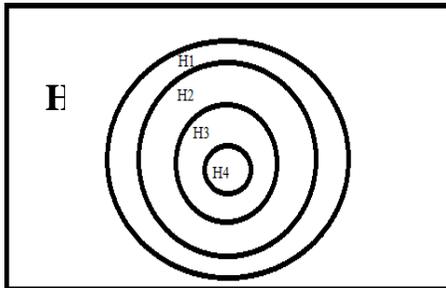
encryption (HASBE) which is an extension to HABE. As our cloud computing model is service-oriented, we should take care of data from outsiders as well as from the cloud service provider itself. The scheme provides full support for hierarchical user grant, file creation, file deletion, and user revocation in cloud computing. The security of proposed scheme is proved using the CP-ABE [1]. We are demonstrating the implementation of this paper for a software company. So, the service-oriented model used is SaaS (Software as a Service). Hence the type of cloud we are using is private cloud.

II. LITERATURE REVIEW

In the existing system, multiple branches had an easy access to data of other branches. Also previously, the system was showing complete data related to the requested query even though the employee required some of the data. Due to this, the time to fetch and execute the query was too long. This increased the system response time thereby degrading the system performance. Another drawback was that the data was encrypted but the decryption was not restricted to that specific user as keys were not distributed in an efficient way resulting in retrieval of wrong data or incomplete requested data thus increasing chances of hacking. In case if a lower level authority is absent or is on leave, work is completely stopped and is delayed for the leave duration. Previously, CP-ASBE policy was been used so the security of stored data was at risk and had chances of misuse as well. The drawback of this trend is that it is increasingly difficult to guarantee the security of data using traditional methods; when data is stored at several locations, the chances that one of them has been compromised increases dramatically. Organization users will face serious consequences if its data was disclosed. For these reasons the requirement is that the sensitive data is stored in an encrypted form so it will remain private and safe. Most existing public key encryption methods allow an organization to encrypt data to a particular user, but are unable to efficiently handle more expressive types of encrypted access control. Hence, less security was provided to the confidential data stored on cloud in previous system.

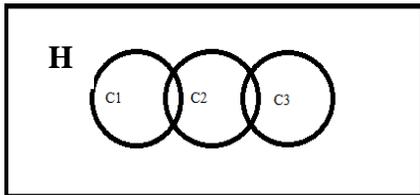
III. SYSTEM MODEL

$H = \{H1, H2, H3, H4\}$
 where,
 H is cloud
 H1 is CEO.
 H2 is general manager.
 H3 is the list of managers.
 H4 is the list of employees.



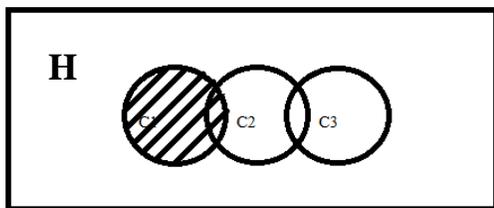
FLEXIBILITY:

$H = \{C1, C2, C3\}$
 Where,
 C1 is the old branch of the company where employee worked before transfer.
 C2 is the employee being transferred.
 C3 is the new branch where employee got transferred to.



$H = \{C1, C2, C3\}$

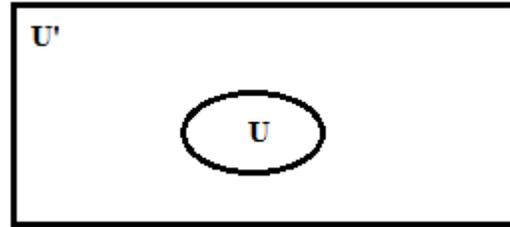
where,
 s2 is employee data should be accessed to new branch only not old branch.



$S2 = (C1 - C2) \cup C3$

Scalability :

$H = \{H1, H2, H3, H4\}$
 $U = \{H1, H2\}$

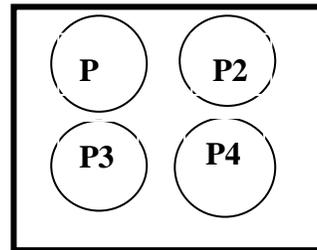


S3

$U' = \{H3, H4\}$
 $U = \text{present user}$
 $U' = \text{absent user}$

FINAL STATE:

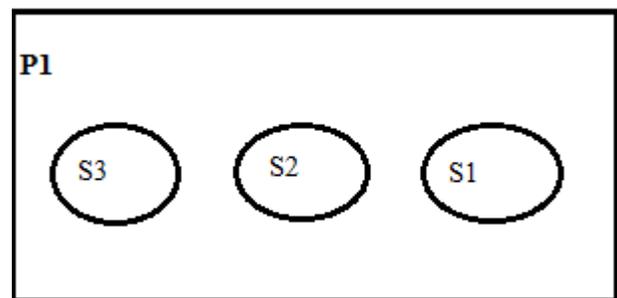
Identify the processes as P.
 $P = \{\text{Set of processes}\}$
 $P = \{P1, P2, P3, P4, \dots\}$
 Where
 $P1 = \{S1, S2, S3\}$



Where :

{ S1= get new attribute after request }
 { S2= get new employee information when employee get transfer. }
 { S3= get access of lower authority }.

Venn Diagram



IV. PROPOSED SYSTEM

In proposed system, instead of showing complete data, fetching of required data is carried out thus achieving fine-grained access control. This resulted in an efficient system response time as well as increased performance of the system. For security purpose, the proposed scheme consists of 3 keys: Private, Public and Master key. Public key is used in encryption of data, Private and public key is used to decrypt the data and

Master key is used for accessing the allowable data. We are also achieving scalability which manages the workload within company by assigning lower level authority task to higher level authority in case of lower level authority absence or leave. It also involves flexible access of data in which when an employee is transferred to another location/branch, the main database is updated. It reduces the work of manual data transfer. Another feature provided is User Revocation [5] that allows expiration of user's key to be updated after the duration of key is near to expiration. This system also maintains a single cloud with a main database for multiple branches as a virtual partition viewing as every branch has its own cloud.

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V. CONCLUSION

Thus, we efficiently provide a fine grained access control with flexibility and scalability with a hierarchical structure in our HASBE system. Our contribution to this paper will be providing security to the users from outsiders or intruders by implementing session hijacking and session fixation security in our system. Also, a performance analysis will be done by the employee's updating monthly record performance.

APPENDIX

Sr no	Term	Description
1	CP-ABE	Ciphertext-Policy Attribute-Based Encryption.
2	CP-ASBE	Ciphertext-Policy Attribute Set Based Encryption.

REFERENCES

- [1] Attribute-Sets: A Practically Motivated Enhancement to Attribute-Based Encryption, Rakesh Bobba, Himanshu Khurana and Manoj Prabhakara University of Illinois at Urbana-Champaign July 27, 2009.
- [2] Enabling Data Dynamic and Indirect Mutual Trust for Cloud Computing Storage Systems Ayad F. Barsoum and M. Anwar Hasan Department of Electrical and Computer Engineering, University of Waterloo, Ontario, Canada, 2012.
- [3] Designing a Secure Cloud-Based EHR System using Ciphertext-Policy Attribute-Based Encryption, Suhair Alshehri, Stanislaw Radziszowski, and Rajendra K. Raj Golisano College of Computing & Information Sciences, Rochester Institute of Technology, Rochester, New York 14623, USA 2011.
- [4] Gasbe: A Graded Attribute-Based Solution For Access Control In Cloud Computing, Chandana.V.R, Radhika Govankop, Rashmi N and R. Bharathi, International Conference on Advances in Computer and Electrical Engineering (ICACEE'2012) Nov. 17-18, 2012 Manila (Philippines) 2011.
- [5] Hierarchical attribute-based encryption and scalable user revocation for sharing data in cloud servers, Guojun Wang, Qin Liu a,b, Jie Wub, Minyi Guo c 2011.
- [6] Cloud Computing Security Issues in Infrastructure as a Service, Pankaj Arora, Rubal Chaudhry Wadhawan Er. Satinder Pal Ahuja M.Tech CSE, IGCE. Asstt.prof (CSE), IGCE Associate Professor & HOD (CSE), IGCE Punjab technical Univ., 2012.
- [7] Hierarchical Attribute-Based Encryption for Fine-Grained Access Control in Cloud Storage Services, Guojun Wang, Qin Liu School of Information Science and Engineering Central South University Changsha, Hunan Province, P. R. China, 410083, Jie Wu Dept. of Computer and Information Sciences Temple University Philadelphia, PA 19122, USA, 2010.

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Design of Fuzzy controller and supervisor for Load Frequency control of Micro Hydro Power Plant

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Abstract- The job of automatic frequency regulation is achieved by governing systems of individual turbine generators and Automatic Generation Control (AGC) or Load frequency control (LFC) system of the hydro power plant. This seminar report addresses a comprehensive literature survey on load frequency control in hydro power plant. The report is aimed to present the various control and structural schemes of LFC present in the microhydro power plant. The LFC schemes on different aspects like classical control based LFC schemes, LFC schemes based on modern control concepts are discussed. The aim of the proposed work is to design a fuzzy controller that would manage almost the whole operation of the generating unit. The presented fuzzy controller has three main tasks. First, it regulates the frequency output of the plant in spite of changing user loads. Second, it limits the waste of the available water. Finally, it manages the electricity distribution by dividing the mini network on different departures connected in order of priority.

Index Terms- Automatic generation control, Load frequency control, hydro power plant, linear and nonlinear turbine model, adaptive fuzzy controller.

I. INTRODUCTION

Climate change, global warming, population growth and the continuous demand for energy and electricity have made Renewable Energy the most appropriate and fitting to answer all these changes in our environment. The scientific community is widely interested in modeling and control of renewable energy plants as the number of published papers do not cease increasing since the last decade, specifically on hydro and micro-hydro power plant. Micro-hydro power plants (MHPP) are of big interest in their easiest installation and their affordability. They are located in mountainous areas where hydropower resources are available. A typical MHPP includes a mountain reservoir, a penstock, a powerhouse and an electrical power substation. The reservoir stores water and creates the head; the penstock carries water from the reservoir to a turbine inside the powerhouse. The water rotates the turbine, which drive a generator that produces electricity. A hydraulic turbine is a hydropower machine that directly converts the hydraulic power in moving water into mechanical power at the machine shaft.

Further, MHPP are often isolated, inaccessible and are not connected to the national grid. So, when a MHPP stop working for any reason, it deprives the local population from electricity. An intervention to make it operational takes a long

time, and might be impossible in case of inclement weather. This requires the control system to be autonomous, robust and capable of managing all operational situations.

Due to alterations of the grid load, deviations are caused between turbine power output and the load. The frequency output of MHPP and the voltage may drastically vary from their nominal value. Thus, MHPP needs control to maintain an uninterrupted power at rated frequency and voltage. It should keep the rotational speed of the turbine generator unit stable around its nominal value for any grid load and prevailing conditions in the water conduit.

Turbine governors are systems for the control and adjustment of the turbine power output and for evening out deviations between the power and the grid load as quickly as possible. Two main governors are used to automatically control the frequency of the generating unit). First, it could remain constant by action on the gate opening position to produce just the necessary power according to the connected load. Second, electronic load controllers (ELC) govern the frequency by adjusting the electrical load connected to the alternator. Therefore, they maintain a constant electrical load on the generator in spite of changing users' load. In this case, the turbine gate opening is kept in a specific position that guarantees a nominal mechanical power at the generator shaft. It permits to use turbine with no flow regulating devices. The former governor takes a long time to stabilize the output and it becomes insufficient in case of large load variations where the stability of the system could be completely lost. ELC is used in order to simplify the MHPP control. The stabilizing time is short even for large load variations.

However, ELC waste precious energy that can be used gainfully. Also they do not carry out flow control, implying that the mineral rich water is made to spill away, which could have been diverted at high heat for irrigation purposes. We have presented a TS fuzzy controller to maintain the MHPP frequency constant using an ELC governor and to adjust the water flow to limit the dissipated power on the ballast load.

In the other hand, there are other effects that cause fluctuations of the frequency on a grid load. For example, the level of water in the reservoir might change significantly depending on the season, which would directly affect the MHPP output frequency. Even for a certain level of water, the users might connect machines that require high levels of power causing a large drop of frequency. Thus, an effective control scheme has to take into account those operation cases in order to insure a good level of control.

The fuzzy logic is an important technology and a successful branch of automation and control theory, which provides good results in control of power systems. This paper aims to use fuzzy control to insure good control of isolated MHPP. The proposed control scheme is suitable for turbine systems with both guide vane governors and synchronous generators, especially permanent magnet machines which have no automatic voltage regulator.

The rest of this paper is structured as follows: section II presents both the problem formulation of frequency fluctuation by that of random power fluctuation at generation and load sides, and the proposed control scheme to overcome frequency fluctuation for any working condition. Dynamic model of the MHPP is briefly introduced in Section III. Design methodology of the proposed fuzzy control system that consists of a fuzzy controller and a fuzzy supervisor is described in Section IV. Simulation results are provided lastly to valid the new control scheme followed by a conclusion in section VI.

II. PROBLEM FORMULATION.

Since frequency fluctuation is effected mainly by the fluctuation of real power, power quality problems threatening the frequency stability can be solved or avoided by satisfying the real power supply. The problem addressed in this paper is to find a fuzzy control law that maintains the MHPP frequency output and voltage stable around their nominal value and optimizes the available water in the reservoir, which will economize and reduce its waste. To achieve our objective, the fuzzy logic has been used for its ability to easily incorporate the human expertise, and to use the traditional methods of analysis and stability. A fuzzy supervisor is added to manage the operation of the MHPP, as shown in Figure 1.

The guide vane governors should be relatively slow to avoid water hammer effect. Thus, with the presence of a large and sudden load discharge, the control law, based on the variation of the gate opening position, would be unable to quickly reduce the produced power. In the proposed control scheme, the fuzzy controller controls an ELC actuator in order to compensate the disconnected load by dispelling the excess produced power on the ballast load (noted "Pd"). In order to avoid wasting available water in the reservoir, the proposed fuzzy controller is able to reduce the power dissipated to a very low value once the system stabilizes, this, by closing the gate position via a servo motor that governs the water flow.

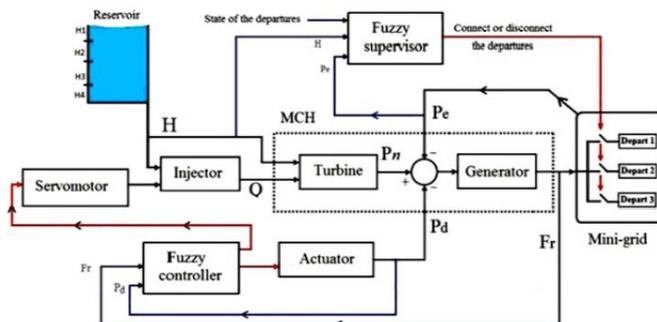


Figure 1: The proposed control scheme.

The produced electrical power depends on the level of water existing in the reservoir. To avoid problems, overloading of the MHPP or insufficient water, the mini- grid network fed by the MHPP is divided into a set of sub- networks (departures) that are powered by order of preference. For example, when very large overloads are caused, the proposed supervisor disconnects the less preferential departures to avoid large drop of frequency. The supervisor also manages the distribution of electricity between these departures depending on the availability of water in the mountain reservoir.

III. THE MICRO HYDRO POWER PLANT MODEL

MHPP is a non-linear, non-stationary multivariable system whose characteristics vary significantly with the unpredictable load on it and this presents a difficulty in designing efficient and reliable controllers. However, the majority of the proposed hydro power models is linear. A linear model representation of the turbine system is valid only for small signal performance study (load disturbance $\leq \pm 10\%$). This makes model an oversimplified and realistic issue not being discussed. Such a linearized model is inadequate for large variations in power output ($> \pm 25\%$ rated load).

This model is based on the mathematical equations resumming the whole operation of MHPP. It incorporates nonlinear equations of the mechanical power; the electrical consumed power and the relationship between the turbine flow, the turbine head and the frequency of the voltage waveform. The two equations that summarize MHPP operation are:

$$P_t = \frac{q_t \sqrt{h_t}}{1 - k_t} f_r - \frac{q_t k_t}{1 - k_t} f_r^2 \quad (1)$$

$$\frac{df^2}{dt} = 2 \cdot T_a (P_t - P_e) \quad (2)$$

Where: f_r is the MHPP frequency; q_t is the water flow; h_t is he head; p_t is the turbine power; p_e is the load; k_t and T_a are constants that characterize the plant.

IV. THE DESIGN OF MHPP FUZZY CONTROLLER AND SUPERVISOR MODEL

In this section, the proposed control system is designed and simulated to be used as a global control system for MHPP, which may replace PID hydraulic turbine governors, and is able simultaneously to control the MHPP frequency and to manage the whole operation of the plant under nonlinear process conditions.

To design a fuzzy controller reliable and smart enough, the design has to rely not only on an accurate MHPP modeling, but also on an "expert knowledge base". The expert knowledge base comprises technical information on hydraulic turbine operation and control gathered from expert people who work in this field, reported and or published articles, field trials, simulation and predictions. It may also cover some hidden dynamics not modeled.

However, to take into account the nonlinear behavior of MHPP towards the load variations, PI controller's parameters should vary with the load variation and hence the resultant power supply would have the potential to be of higher quality. Fuzzy

Thus, the generated power would vary considerably. Therefore, undesirable situations might be occurred, where the generating unit would be no longer able to feed th consumer loads connected to the mini-grid. To remedy this possible situation, the proposed fuzzy supervisor, presented at the figure 4, is able either to disconnect or connect the less preferred departures, depending on the level of the available water.

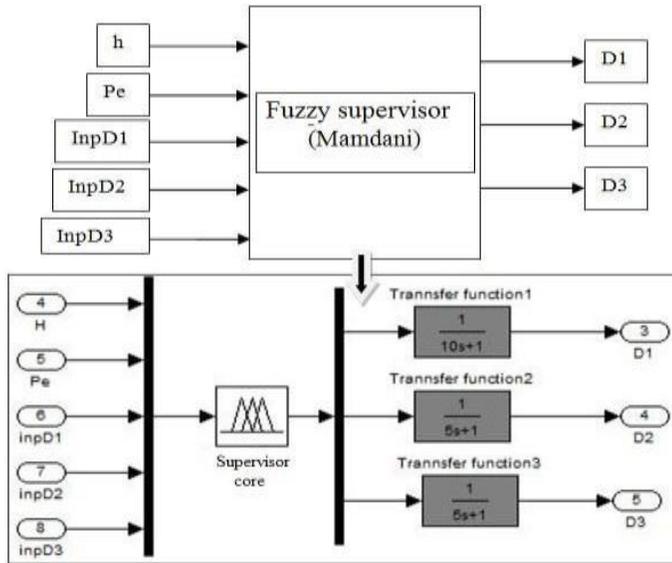


Figure 4: The proposed fuzzy supervisor.

The level of water "h" is divided into four sets (H1, H2, H3, H4) while the departures of the grid are three (D1, D2 and D3). D1 is the more preferential departure while D3 is the less preferential. This task, assured by the fuzzy supervisor, can be summarized by the following rules:

- if h is H1 then D1, D2, and D3 are connected.
- if h is H2 then D1 and D2: connected, D3: disconnected.
- if h is H3 then D1 connected, D2 and D3: disconnected.
- if h is H4 then D1, D2, and D3 are disconnected.

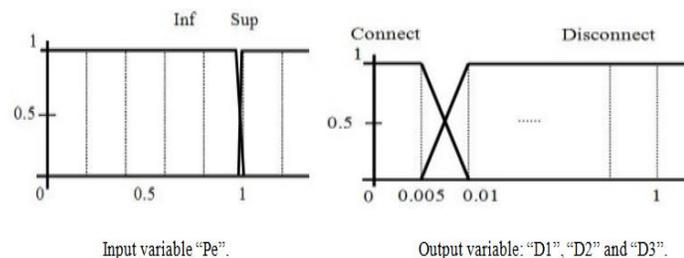
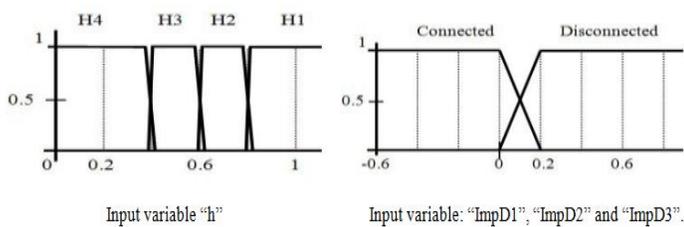
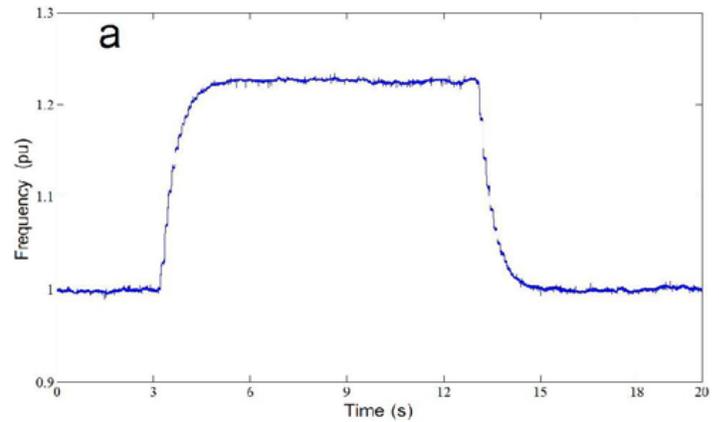
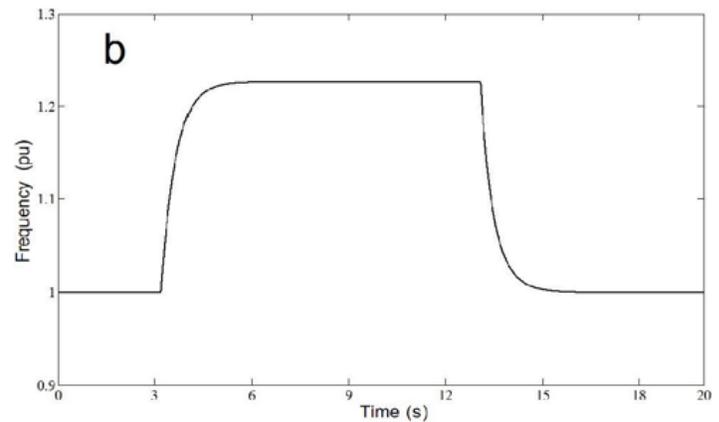


Figure 5: Fuzzy supervisor's membership functions.

Furthermore, the proposed fuzzy supervisor manages the electrical production between the three departures. The division of the mini-grid into different departures will be also used by the proposed supervisor to limit the consumed power "Pe", to make sure that it never exceeds the turbine power. Whenever very large overloads are caused by the users, where the load exceeds the produced power, the fuzzy supervisor disconnects the less preferential departures (D3) to avoid large drop of frequency. If the consumed power still exceeds the turbine power, the supervisor disconnects other less priority departure (D2) and so on. The fuzzy membership functions for the fuzzy supervisor input parameters (h, Pe, ImpD1, ImpD2 and ImpD3) and output parameters (D1, D2 and D3) are shown in figure 5.



(a) Experimental results



(b) Simulation results

V. CONCLUSION

Considering the situation in some countries where many villages still live without electricity, especially those in the mountains. Our work aimed to contribute to a cost effective Solution to improve the exploitation of MHPP. To insure better regulation of its frequency output and to use the available water more economically. In this paper, we propose a new control strategy based on the combination of a fuzzy controller and a fuzzy supervisor to ensure the best solution in terms of efficiency.

The proposed fuzzy controller is able to maintain MHPP frequency in spite of the load variations. In addition, it minimizes the waste of water by limiting the dissipated power on the ballast load. The fuzzy supervisor manages to use the available water based on consumer demand. Even for random and large load variations, the proposed control system keeps good dynamics as expected. Simulation results show the feasibility of the proposed fuzzy control system.

REFERENCES

- [1] I. H. G. M.Hanmandlu, Member and I. D.P.Kothari, Senior Member, "An advanced control scheme for micro hydropower plants," IEEE Trans. , 2006.
- [2] D. Shrestha and A. B. Rajbanshi, "An advanced control scheme for micro hydropower plants," Fifth International Conference on Power and Energy Systems, Kathmandu, Nepal, October 2013.
- [3] M. T. G. Ebruzbay, "Self-tuning fuzzy pi controlled system model for small hydro power plants," 10th International Conference on Clean Energy ICCE Famagusta, N. Cyprus, September 2010.
- [4] P. K. R. A. Priyabrata Adhikary, SusmitaKundu, "Fuzzy logic based user friendly Pico-hydro power generation for decentralized rural electrification," International Journal of Engineering Trends and Technology , 2013.
- [5] M. M. Umrao, Sanjeev Kumar and D. K. Chaturvedi, "Load frequency control methodologies for power system." 2nd International Conference on Power, Control and Embedded Systems, 2012.
- [6] T. G. Ebru6zbay Muhsin, "Load frequency control for small hydro power plants using adaptive fuzzy control," IEEE Trans. , 2010.
- [7] K. R. Neethu John, "An overview of load frequency control strategies: A literature survey," International Journal of Engineering Research Technology (IJERT) , 2012.
- [8] I. Hassan Bevrani, Senior Member and I. Takashi Hiyama, Senior Member, "On load-frequency regulation with time delays: Design and real-time implementation," IEEE Transactions On Energy Conversion , 2009.
- [9] I. Hassan Bevrani, Senior Member and P. R. Daneshmand, Comparison of Conventional PID Tuning of Sliding Mode Fuzzy Controller for BLDC Motor Drives. IEEE Trans., 2012.
- [10] M. R. Zohra Zidane, Mustapha AitLafkih, "Simulation studies of adaptive predictive control for small hydro power plant," Journal of Mechanical Engineering and Automation , 2012.

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Design and Analysis of Level Shifter in High Voltage Transmitter

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Abstract: A high voltage transmitter integrated circuit for ultrasound medical imaging is implemented using 90nm technology. The high voltage transmitter consists of level shifter and output drivers to increase the voltage, with reduced delay, that drives the capacitive micro-machined ultrasound transducer to produce acoustic signal in medical applications. The performance of various level shifters are compared. The level shifter generates 20V pulses from the input of 10V. The level shifter is designed using 90nm technology in HSPICE.

Key words: CMUT, Level shifter, CMOS.

I. INTRODUCTION

Ultra sonic imaging is an important modality for medical diagnosis. Compared with other imaging modalities, ultrasound is relatively low cost and harmless to human health and has decent resolution. Modern ultrasonic imaging systems are becoming increasingly complex and powerful, yet compact. The trend toward highly integrated ultrasonic imaging solutions to enable portable or even wearable ultrasound applications in hospital and at home. capacitive micro machined ultrasonic transducers recently emerged for better system integration cmut technology offers advantages such as improved bandwidth, ease of fabricating large arrays, and potential for integration with electronics. For the transmitter, high-voltage linear amplifiers are commonly used to drive the PZT loads to achieve a linearity and acceptable efficiency. In case of CMUT load, linear amplifiers are not optimum and degrades the overall power efficiency of the transmitter stage. High voltage pulser can be used instead of amplifiers so that the power dissipated while charging and discharging capacitance does not contribute to the acoustic output. The transmitter efficiency is defined as the ratio between the useful acoustic power and the total power dissipated. One of the main issues is the area-hungry HV transmitter in the interfacing analog front-end IC. The HV transmitter usually utilizes large-size HV double-diffused MOS (DMOS) transistors to generate HV output pulse signals to drive the CMUT to produce large acoustic pressure while maintaining the reliability to prevent possible device junction breakdown. In this brief, a highly integrated HV transmitter utilizing standard CMOS transistors targeted for ultrasound medical imaging in a highly integrated needle device for obstetrics and gynecology applications is presented [2]. In this alternate implementation highly-integrated, high-voltage pulsers quickly switch the transducer element to the appropriate programmable high-voltage supplies to generate the transmit waveform. To generate a simple bipolar transmit waveform, a transmit pulser alternately connects the element to a positive and negative transmit supply voltage controlled by the digital beamformer. More complex realizations allow connections to multiple supplies and ground in order to generate more complex multilevel waveforms with better characteristics. The slew rate and symmetry requirements for high-voltage pulsers have increased in recent years due to the popularity of second-harmonic imaging. Second-harmonic imaging takes advantage of the nonlinear acoustic properties of the human body. These nonlinearities tend to translate acoustic energy at f_0 to energy at $2f_0$. Reception of these second-harmonic signals has, for a variety of reasons, produced better image quality and is now widely used. A high-voltage (HV) transmitter integrated circuit for ultrasound medical imaging applications was implemented using 0.18- μm CMOS technology. The HV transmitter achieves high integration by only employing standard CMOS transistors in a stacked configuration with dynamic gate biasing circuit while successfully driving the capacitive micro machined ultrasound transducer device immersed in an oil environment without breakdown reliability issues. The HV transmitter including the output driver and the voltage level shifters generates over 10-Vp pulses at 1.25-MHz frequency.

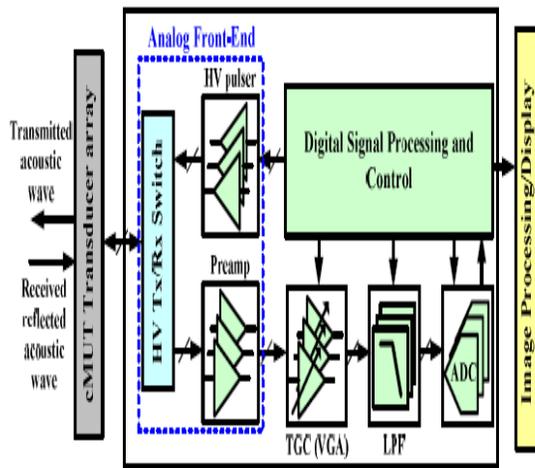


Fig1. Block diagram of ultrasound medical system

A fully integrated high-voltage (HV) front-end transducer for ultrasonic sensing applications. This includes a programmable HV dc–dc converter (HVDC), a drive amplifier, and a tuneable pulse generator. The HVDC is based on a multistage two-phase voltage doubler and static level up shifters. The drive amplifier is composed of a static level-up stage and a Class-D switching output stage. In this paper, a static level-up shifter (LUS) is used in each stage as a clock generator, in order to increase the voltage exponentially. By cascading voltage-doublers, the output voltage obtained.

Each stage consists of a voltage doubler circuit, a charge transfer circuit, a static LUS and a static level-up stage. The voltage doubler circuit is composed of cross-connected HVnMOS transistors and pumping capacitors. The charge transfer circuit is composed of a pair of HVpMOS transistors.

II. LITERATURE SURVEY

CMUT fabrication can be done using several processes such as wafer bonding, simple wafer bonding, LOCOS process, thick-buried oxide process, sacrificial release process and piston CMUT structure and process. These can be integrated with front end electronics to provide high voltage according to their applications. Transmitter pulsers and receive amplifiers are used. The advantages of integrating front end electronics with CMUT: Better utilization of large arrays and Improves receive sensitivity. Ultrasound is widely used as a diagnostic imaging modality in many clinical applications and has recently received increased attention and acceptance as a therapeutic tool.

A fully integrated high-voltage (HV) front-end transducer for ultrasonic sensing applications. This includes a programmable HV dc–dc converter (HVDC), a drive amplifier, and a tuneable pulse generator. The HVDC is based on a multistage two-phase voltage doubler and static level up shifters. The drive amplifier is composed of a static level-up stage and a Class-D switching output stage. In this paper, a static level-up shifter (LUS) is used in each stage as a clock generator, in order to increase the voltage exponentially. By cascading voltage-doublers [2], the output voltage obtained. Each stage consists of a voltage doubler circuit, a charge transfer circuit, a static LUS and a static level-up stage. The voltage doubler circuit is composed of cross-connected HVnMOS transistors and pumping capacitors. The charge transfer circuit is composed of a pair of HVpMOS transistors. Level shifter circuits are widely used as the bridges that connect low core voltage to high I/O interface voltage for interfacing logic and functional devices or circuits. A level shifter using bootstrapping technique has been reported [3]. Level-up shift aims at ultra low core voltage and wide range I/O voltage in high speed application. A New level-up shifter aimed at ultra low core voltage and wide range I/O voltage is designed using a 90nm CMOS process. Level shifter uses analog circuit techniques and standard zero-Vt NMOS transistor without adding extra mask or process step. No static power consumption and stable duty ratio make this level shifter suitable for wide I/O interface voltage applications in ultra deep sub-micron. These techniques work even 0.6V core voltage, 1.65~3.6V I/O voltage.

With scaling of Vt sub-threshold leakage power is increasing and expected to become significant part of total power consumption. In present work three new configurations of level shifters for low power application in 0.35µm technology have been presented. The proposed circuits utilize the merits of stacking technique with smaller leakage current and reduction in leakage power. Conventional level shifter has been improved by addition of three NMOS transistors, which shows total power consumption as compared to with existing circuit. Single supply level shifter has been modified with addition of two NMOS transistors that gives total power consumption. Contention mitigated level shifter (CMLS) with three additional transistors [3] shows total power consumption of 396.75pW. Three proposed circuit's shows better performance in terms of power consumption with a little conciliation in delay. Output level of 3.3V has been obtained with input pulse of 1.6V. Level Shifters are required between core circuits and I/O circuits interface where low voltage logic signals from chip core are shifted to high voltage level at which pad Ring is working. Since the level shifter circuit consumes power and has a considerable delay, how to optimize the performance to gain low power and small delay and how to minimize the number of level shifters are important in the voltage scaling technique. In paper [4], different types of level shifter are focused. Driven by the need to reduce power consumption and maintain high reliability in leading edge integrated circuits, the nominal operating supply voltage for these devices is falling steadily.

A voltage level conversion at the input of a particular voltage domain will require all the supply voltages of signals coming to this voltage domain from other voltage domains whose voltage level is lower than its own voltage level. This may result in routing congestion, excessive area utilization and also may pose restrictions on module placement. The routing of additional supply voltages can be avoided by sending a signal (which is going to a different voltage domain) in both polarities. However, this strategy would require one additional wire per signal and hence could lead to routing congestion. This problem is further aggravated by the increasing number of voltage domains in SoCs and multi-core architectures. Additional complexity is encountered if the voltage domains have variable voltages[5], which requires a domain to receive the supply voltages of every other domain.

III. BASIC LEVEL SHIFTER

3.1 OVERVIEW OF LEVEL SHIFTER

The level shifter is used to convert high voltage levels to low voltage level or vice-versa. Bi-directional level shifters and translator circuits are used to interface between applications with different supply voltage and input-output voltage levels. Level shifter are the bridges that transform from low core voltage to high voltage. There are different types of level shifter such as single supply level shifter and dual supply level shifter. The single supply level shifter allows communication between modules without adding any extra supply pin, it has advantages over dual supply level shifter in terms of pin count, congestion in routing and overall cost of the system.

3.2 BASIC OPERATION OF LEVEL SHIFTER

The schematic of level shifter is shown below. Conventional level shifter using 10 transistor with low voltage supply V_{DDL} and high voltage supply V_{DDH} . The conventional level shifters have disadvantages of delay variation due to different current driving capabilities of transistors, large power consumption and failure at low supply core voltage V_{DDL} .

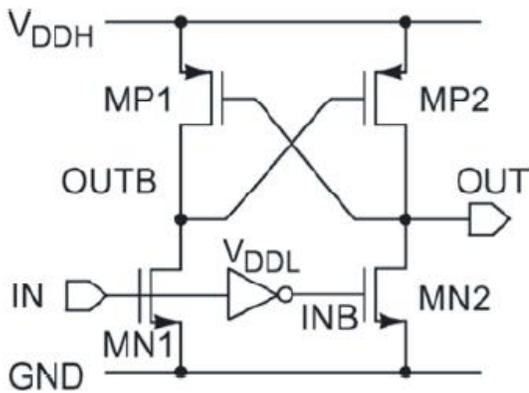


Fig 2. Block diagram of level shifter

3.3 SINGLE SUPPLY LEVEL SHIFTER

The needs for two voltage supply limit the physical placement of such level shifter to the boundary of high and low voltage designs which restricts the physical design flexibility. To address this, a novel level shifter which requires only one supply V_{DDH} to convert the low voltage signal to the higher voltage has been proposed. It makes the placement much more flexible in the entire high voltage regions. The threshold drop (V_{tn}) across the NMOS $MN1$ provides a virtual V_{DDL} to the input inverter ($MP2, MN2$). The output stage is a half latch which pulls up the input of the inverter ($MP3, MN3$) to V_{DDH} in order to avoid leakage. When input signal (IN) is HIGH, the voltage at node T1 is ($V_{DDH} - V_{tn}$) with the purpose of reducing gate to source voltage of $MP2$ to turn it OFF. When the input signal (IN) is LOW, the feedback transistor $MP4$ turns ON so that charges node T1 to V_{DDH} to compensate the threshold drop. Hence the supply voltage of inverter ($MP2 - MN2$) is dynamically switched between $V_{DDH} - V_{tn}$ and V_{DDH} depending upon the input state.

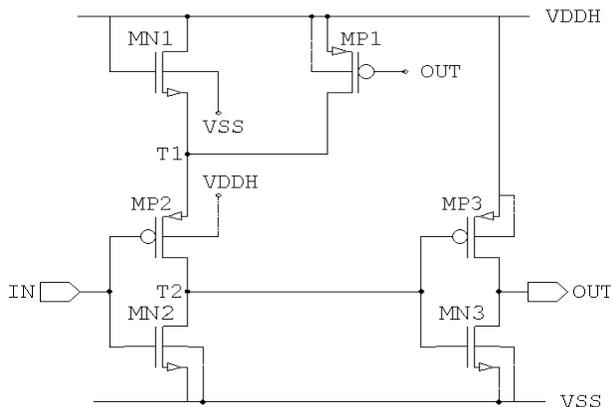


Fig.3 Schematic of single supply level shifter

3.4 EXISTING LEVEL SHIFTER

A high-voltage (HV) transmitter integrated circuit for ultrasound medical imaging applications was implemented using 180nm CMOS technology. The HV transmitter achieves high integration by only employing standard CMOS transistors in a stacked configuration with dynamic gate biasing circuit while successfully driving the capacitive micro machined ultrasound transducer device. The HV transmitter including the output driver and the voltage level shifters generates over 10-V_p-p pulses

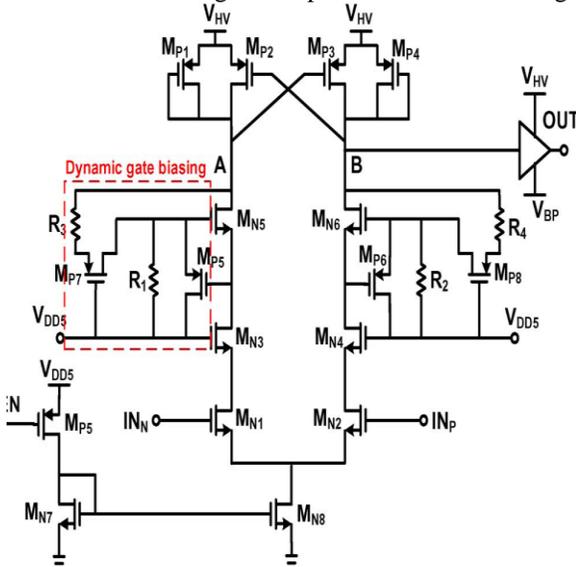


Fig.4 Schematic of Existing level shifter in HV transmitter

3.5 MODIFIED LEVEL SHIFTER

The level shifters can be designed to convert low voltage (5V) to high voltage (20V). We propose a low-power single-input level shifter as shown in Fig.5. To reduce power consumption, there is no diode-connected TFT in the circuit and the pull-up TFTs and the pull-down TFTs are never turned on simultaneously. In addition, only a single input signal is required by this circuit, which simplifies the interface design considerably. This design minimizes the leakage. Reliability is high compared to existing method. Delay can be reduced by using HSPICE tool(90nm)

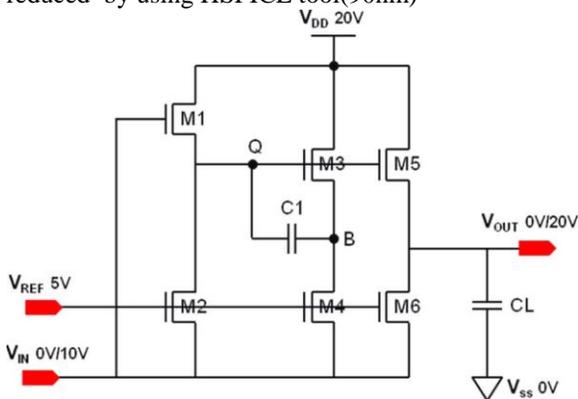
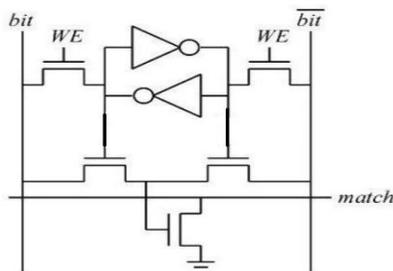


Fig.5 Modified Single Supply Level Shifter

4 SIMULATION RESULTS



Effect of Mental Imagery Training & Tratak Kriya on Stopping of Penalty Strokes in Hockey

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Abstract- This study was determined to identify the effects of Mental Imagery Training & Tratak Kriya training on stopping the penalty stroke by goalkeeper in hockey. A total of 150 male hockey players from Delhi, whose average of stopping the penalty stroke ranges from 3-5 out of 10 penalty strokes in 2 trials were selected. The subjects were further randomly divided into three groups namely MIT (Mental Imagery Training Group) N = 50, TK (Tratak Kriya Group) N = 50 and CG (Control Group) N = 50. All the 3 groups did regular hockey training; followed by 20 minutes of mental imagery training (by MIT Group only) and tratak kriya training (by TK group only) for 3 days in a week and for 8 weeks respectively while Control group received the hockey training session only. The results of the study showed that all the three groups had significantly improved in the rate of stopping the penalty stroke as the paired t' value obtained for MIT, TK & CG were found to be 18.406, 14.984 & 4.598 at $p \leq 0.05$ respectively. The highest percentage of improvement was seen in MIT group followed by TK group and CG as the value obtained were 63.59%, 50.00% and 18.27% respectively. The LSD post hoc analysis confirms that the percentage improvement differs significantly between the groups as the mean differences obtained for CG- MIT, CG- TK and MIT- TK were 1.720, 1.220 and 0.500 at $p \leq 0.05$. Therefore it was concluded that mental imagery training and tratak kriya training were proved to be effective means for the improvement in stopping the penalty stroke in hockey and hence it may be used as a part of cognitive training for the making an hockey goalkeeper player.

Index Terms- Mental Imagery Training, Tratak Kriya Training, Penalty Stroke, Goal Keeper, hockey.

I. INTRODUCTION

In recent years the use of cognitive strategies to facilitate optimum performance has gained increased acceptance. Cognitive strategies teach the athletes psychological skills that they can employ in their mental preparation for the competition. In addition to focusing on alleviating the harmful effects of anxiety and arousal, these cognitive strategies can also be used to enhance motivation and self confidence and to improve performance consistency (D. A. Wuest and Charles A. Bucher, 1994).

Mental practice devotes the cognitive rehearsal of an action without overt performance of the physical performance of the physical movement involved (Oriskell, copper and Moran, 1994). It has also been defined by Richardson (1967) as "The Symbolic Rehearsal of a Physical Activity in the absence of any Gross Muscular Movements". The importance of mental factors in sport was also underlined by Mike Marsh, the American Champion Sprinter, who claimed that the ability to win comes "90% from the mind and 10% from the body" (Chadban, 1995)

Besides practicing mental rehearsal the athletes may also use Tratak Kriya another form of intervention technique to enhance performance. Tratak or steady gazing is an excellent concentration exercise. It involves alternately gazing at an object or a point without blinking, then closing eyes and visualising the object in mind's eye. The practice steadies the wandering mind and concentrates attention, leading to focus with pin point accuracy, whenever the eyes go, and the mind follows. So that when you fix your gaze on a single point, the mind too becomes one pointed. Tratak also improves the eye sight and stimulus the brain via the optic nerve.

In recent years the study of mental imagery has sparked the interest of many scholars in the field of sport psychology. It is now recognized that, in general, imagery is used daily by most people (Barr & Hall, 1992). In addition, many athletes and coaches have realized the important role that imagery plays (Salmon, Hall, & Haslam, 1994) and have incorporated its use in into their training regimens (Martin, Moritz, & Hall, 1999).

Mental imagery can be defined as the process that occurs when we recreate experiences in the mind using information that is stored in the memory. Dreaming is an unstructured form of imagery, but the type of imagery we're interested in here is structured imagery, where the athlete uses his or her imagination in a controlled fashion to recreate specific images. There are a number of different ways of visualizing images or experiences recreated in the mind (e.g. you can visualize yourself feeling movement internally, or externally as a spectator) but research shows that the more able an athlete is to control his or her imagined movements, the greater the potential performance enhancement (Advances in Sport Psychology (2nd ed), Champaign IL: Human Kinetics, 2002:405-439)

These aspects of the mental imagery and tratak kriya process need to be constantly practiced in order to elicit results. Even though individual differences exist in mental imagery ability, generally, better imagery control correlates to better performance in the motor skill (Annett, 1995). Another approach is to combine the techniques of mental imagery with physical practice of the intended skill

labelled visual-motor behaviour rehearsal, which in fact till date, had not been used or applied in the field of hockey hence the study has been undertaken.

II. OBJECTIVES AND HYPOTHESIS

The study was conducted with the objectives to determine the effect of Mental Imagery Training and Tratak Kriya on stopping the penalty stroke in hockey. The sub-objective of the study was to determine which way of cognitive training has better results for the improvement in stopping the penalty stroke in hockey. After thoroughly going through the literature it was hypothesized that there would be significant effect of both Mental Imagery Training and Tratak Kriya on stopping the penalty stroke conversion in hockey, while there would no significant difference between the both Mental Imagery Training and Tratak Kriya on stopping the penalty stroke conversion in hockey.

III. PROCEDURE AND METHODOLOGY

The study was conducted on 150 male hockey players from Delhi, whose average of stopping the penalty stroke ranges from 3-5 out of 10 penalty strokes in 2 trials. The selected subjects were further randomly divided into three groups namely MIT (Mental Imagery Training Group) N = 50, TK (Tratak Kriya Group) N = 50 and CG (Control Group) N = 50. All the 3 groups did regular hockey training; followed by 20 minutes of mental imagery training (by MIT Group only) and tratak kriya training (by TK group only) for 3 days in a week and for 8 weeks respectively while Control group received the hockey training session only. Throughout the test, penalty strokes were taken alternately by two penalty strokes specialists (N=2) i.e. 5 strokes by each player. (2×5=10). Standard penalty stroke procedure was used as the criterion measure. All the three groups did hockey training for 3 days a week and for 8 weeks, while the MIT group and TK group did an extra 20 minutes session of Mental Imagery Training and Tratak Kriya respectively. To study the effect of MIT and TK on stopping of Penalty Stroke in hockey descriptive statistics (Mean & SD) and paired 't' test were employed. While One Way ANOVA was used to determine the significant difference between the groups. The MIT and TK guidelines as explained below:

Mental Imagery Training

1. Get yourself into a comfortable position, make sure you will be warm and make sure you won't be disturbed.
2. Turn off your phone and loosen any tight clothing.
3. Now focus on your breathing.
4. Breathe easily and slowly.
5. As you breathe in allow your stomach to rise and extend. As you breathe out let your whole body relaxes. Breathe in-feel your stomach rise. Breathe out-relax. Breathe in-feel your stomach rise. Breathe out-relax. (Do 3 times). For the next 10 breaths, each time you breathe in feel your stomach rise-each time you breathe out think to yourself...relax...relax...relax (pause 10 breaths).
6. Let yourself relax. Feel the relaxation speed through your body. Breathe easily and slowly. Become aware of your feet. Move your toes slightly. Let them relax. Now think into your lower legs. Let your calf muscles totally relax. Think into your upper legs. Let them totally relax. Feel your legs sink into a completely relaxed state. Relax your behind (pause).
7. Focus on the muscles in your lower back. Think relaxation into those muscles. Feel that relaxation spread into your upper back. Feel your whole body sink into a deep state of relaxation. Now focus on your fingers. Feel them tingle slightly. Think warmth into your fingers. Let them totally relax. Relax your forearms, your upper arms, and your shoulders. Totally relax. Relax your neck (pause) and your jaw. Feel your head sink into a totally relaxed and comfortable position.
8. Scan your body for possible areas of tightness and relax those areas. Feel your entire body encircled with soothing warmth and relaxation. Enjoy this wonderful state of complete relaxation. (Pause 1 minute).
9. Feel yourself sink deeper into a calm and wonderful state of complete relaxation.

Tratak Kriya

Purpose:The purpose of the test was to develop the concentration ability of the subjects.

Materials Required:Hockey Ball, Stop Watch and Table (18" to 20" high)

Administration of the test:

1. The subjects were asked to sit firmly in one of the meditation posture with the head, neck and backbone remained, in a straight vertical line and motionless.
2. The subjects were instructed to breathe slowly and smoothly.
3. A hockey ball was placed on the 18" table level, about three feet away from the subjects.
4. The subjects were asked to look steadily at the centre of the hockey ball (the black spot marked on the ball) and concentrate on it.
5. The subjects were informed not to stare or gaze vacantly, instead of just looking steadily without straining their eyes.
6. **Note:** The subjects were made to gaze in a calm, relaxed manner, somewhat as they are looking their faces in the mirror.
7. After about a minute or when eyes become dry and painful, the subjects were asked to close their eyes and keep their inner gaze steady and visualized at the centre of the hockey ball (black spot) at aAjna or Anahata chakra or in the subject's mind eyes.

8. When the after image is vanished, the subjects were asked to open their eyes and the same process was administered, if possible.

IV. RESULTS

Table- 1 Pre-test and Post- Test Scores of Stopping of Penalty Stroke in Hockey

Group		N	Mean	% Improvement	t	Sig (2- tailed)
Mental Imagery Training	Pre test	50	3.90±0.76			
	Post test	50	6.38±1.19	63.59%	18.406	0.001
Tratak Kriya	Pre test	50	3.92±0.72			
	Post test	50	5.88±1.33	50.00%	14.984	0.001
Control Group	Pre test	50	3.94±0.71			
	Post test	50	4.66±1.02	18.27%	4.598	0.001

Note: N= Sample Size

Table-1 clearly reveals all the three groups i.e. mental imagery training group, tratak kriya group and control group had significantly improved over the period of 8 weeks. While among the three groups the highest improvement was seen in the mental imagery training group followed by tratak kriya group and control group as the % improvement was found to be 63.59%, 50.00% and 18.27% respectively.

Fig 1: Effect of Mental Imagery training and Tratak Kriya on Stopping of Penalty Stroke in hockey

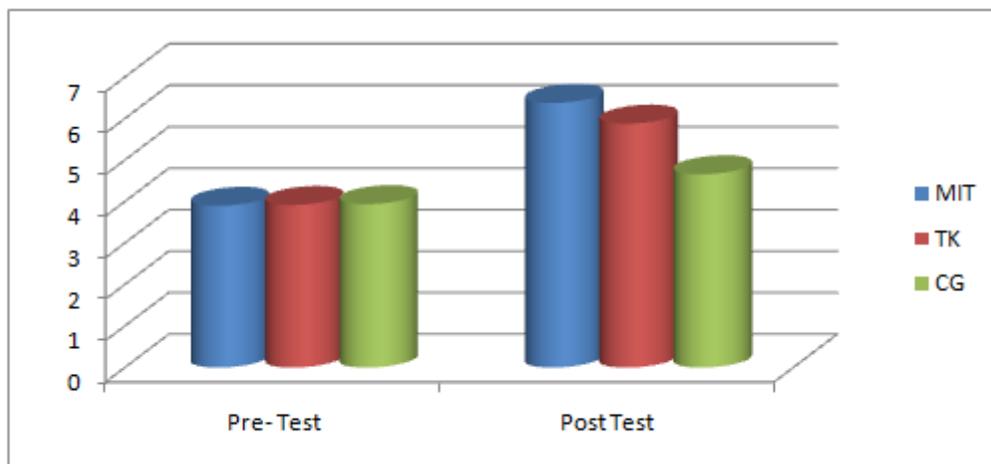


Table No. 2 One Way Analysis of the Post Scores of Stopping of Penalty Strokes in hockey

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	78.28	2	39.14	27.62	.000
Within Groups	208.28	147	1.41		
Total	286.56	149			

Table- 2 indicates the values of one way analysis of variance, which shows that there was a significant difference in the selected group's i. e. Mental Imagery training group, Tratak Kriya Group & Control Group as the f² value was found to be 27.624 at p ≤ 0.05.

Table- 3 Post Hoc Analysis of the Post Scores of Stopping of Penalty Strokes in hockey

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig.
Control Group	MIT Group	-1.720*	0.238	0.000
	TK Group	-1.220*	0.238	0.000
TK Group	MIT Group	-0.500*	0.238	0.037

*. The mean difference is significant at the 0.05 level.

Table- 3 clearly reveals the LSD post hoc values of the post scores of stopping of penalty strokes in hockey showing that all the all the three groups were significantly differs after receiving the mental imagery training and tratak kriya.

V. CONCLUSION

The study concludes that cognitive trainings like mental imagery training and tratak kriya are very effective for stopping the penalty stroke in hockey and hence it can prove to be a use full training aspect for the making of a goal keeper in hockey.

REFERENCES

- [1] K. Martin, R. C. Hall, (1995). Using Mental Imagery to Enhance Intrinsic Motivation Journal of Sport and Exercise Psychology, 17(1), 54-69
- [2] Pavio, (1985). Cognitive and Motivational Functions of Imagery in Human Performance, Journal of Applied Sports Science, 10, 22-28.
- [3] K. Porter, J. Foster, Visual Athletics, Dubuque, Iowa: Wm. C. Publishers, 1990.
- [4] L. D. Feltz, & M. D. Landers, (1983), The Effects of Mental Practice on Motor Skill Learning and Performance: A Meta-analysis. Journal of Sport Psychology, 5, 25-57.
- [5] R. Roure, et al. (1998). Autonomic Nervous System Responses Correlate with Mental Rehearsal in Volleyball Training, Journal of Applied Physiology, 78(2), 99-108.
- [6] R. A. Isaac, (1992). Mental Practice- Does it Work in the Field? The Sport Psychologist, 6, 192-198.
- [7] R. Suinn, Psychological Techniques for Individual Performance. New York, New York: Macmillan, 1990, p 492-506.
- [8] S. Murphy, (1990), Models of Imagery in Sport Psychology: A Review. Journal of Mental Imagery, 14 (3&4), 153-172.
- [9] T. Orlick, L. Zitzelsberger, Z. LI-Wei, & M. Qi - wei, (1992), The Effect of Mental-Imagery Training on Performance Enhancement With 7-10-Year-Old Children, The Sports Psychologist, 6, 230-241.

Some Modified Unbiased Estimators of Population Mean

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ABSTRACT

The use of supplementary information on auxiliary variables in sample surveys was extensively discussed by Cochran and Jessen. In their work they showed that regression estimator is superior to the other estimators (viz. ratio and mean per unit estimators etc.). This paper proposes a new kind of estimator based on appropriate weighing of the sample means of the main and the auxiliary variables. It is shown that the proposed estimator is more efficient when compared with the regression, ratio and the mean per unit estimator under certain restrictions on the correlation coefficient between main and the auxiliary variables.

I. INTRODUCTION

Let a simple random sample of size n be drawn without replacement from a finite population of N units and the variables observed are Y and X . The variable Y is the variable of interest so-called main variable and the variable X is called the auxiliary variable. The population means of the variables Y and X are \bar{Y} and \bar{X} respectively, where \bar{X} is assumed to be known. Let \bar{y} and \bar{x} be the unbiased sample estimators of \bar{Y} and \bar{X} . Let ρ be the correlation coefficient between the variables Y and X , given by the relation

$$\rho = \frac{S_{XY}}{S_X S_Y} \quad (2.1)$$

where

S_X^2 = Variance of X ,

S_Y^2 = Variance of Y ,

S_{XY} = Covariance of X and Y .

The usual estimators of the simple, ratio, and the regression for estimating the mean of the main variable Y with the help of auxiliary variable are given by Cochran and Jessen as follows:

Simple: $\bar{y} = [(1) \cdot \bar{y} + 0 \cdot (\bar{X} - \bar{x})]$ (2.2)

Ratio: $\bar{y}_{rat} = [(0) \cdot \bar{y} + \frac{\bar{y}}{\bar{X}} \cdot (\bar{X} - 0)]$ (2.3)

Regression: $\bar{y}_{reg} = [(1) \cdot \bar{y} + (b) \cdot (\bar{X} - \bar{x})]$ (2.4)

where 0 and 1 are the weights, and

$$b = \frac{S_{XY}}{S_X^2} \quad (2.1.5)$$

II. GENERALIZED ESTIMATORS

An estimator denoted by \bar{y}_{gen} is proposed:

$$\bar{y}_{gen} = W_1(\bar{y}) + W_2(\text{ratio}) \quad (3.1)$$

$$\bar{y}_{gen} = W_1(\bar{y}) + W_2\left(\frac{\bar{y}}{\bar{X}}\bar{X}\right)$$

where W_1 and W_2 are constants such that

$$W_1 + W_2 = 1 \tag{3.2}$$

$$E(\bar{y}_{gen}) = E(W_1(\bar{y}) + W_2(\frac{\bar{y}}{R}\bar{X}))$$

$$E(\bar{y}_{gen}) = (W_1 + W_2)\bar{Y} \tag{3.3}$$

$$\begin{aligned} \text{Var}(\bar{y}_{gen}) &= E[(\bar{y}_{gen} - E(\bar{y}_{gen}))^2] \\ &= E[W_1(\bar{y}) + W_2(\frac{\bar{y}}{R}\bar{X}) - (W_1 + W_2)\bar{Y}]^2 \\ &= E[W_1(\bar{y} - \bar{Y}) + W_2(\frac{\bar{y}}{R}\bar{X} - \bar{Y})]^2 \\ &= E[W_1^2(\bar{y} - \bar{Y})^2 + W_2^2(\frac{\bar{y}}{R}\bar{X} - \bar{Y})^2 + 2W_1W_2(\bar{y} - \bar{Y})(\frac{\bar{y}}{R}\bar{X} - \bar{Y})] \\ &= E[W_1^2(\bar{y} - \bar{Y})^2 + W_2^2(\frac{\bar{y}}{R}\bar{X} - \bar{Y})^2 + 2W_1W_2(\bar{y} - \bar{Y})(\frac{\bar{y}}{R}\bar{X} - \bar{Y})] \\ &= W_1^2 E(\bar{y} - \bar{Y})^2 + W_2^2 E(\frac{\bar{y}}{R}\bar{X} - \bar{Y})^2 + 2W_1W_2 E(\bar{y} - \bar{Y})(\frac{\bar{y}}{R}\bar{X} - \bar{Y}) \\ &= W_1^2 \text{var}(\bar{Y}) + W_2^2 \text{var}(\frac{\bar{y}}{R}\bar{X}) + 2W_1W_2 E(\bar{y} - \bar{Y})(\frac{\bar{y}}{R}\bar{X} - \bar{Y}) \\ &= W_1^2 \text{var}(\bar{Y}) + W_2^2 \text{var}(\frac{\bar{y}}{R}\bar{X}) + 2W_1W_2 E[\frac{\bar{y}}{R}\bar{X}(\bar{y} - \bar{Y}) - \bar{Y}(\bar{y} - \bar{Y})] \\ &= W_1^2 \text{var}(\bar{Y}) + W_2^2 \text{var}(\frac{\bar{y}}{R}\bar{X}) + 2W_1W_2 \bar{X} \text{cov}(\bar{R}, \bar{Y}) \\ &= \frac{(1-f)}{n} (W_1 + W_2)^2 S_y^2 - 2R\rho S_x S_y W_2 (W_1 + W_2) + W_2^2 S_y^2 R^2 \end{aligned}$$

$$\text{Var}(\bar{y}_{gen}) = \frac{(1-f)}{n} (S_y^2 - 2R\rho S_x S_y W_2 + W_2^2 S_y^2 R^2) \tag{3.4}$$

where $f = \frac{n}{N}$

The constants W_1 and W_2 are chosen such that the variance of the proposed estimator is minimum. The following theorem obtains the value of W_1 and W_2

This variance of the proposed estimator given by equation (2.2.4) is minimum if

$$- 2R\rho S_x S_y + 2W_2 S_y^2 R^2 = 0$$

or if $W_2 = \frac{\rho}{R} \left(\frac{S_x}{S_y}\right)$ (3.5)

and $W_1 = (1 - W_2)$ (3.6)

Thus, the **minimum value** of the proposed estimator is given by

$$\text{Var}(\bar{y}_{gen}) = \frac{(1-f)}{n} (S_y^2 - \rho^2 S_x^2)$$

III. COMPARISON

To Compare the efficiencies of various estimators, the following variances of the mean per unit, ratio and regression estimators are required

$$\text{Simple: } \text{var}(\bar{y}) = \frac{(1-f)}{n} (S_y^2) \tag{4.1}$$

$$\text{Ratio: } \text{var}(\bar{y}_{rat}) = \frac{(1-f)}{n} (S_y^2 + R^2 S_x^2 - 2 \rho R S_y S_x) \tag{4.2}$$

$$\text{Regression: } \text{var}(\bar{y}_{reg}) = \frac{(1-f)}{n} (1 - \rho^2) S_y^2 \tag{4.3}$$

Theorem 4.1: The proposed estimator is more efficient than the mean per unit estimator if

$$\text{Var}(\bar{y}_{gen}) < \text{var}(\bar{y}) \tag{4.4}$$

This implies

$$\frac{(1-f)}{n} (S_y^2 - \rho^2 S_x^2) < \frac{(1-f)}{n} (S_y^2)$$

$$(S_y^2 - \rho^2 S_x^2) < S_y^2$$

$$\text{or } S_{xy} > 0 \tag{4.5}$$

Hence the proposed estimator is more efficient than the mean per unit estimator if $S_{xy} > 0$

Theorem 4.2: The proposed estimator is more efficient than the regression estimator if

$$\text{Var}(\bar{y}_{gen}) < \text{var}(\bar{y}_{reg}) \tag{4.6}$$

This implies

$$\frac{(1-f)}{n} (S_y^2 - \rho^2 S_x^2) < \frac{(1-f)}{n} (1 - \rho^2) S_y^2 \tag{4.7}$$

$$S_y^2 - \rho^2 S_x^2 < (S_y^2 - \rho^2 S_y^2)$$

$$\text{or } S_x > S_y \tag{4.8}$$

Hence the proposed estimator is more efficient than the regression estimator if $S_x > S_y$

The equation (4.7) clearly suggests that if $S_x = S_y$ then the proposed estimator becomes the regression estimator.

IV. CONSIDERING ANOTHER ESTIMATOR

Considering the estimator as:

$$\bar{y}_{reg} = W_1 (\bar{y}) + W_2 (\text{regression}) \tag{5.1}$$

$$\bar{y}_{reg} = W_1 (\bar{y}) + W_2 (\bar{y} + b(\bar{X} - \bar{x}))$$

where W_1 and W_2 are constants such that

$$W_1 + W_2 = 1 \tag{5.2}$$

Also we consider the estimator based on paired observations as follows:

$$\bar{y}_{mg} = \bar{y} + W_1 (\bar{y} - \lambda_1 \bar{x}) \tag{5.3}$$

$$\bar{y}_{mm} = \bar{y} + W_2 (\bar{y} - \alpha_0 - \beta_0 \bar{x}) \tag{5.4}$$

$$\bar{y}_{sg} = \bar{y} + W_1 (\bar{x} - \lambda) \tag{5.5}$$

where $W_1, W_2, \alpha_0, \beta_0, \lambda_1$ are constants with no restrictions.

$$E(\bar{y}_{reg}) = E [W_1(\bar{y}) + W_2 (\bar{y} + b(\bar{X} - \bar{x}))]$$

$$E(\bar{y}_{reg}) = (W_1 + W_2) \bar{Y} = \bar{Y} \tag{5.6}$$

$$E(\bar{y}_{mg}) = E [\bar{y} + W_1 (\bar{y} - \lambda_1 \bar{x})]$$

$$= \bar{Y} + W_1 (\bar{Y} - \lambda_1 \bar{X}) \tag{5.7}$$

$$E(\bar{y}_{mm}) = E [\bar{y} + W_2 (\bar{y} - \alpha_0 - \beta_0 \bar{x})]$$

$$= \bar{Y} + W_2 (\bar{Y} - \alpha_0 - \beta_0 \bar{X}) \tag{5.8}$$

$$E(\bar{y}_{sg}) = E [\bar{y} + W_1 (\bar{x} - \lambda)]$$

$$= \bar{Y} + W_1 (\bar{X} - \lambda) \tag{5.9}$$

$$\text{Var}(\bar{y}_{reg}) = E[(W_1 + W_2)\bar{y} + W_2 b(\bar{X} - \bar{x}) - (W_1 + W_2)\bar{Y}]^2$$

$$= E[(\bar{y} - \bar{Y}) + W_2 b(\bar{X} - \bar{x})]^2$$

$$= \text{var}(\bar{y}) + W_2^2 b^2 \text{var}(\bar{x}) - 2W_2 b E(\bar{x} - \bar{X})(\bar{y} - \bar{Y})]$$

$$= \text{var}(\bar{Y}) + W_2^2 b^2 \text{var}(\bar{x}) - 2W_2 b \text{cov}(\bar{x}, \bar{y})$$

$$\text{Var}(\bar{y}_{reg}) = \frac{(1-f)}{n} (S_y^2 - 2W_2 b \rho S_x S_y + W_2^2 S_x^2 b^2) \tag{5.10}$$

where $f = \frac{n}{N}$

$$\text{Var}(\bar{y}_{mg}) = \frac{(1-f)}{n} (S_y^2 + W_1^2 S_y^2 + \lambda_1^2 S_x^2 + 2W_1 S_y^2 - 2\lambda_1 W_1 \rho S_x S_y - 2\lambda_1 \rho S_x S_y)$$

$$\tag{5.11}$$

$$\text{Var}(\bar{y}_{mm}) = \frac{(1-f)}{n} (S_y^2 + W_2^2 S_y^2 + W_2^2 \beta_0^2 S_x^2 + 2W_2 S_y^2 - 2W_2^2 \beta_0 \rho S_x S_y - 2\beta_0 W_2 \rho S_x S_y)$$

$$\tag{5.12}$$

$$\text{Var}(\bar{y}_{sg}) = \frac{(1-f)}{n} (S_y^2 + W_1^2 S_x^2 + 2W_1 \rho S_x S_y) \tag{5.13}$$

The constants W_1 and W_2 are chosen such that the variance of the proposed estimator is minimum. The following theorem obtains the value of W_1 and W_2

This variance of the proposed estimator \bar{y}_{reg} given by equation (5.10) is **minimum** if

$$2W_2 S_x^2 b^2 - 2\rho b S_x S_y = 0$$

or if $W_2 = \frac{\rho}{b} \left(\frac{S_y}{S_x} \right)$ (5.14)

and $W_1 = (1 - W_2)$ (5.15)

Thus, the minimum value of the estimator \bar{y}_{reg} is given by

$$\text{Var}(\bar{y}_{reg}) = \frac{(1-f)}{n} (1 - \rho^2) S_y^2 \text{ which is same as the variance of the regression estimator.}$$

To find the **minimum variance of the proposed estimator** \bar{y}_{mg} given by equation (5.11) we differentiate the equation w.r.t. W_1 and equate it to zero. Thus we get

$$W_1 S_y + S_y = \lambda_1 \rho S_x$$

Or $W_1 = \left(\frac{\lambda_1 \rho S_x - S_y}{S_y} \right)$ (5.16)

Thus, the minimum value of the estimator \bar{y}_{mg} is obtained by substituting $W_1 = \left(\frac{\lambda_1 \rho S_x - S_y}{S_y} \right)$ in equation (2.4.11) and we get the minimum value as

$$\text{Var}(\bar{y}_{mg}) = \frac{(1-f)}{n} (S_y^2 - \lambda_1^2 \rho^2 S_x^2 + \lambda_1^2 S_x^2) \text{ (5.17)}$$

Also the minimum value of the estimator \bar{y}_{mg} is obtained if we differentiate the equation w.r.t. λ_1 and solving for λ_1

$$\lambda_1 = (1 + W_1) \left(\frac{\rho S_y}{S_x} \right)$$

and the minimum variance as

$$\text{Var}(\bar{y}_{mg}) = \frac{(1-f)}{n} (1 - \rho^2) (1 + W_1)^2 \text{ (5.18)}$$

Similarly the minimum variance of the estimator \bar{y}_{sg} is given by substituting

$$W_1 = -\frac{\rho S_y}{S_x} \text{ in equation (5.13)}$$

And we get the minimum variance of \bar{y}_{sg} as

$$\text{Var}(\bar{y}_{sg}) = \frac{(1-f)}{n} (1 - \rho^2) S_y^2 \text{ which is same as the variance of the regression estimator.}$$

V. COMPARISON

6.1: The proposed estimator \bar{y}_{reg} is more efficient than the mean per unit estimator if

$$\text{Var}(\bar{y}_{reg}) < \text{var}(\bar{y}) \text{ (6.1)}$$

This implies

$$\frac{(1-f)}{n} (1 - \rho^2) S_y^2 < \frac{(1-f)}{n} (S_y^2)$$

$$(1 - \rho^2) < 0$$

$$i.e \quad \rho^2 > 1$$

$$or \quad \rho > \pm 1 \tag{6.2}$$

Hence the proposed estimator is more efficient than the mean per unit estimator if

$$\rho > \pm 1$$

6.2: The proposed estimator \bar{y}_{mg} is more efficient than the mean per unit estimator if

$$Var(\bar{y}_{mg}) < var(\bar{y}) \tag{6.3}$$

This implies

$$\frac{(1-f)}{n} (S_y^2 + W_1^2 S_y^2 + \lambda_1^2 S_x^2 + 2W_1 S_y^2 - 2\lambda_1 W_1 \rho S_x S_y - 2\lambda_1 \rho S_x S_y) < \frac{(1-f)}{n} (S_y^2)$$

Hence the proposed estimator is more efficient than the mean per unit estimator if

$$\rho > \frac{(W_1^2 S_y^2 + 2W_1 S_y^2 + \lambda_1^2 S_x^2)}{2\lambda_1 \rho S_x S_y (1+W_1)}$$

$$\tag{6.4}$$

6.3. The proposed estimator \bar{y}_{mm} is more efficient than the mean per unit estimator if

$$Var(\bar{y}_{mm}) < var(\bar{y}) \tag{6.5}$$

This implies

$$\frac{(1-f)}{n} (S_y^2 + W_2^2 S_y^2 + W_2^2 \beta_0^2 S_x^2 + 2W_2 S_y^2 - 2W_2^2 \beta_0 \rho S_x S_y - 2\beta_0 W_2 \rho S_x S_y) < \frac{(1-f)}{n} (S_y^2)$$

$$W_2 < \frac{2(\beta_0 \rho S_x S_y - S_y^2)}{(S_y^2 + \beta_0^2 S_x^2 - 2\beta_0 \rho S_x S_y)} \tag{6.6}$$

Hence the proposed estimator is more efficient than the mean per unit estimator if

$$W_2 < \frac{2(\beta_0 \rho S_x S_y - S_y^2)}{(S_y^2 + \beta_0^2 S_x^2 - 2\beta_0 \rho S_x S_y)}$$

$$\tag{6.7}$$

6.4. The proposed estimator \bar{y}_{sg} is more efficient than the mean per unit estimator if

$$Var(\bar{y}_{sg}) < Var(\bar{y}) \tag{6.8}$$

This implies

$$\frac{(1-f)}{n} (S_y^2 + W_1^2 S_x^2 + 2W_1 \rho S_x S_y) < \frac{(1-f)}{n} (S_y^2)$$

$$W_1 < -2\rho S_y \tag{6.9}$$

Hence the proposed estimator is more efficient than the mean per unit estimator if

$$W_1 < -2\rho S_y$$

VI. EMPIRICAL STUDY

For Empirical Study we consider the example dealing with a complete enumeration of 256 commercial pea orchards in North Carolina in June 1946 as given in Cochran (1983) , pp. 174-175,200. In example we have

$$S_y^2 = 6009 \quad S_{xy} = 4439 \quad S_x^2 = 3898 \quad r = 0.887$$

$$b = 1.14 \quad n=100 \quad N=256 \quad \bar{X} = 44.45 \quad \bar{Y} = 56.47$$

β	λ	b	W1	W2	\bar{Y} (gen)	\bar{Y} (reg)	\bar{Y} (mg)	\bar{Y} (mm)
0.5	1	1.138789	-0.9	1.9	119.3773	30.7645	18.70958	180.343
0.5	1	1.138789	0	1	26.98626	5.81292	6.270469	98.30742
0.5	1	1.138789	1	0	36.61734	36.61734	62.02219	36.61734
1	2	1.138789	0.1	0.9	22.63047	6.120965	20.30005	58.91736
0.2	1	1.138789	0.5	0.5	17.02709	13.51403	24.99199	74.51151
0.5	0.5	1.138789	0.6	0.4	18.58119	16.90251	56.39851	57.57204

VII. CONCLUSION

From the above study we have the conclusion that the proposed estimators are better than simple mean per unit estimators in many practical situations. Also \bar{Y} (mg) is better than any other estimators if W_1 is negative or close to zero & \bar{Y} (reg) is better if $W_2 > W_1$. Thus theoretically and from above study we see that the proposed estimators are better than existing ones in many practical situations under certain conditions.

REFERENCES

- [1] 1. Cochran, William G. (1977), Sampling Techniques, 3rd edition. New York : John Wiley and Sons.
- [2] 2. Jessen, R.J. (1978). Statistical surveys techniques. John Wiley and Sons.

The Emerging Development Model in India Differently-abled Entrepreneurs

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Abstract: Many initiatives are undertaken to improve the empowerment of people with disabilities in developing countries especially in India. However, an adequate development in proportion to the pre-determined programmes and budget allocation never attained to date. This systematic literature review aims to describe and assess a new model of development and empowerment in people with disability, suitable for use in developing countries especially in India. A systematic literature review was conducted. Articles and reports were considered when they described the development, validation, translation or the use of an instrument to measuring empowerment in the context of disability. The study revealed a new model of development, Differently-abled entrepreneurs highly motivated, enthusiastic, successful entrepreneurs, who contribute to the total wealth of a developing nation. The study is purely an empirical study used to measure empowerment of disabled people through the development of entrepreneurial quality, innovation and creativity. Further research is needed to develop, evaluate, assess, the importance of present study in other developing countries. India is often described as an old civilization but a young country. As the country enters its 65th year of independent existence the description of youth does not seem too apposite. It can now be termed young by reason of the fact that 50% of its billion plus population consists of persons below 25 years of age and 65% of the population is below 35 years. Differently-abled entrepreneurs, a new breed in the developmental spectrum of developing India. Each and every disabled people have a residual potential power than their non-disabled peers. Six to seven percentage of population in India is people with disability nearly 8 to 9 crore people the number is increasing with accidents and aging. Nearly one third of total number of people in India is affected with some sort of disability. Differently -abled entrepreneurs emerged as a need of an existence, than financially motivated. Who contribute a major chunk to the economic development of our nation.

Key words: Differently-abled entrepreneurs, Residual potential, Entrepreneurship, Disability.

Introduction

Entrepreneurship Development is a rapidly growing distinct field of study. Entrepreneurship and entrepreneurship development has become an everyday buzzword, Policy makers, economists, academics and even common people are talking about it. Seminars , conferences and workshops are being conducted every year across the world. Which emphasised on the importance of entrepreneurship to country, society as well as individual development (Bechard and Toulouse 1998). Today entrepreneurship is regarded as one of the best economic development strategies to develop country's economic growth and sustain the country's competitiveness in facing the increasing trends of Globalisation (Schaper and Volery 2004). Entrepreneurship is a major engine

driving many nation's economic growth, innovation and competitiveness . At the same time many studies shown there is a positive relation ship between entrepreneurship and economic growth. Many studies have been made in the subject of entrepreneurship in general and other relative field, women entrepreneurship, Ethnic entrepreneurship, Social entrepreneurship, Bureaucratic entrepreneurship, Edu entrepreneurship and other allied topics. Entrepreneurship and social development, No work and studies has not been found out in the field of Empowerment and Development of Socially disadvantaged through entrepreneurship development . Especially entrepreneurship development among differently-abled.

World Scenario

Persons with disabilities make up an estimated 15 per cent of the world's population, over one billion—80% of whom live in developing countries. They frequently experience discrimination and face barriers to participation in all aspects of society – for example, in accessing Education, employment, health care and transportation. Some persons with disabilities face multiple barriers to their participation, due to discrimination on the basis of other grounds, including race, colour, sex, language, religion, political or other opinion, national, ethnic, indigenous or social origin, property, birth and age. As a result, persons with disabilities are at a high risk of poverty, which in itself increases the likelihood of having a disability. Given that persons with disabilities represent a significant portion of the world population, and are more likely to live in poverty than their non-disabled peers, their inclusion in all development activities is essential, if internationally agreed development goals, including the Millennium Development Goals (MDGs) are to be achieved in an equitable manner. The inclusion of persons with disabilities in development programming also makes sense from an economic perspective. Excluding persons with disabilities from the world of work has costs for societies, in terms of their productive potential, the cost of disability benefits or pensions, where these exist, and the implications for their families. This exclusion may cost countries between 1 and 7 per cent of Gross Domestic Product. These costs to society can be minimized by dismantling barriers to participation of persons with disabilities, in education, skills development, enterprise development and employment, as well as poverty reduction and development programmes.

Indian Context

Six to seven per cent of the population in India is disabled according to the census begin from February 9, 2011. The 2001 census found 21 million persons with disability that is 2.13 % of the total population. There is a lack of political will in understanding seriousness of disability issues which has led to inadequate allocation of resources for the disabled in the country. With a small national budget allocation, no wonder the various measures which the government and the society have taken for the welfare of the disabled touch only the fringe of the problem. The plight of the blind, the deaf, the mute, the mentally challenged and the orthopedically handicapped continues to be distressing. Mainly because of the bulk of them are poor, enjoying no political clout, there needs come quite low in the order of priorities of the government. Whatever Government facilities that are available for the disabled are in the nature of mere crumbs.

In India, persons with disabilities are more likely to be poor, hold fewer assets, and incur greater debts. The causal relationship between disability and chronic poverty has been widely discussed but still lacks wider comprehensive research showing how this relationship really operates and can be self-fuelling. A few studies have been made, which show that persons with disabilities, more often than other groups, lack access to basic services, employment, credit, land and other resources that could reduce poverty. The vicious circle between disability and poverty varies as well within and between cultures and contexts, but is generally

acknowledged to be strong. Poverty has to be seen not only from the economic perspective, but also from the point of social exclusion and powerlessness. In developing countries, persons with disabilities and their families often live in poor and unsafe conditions and all persons with disabilities experience discrimination. Exclusion from full participation in social and economic life and from education opportunities substantially increases the risk of poverty. In India people living in poverty are at higher risk of serious health problems and accidents due to restricted access to health care, poor nutritional access, poor working and living conditions, which might lead to impairment and worsen the present condition. If a person acquires a type of impairment, he or she usually faces barriers to health services, education, employment, and other public services, and finds himself/herself often denied the opportunities that could help them to escape poverty. Disability can lead and cause poverty by preventing the full participation of persons with disabilities in the economic and social life of their communities, especially if appropriate support services and reasonable accommodation are not available. The link between poverty and disability is due to discrimination, social exclusion and denial of rights together with lack of access to basic services, not the impairment itself. Some persons with disabilities, such as women, persons with intellectual, psychosocial or multiple disabilities as well as elderly people, are more at risk of experiencing poverty than others. In some communities girls and women with disabilities receive less care and food, have less access to health care and rehabilitation services and fewer education and employment opportunities. They also tend to have lower marriage prospects than boys or men with disabilities, and to be at a higher risk of physical, sexual and mental abuse.

The number of handicapped people in India increases by about 5 million every year. Majority of them cannot hope for medical, educational and vocational aid. According to the report of National Statistical Survey (NSS) disability transition in India is predicted to be most rapid. Between 1990 and 2020, there is predicted to be a halving of disability due to communicable diseases, a doubling of disability due to accidents and injuries, and more than 40 per cent in the share of disability due to non-communicable diseases such as cardiovascular and stroke. At present six to seven per cent of the total population in India is a person with differently abled. The study is more significant in the social, cultural, educational and economic dimensions.

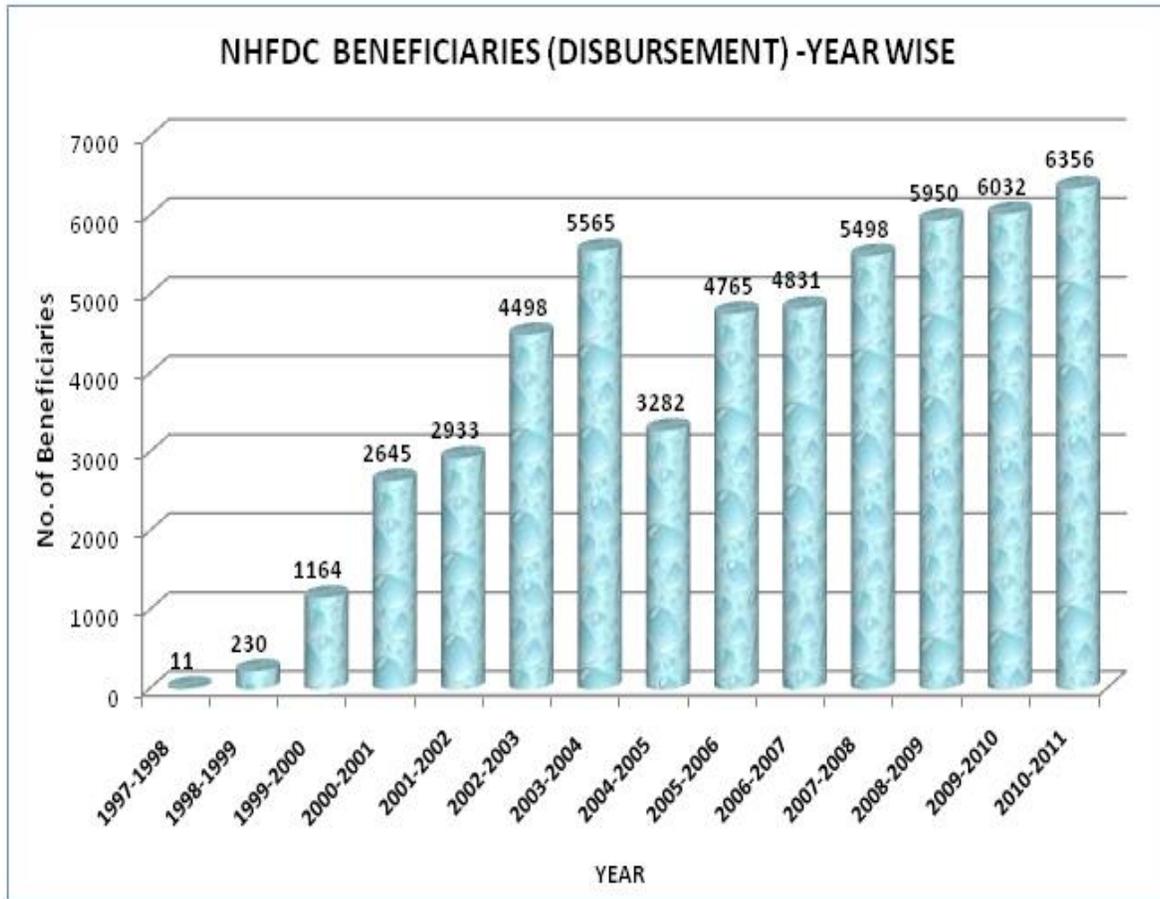
Governmental Schemes:

In India large number of programmes are being implemented through national and apex institutions dealing with various categories of disabilities. These institutions conduct short- and long-term courses for various categories of personnel for providing rehabilitation services to those needing them. Under the Scheme of Assistance to the Disabled for Purchase/Fitting of Aids and Appliances (ADIP), approximately 2 lakh persons with disabilities are provided assistive devices every year. During 2010-11, ₹ 27.71 crore was released to implementing agencies up to December 2010 against a revised allocation of ₹ 90 crore under the scheme. The target is to cover 2 lakh persons with disabilities. Under the Deen Dayal Disabled Rehabilitation Scheme (DDRS), ₹ 37.64 crore has been released up to December 2010 against a revised allocation of ₹ 90 crore during 2010-11 to voluntary organizations for running special schools for children with hearing, visual, and mental disability and vocational rehabilitation centres for persons with various disabilities and for manpower development in the field of mental retardation and cerebral palsy. The targeted number of beneficiaries is 76,000.

National Handicapped Finance and Development Corporation (NHFD)

National Handicapped Finance and Development Corporation plays an important and vital role for the development and empowerment of handicapped people in our country, The Corporation provides financial assistance to disabled

people for their Business and economically viable projects. The total amount of financial assistance provided by the Corporation in the States and UT,s of India upto the date 12/12/2012 was 1805.89 lakhs with a total number of beneficiaries 2604. Differently abled entrepreneurs in Kerala and other 30 States and Union Territories change the specturm of development.



Frome the above data the number of people with

disability has increasing year to year who build and develop their life more secure through new ,innovative and self-supporting ventures. In the past fifteen years number of differently-abled entrepreneurs ever increasing. Differently-abled entrepreneurs, a new breed in the developmental spectrum of developing India. Each and every disabled people have a residual potential power than their non-disabled peers. Six to seven percentage of population in India is people with disability nearly 8 to 9 crore people the number is increasing with accidents and aging. Nearly one third of total number of people in India is affected with some sort of disability. Differently -abled entrepreneurs emerged as a need of an existence, than financially motivated. They contribute a major chunk to the economic development of our nation.

The Corporation has been able to increase the disbursement of loan as well as coverage of beneficiaries during the year under review as compared to the previous financial year 2010-11. Comparative data of disbursement made in the previous two financial years is , In the Financial Year 2011-12 Amt. Disbursed (in Crores) was Rs:50.86 and in 2010-11 financial year the Amt. Disbursed (in Crores) was Rs: 31.84 and the No. Of Beneficiaries Assisted (including estimated no. of beneficiaries against advance funds on average loan basis) 10625 in (2011-2012) and 6356 in (2010-2011).

SCHEME-WISE PERFORMANCE

The scheme-wise performance of the Corporation in respect of disbursement of loan during the financial year under report is as under:

Sl No.	Schemes/Sectors	Amount (in Crores)	Number of Beneficiaries
1	Trading / Sales Activities	20.55	4283
2	Service Sector Activities	11.93	2339
3	Agricultural (Allied) Activities	13.06	3534
4	Agricultural Activities	0.98	69
5	Small business Activities	1.09	220
6	Purchase of vehicle for commercial hiring	2.7	162
7	Educational loan	0.55	18
8	Microcredit scheme	0	0
	Total	50.86	10625

DISABILITY-WISE DISTRIBUTION OF LOAN MADE DURING THE YEAR

The Corporation aims at serving all categories of persons with disabilities and no special preference is attached to particular category of the target group, it has been observed that major part of the loan off-take is for the benefit of OH category amongst target group.

Disability Type	Amount (in Crore)	Beneficiaries
Orthopedically Handicapped	42.68	8914
Mentally	1.32	270
Visually	3.14	591
Hearing	3.72	850
Total	50.86	10625

GENDERWISE DISTRIBUTION OF LOAN

The gender-wise distribution of loan assistance by the Corporation during 2011-12 is as under:

Gender	Beneficiaries	Loan Disbursement
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	Number	%	Amount (in Crore)	%
Female	3174	25.91	14.78	29.88
Male	7451	74.01	36.08	70.12
Total	10625	100	50.86	100

Number of beneficiaries with respect of the choice areas/activities of the target group.

The Corporation has been extending loans for the benefit of Persons with Disabilities for various income generating activities. As a matter of policy, the beneficiary is free to make his own choice of project /venture which he wants to set up. The corporation does not in any way influence the decision of the beneficiary. Under the aforesaid circumstances, the following data exhibit the number of beneficiaries with respect of the choice areas/activities of the target group.

Sl.no.	Scheme/Sectors	Beneficiaries		Disbursement	
		In absolute number	In % age	Amount (in crore)	In % age
	Trading / Sales Activities	35866	55.71	167.74	23.06
	Service Sector Activities	11620	18.05	64.68	20.46
	Agricultural (Allied) Activities	8889	13.81	38.64	12.22
	Agricultural Activities	798	1.24	9.65	3.05
	Small business Activities	1116	1.73	7.37	2.33
	Purchase of vehicle for commercial hiring	890	1.38	19.62	6.21
	Educational loan	58	0.09	1.36	0.43
	Microcredit scheme	5148	8	7.06	2.23
	Total	64385	100	316.12	100

IMPLEMENTING AGENCIES

Funds of the Corporation are channelized through State Channelizing Agencies (SCAs) nominated through respective State/UT Government. These agencies, interalia, play the vital role of implementation of schemes of the Corporation for the benefit of target group in the respective States/U.T.s. The Corporation has been pursuing with certain States/UTs where the

State Channelizing Agency (SCA) is yet to be operational. The Corporation has been extending loans for the benefit of Persons with Disabilities for various income generating activities. As a matter of policy, the beneficiary is free to make his own choice of project /venture which he wants to set up. The corporation does not in any way influence the decision of the beneficiary.

State Wise Distribution of Loan

Sl no.	Name of States	2010-2011		2011-2012	
		Amount Disbursed	Number of Beneficiaries	Amount Disbursed	Number of Beneficiaries
	Assam	0.91	100	0	0
	Chandigarh	0.11	48	0.02	8
	Chattisgash	2.33	152	2.85	160
	Delhi	0.4	144	0.1	36
	Goa	0.1	8	0.1	8
	Gujarath	0.3	76	1.7	435
	Haryana	1.93	292	9.27	1838
	Himachal Pradesh	2.33	208	2.2	228
	Jammu&Kashmir	0.99	105	1.57	176
	Jharkhand	0.97	78	0	0
	Karnataka	1	200	0.7	101
	Kerala	0	0	2.18	290
	Lakshdweep	0.19	22	0.1	13
	MadhyaPradesh	0.86	88	0.02	1
	Maharashtra	4.09	310	2.42	319
	Meghalaya	0.1.	20	0.53	85
	Mizoram	0.5	178	0	0
	Orissa	1.76	365	0.36	27
	Pondicherry	0.39	74	2.83	392
	Punjab	0.73	80	1.5	320
	Rajasthan	2.01	239	1.35	124
	Sikkim	0.06	2	0.05	13
	Tamil Nadu	7.96	3239	8.79	3624
	Uttar Pradesh	0	0	4.65	921
	Uttaranchal	0.35	56	7.27	1444
	West Bengal	1.47	272	0.32	62
	Total	31.84	6356	50.86	10625

OBJECTIVES OF THE STUDY.

- To study the Socio –Economic and general background of disabled persons in India.
- To ascertain entrepreneurship development and economic independency of disabled people living in Indian states and Union Territories.

- To examine the relationship of entrepreneurial talent of disabled people and their educational status and vocational training.
- To find the effect of entrepreneurship development to solve the economic and general conditions of disabled people in general.
- To study the scope of proper utilisation of the residual potential of the differently-abled people in entrepreneurship development.
- To study the changing attitude of Society and contribution of Differently-abled entrepreneurs to the economic development of country, employment generation and inclusive development of Differently-abled through Entrepreneurship Development.

METHODOLOGY

The study is about entrepreneurship development among differently-abled people in general, The study mainly focuses on the overall development of disabled people in various spheres of their life such as social, economical, professional and vocational through proper utilisation of entrepreneurial development activities. The research design and procedural plan for the study is retrospective-prospective study design.

1. Data collection.

[1] Primary Data.

There are a number of institutions and NGO's working in the states of India. Each to uplift the pathetic conditions of disabled people. State sponsored Handicapped development and finance corporations and centrally promoted National Handicapped Finance and Development Corporation are mainly provide financial assistance and other support for the economical and social upliftment of differently abled people through entrepreneurship development programmes. There are a large number of successful entrepreneurs and economically viable ventures emerged in the past in different states through the various programmes of these institutions.

[2] Secondary Data.

Entrepreneurial Development Index and earlier research studies, personal records constitutes secondary source of the study data are collected from Governmental and non- governmental organisations with respect of the study. Published reports of state and central organisations and studies conducted in relative fields and published and non-published sources constitutes the secondary source.

SIGNIFICANCE OF THE STUDY

The outcomes of the World Summit for Social Development, held in Copenhagen from 6 to 12 March 1995, and of the twenty-fourth special session of the General Assembly entitled “*World Summit for Social Development and beyond achieving social development for all in a globalizing world*”, held at Geneva from 26 June to 1 July 2000, *The World Programme of Action concerning Disabled Persons, and the Standard Rules on the Equalization of Opportunities for Persons with Disabilities and the Convention on the Rights of Persons with Disabilities*, in which persons with disabilities are recognized as both development agents and beneficiaries in all aspects of development, Recalling further its previous resolutions concerning persons with disabilities and further promotion of equalization of opportunities and mainstreaming of disability in the development agenda and the relevant resolutions adopted by the General Assembly, Welcoming the fact that, since the opening for signature on 30 March 2007 of the Convention on the Rights of Persons with Disabilities and the Optional Protocol thereto, one hundred and forty-seven States have signed and ninety-seven States and one regional integration organization have ratified the Convention and ninety States have signed and sixty States have ratified the Optional Protocol, and encouraging all States that have not yet done so to consider signing and ratifying the Convention and the Optional Protocol, Acknowledging that the majority of the 690 million persons with disabilities in the world live in conditions of poverty, and in this regard recognizing the critical need to address the impact of poverty on persons with disabilities, *Noting* that persons with disabilities make up an estimated 10 per cent of the world’s population, of whom 80 per cent live in developing countries, and recognizing the important role of international cooperation in supporting national efforts to mainstream disability in the development agenda, in particular for developing countries.

Around 10 per cent of the world’s population, or 650 million people, live with a disability. There are the world’s largest minority. This figure is increasing through population growth, medical advances and the ageing process. Eight per cent of the persons with disabilities live in developing countries. Disability rates are significantly higher among groups with lower educational attainment in various countries. Women report higher incidents of disability than men. The World Bank estimates that 20 per cent of the world’s poorest people have some kind of disability. And tend to be regarded in their own communities as the most disadvantaged. Women with disabilities are recognized to be multiply disadvantaged. Mortality of children with disabilities may be as high as 80 per cent in developing countries. Comparative studies on disability legislation show that only 45 countries have anti-discrimination and other disability-specific Laws.

FINDING

- 1) One may find plethora of public programmes to promote the employment of the persons with disabilities, though their impact has been quite negligible and mostly confined to urban areas. This is perhaps due to weaknesses in design and implementation.
- 2) Private sector employment incentives for hiring the persons with disabilities are quite limited. Despite the fact that the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995 has provided for private sector incentives policy with a target of 5 per cent of the private sector workforce being persons with disabilities, neither the Government of India nor State Governments have introduced a general incentives policy (though there is a specific new incentive provided for formal sector workers in the 2007- 2008 budget). During the fag end of 1990s, employment of persons with disabilities among larger private firms was only 0.3 per cent of their workforce. Among the multinational companies, the situation was far worse with only 0.05 per cent of their workforce being the persons with disabilities. One could, however, find a number of private and public sector firms with far better performance with regard to hiring the persons with disabilities.
- 3) Public sector employment reservations have also yielded poor outcomes due to design and implementation problems.
- 4) Notwithstanding the fact that a financial assistance programme for entrepreneurs with disabilities is in place, the beneficiaries have been negligible so far. This could be corroborated by the fact that more than 11 years have passed since the establishment of

the National Handicapped Finance Development Corporation (NHFDC) with the mandate of providing financial assistance to the disabled beneficiaries, the beneficiaries of the NHFDC scheme had percolated down to only 19,643 till 2005. If the NHFDC is to reach more stakeholders, the scheme requires to be restructured so as to give channelling agencies (including public sector banks) better incentives.

- 5) There cannot be denying the fact that a greater number of NGOs have become active in vocational training of the persons with disabilities and direct employment generation, but the majority of them without accreditation process.
- 6) The Government of India provides vocational services to the persons with disabilities, but coverage is low and its impact not known. Seventhly, one may also find a national network of special employment exchanges for the persons with disabilities, but they have failed to play the desired role in promoting their employment. Though there are employment exchanges in State capitals, the link between employment exchanges and establishments in the private sector is weak. Consequently, the job placement ratio is quite abysmal for both special and other exchanges, 0.9 per cent and 0.7 per cent of registered persons with disabilities respectively in 2003, has roughly halved over the past decade. The downward trend is indicative of shrinking job avenues in the public sector as also general failure of employment exchanges to reach out to the private employers.
- 7) Low educational attainment, poor employment prospects and stigma also suggest that the persons with disabilities and their households are notably worse off than average.
- 8) Entrepreneurship development among disabled people find more advantage than any other programmes implementing for the socio-economic upliftment of the group.
- 9) Disabled people have a residual potential than non-disabled people.
- 10) Selfsupporting ventures contribute a major chunk to the economic development of the country with eabled and self-motivated, independent human.

Conclusion

Around 10 per cent of the world's population, or 650 million people, live with a disability. There are the world's largest minority .This figure is increasing through population growth, medical advances and the ageing process. Eight per cent of the persons with disabilities live in developing countries. Disability rates are significantly higher among groups with lower educational attainment in various countries. Women report higher incidents of disability than men. The World Bank estimates that 20 per cent of the world's poorest people have some kind of disability. And tend to be regarded in their own communities as the most disadvantaged. Women with disabilities are recognized to be multiply disadvantaged. Mortality of children with disabilities may be as high as 80 per cent in developing countries. Comparative studies on disability legislation show that only 45 countries have anti- discrimination and other disability- specific Laws. The number of handicapped people in India increases by about 5 million every year. Majority of them cannot hope for medical, educational and vocational aid. According to the report of National Statistical Survey (NSS) disability transition in India is predicted to be most rapid. Between 1990 and 2020, there is predicted to be a halving of disability due to communicable diseases, a doubling of disability due to accidents and injuries, and more than 40 per cent in the share of disability due to non- communicable disease4s such as cardiovascular and stroke. At present six to seven per cent of the total population in India is a person with differently abled. The study is more significant in the social, cultural, educational and economic dimensions.

Reference

1. **Reports of WHO, UNDP, UNICEF.**
2. **2011 PROVISIONAL CENSUS DATA AND 2001 CENSUS DATA of India.**
3. **Report of the World Summit for Social Development, Copenhagen, 6-12 March 1995.**
4. **(United Nations publication, Sales No.E.96.IV.8), chap. I, Resolution 1, annexes I and II. General Assembly resolution S-24/2, annex.3 A/37/351/Add.1 and rr.1, annex, sect. VIII, recommendation I (IV), adopted by the General Assembly by its resolution 37/52.**
5. **UN General Assembly resolution 48/96, annex.**
6. **UN General Assembly Resolution 61/106, annex I.**
7. **Planning Commission, Government of India “Employment of Persons with Disabilities in Public Sectors in India Emerging Issues and Trends--An Evaluation Study with Special Reference to Persons with Disabilities Act (1995)” Commissioned by Planning commission, Government of India 2008 Submitted by Society for Disability and Rehabilitation Studies.**
8. **“India Country Profile March 2003 Employment of People with Disabilities: The Impact of Legislation (Asia and the Pacific) by the ILO InFocus Programme on Skills, Knowledge and Employability in the framework of a project funded by Development Cooperation Ireland (DCI).**
9. **Poised For Change First Country Report Of INDIA Submitted in pursuance of Article 35 of the UN Convention on the Rights of Persons with Disabilities (UNCRPD).**
10. **Ooi Yeng Keat, Christopher Selvarajah,Denny Meyer.(2011). “Inclination towards entrepreneurship among university students: An emperical study of Malayasian University students”International Journal of Business and Social Science 2(4):206-220.**
11. **Brown,Christopher Russell,(2007). “Economic theories of the entrepreneur:A systematic review of the literature” Cranfield University, United Kingdom,ISBN.**
12. **Jose c Sanchez, Andrea Gutierrez,(2011), “Entrepreneurship resrarch in Spain: Developments and Distinctivenass” Psicothema 23(3):458-463.**
13. **JaAnn C, Carland,James W. Carland, Wayne H Stewart(1996). “seeing what's not there:The enigma of entrepreneurship”,Journal of Small Business Strategy,7(1),1-20.**

14. John C McIntosh, Samia Islam (2010), "Beyond the Veil: The influence of islam on female entrepreneurship in a conservative muslim context" International Management Review ,6(1):103-108.

Study of Various Plant Species Useful in Each Nakshatra for Human Society

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Abstract- The Punitvan is a conglomeration of Panchvati, Nakshatra Van, Rashi Van, Navgraha Van and Charak Van. The Punitvan inspires to human society to plant the trees and care they including all matters. Punitvan is situated in sector 18, Gandhinagar. It was established in the year 2004. Thus Punitvan gives us inspiration to protect the plants and to know its uses. There are various plants planted according to different themes like planets, constellations, a sign of zodiac, and Panchavati. Present paper indicates 27 constellations with 27 plant- species show importance of individual. In the ancient time our elders were directly or indirectly connected with the trees. They believed that plants are useful to different purposes in life. Recently people believe in astrology, so they can care and protect the plants regularly.

plant species associated with the constellations and are believed to have medicinal properties for treating the various diseases.



Study area map

Index Terms- Punitvan, Plantation, Constellations, Species.

I. INTRODUCTION

In our civilization/society all the ceremonies beginning from the birth to death are celebrated after consulting religious almanac. The advice of an astrologer is sought on various occasions such as Naming Ceremony, Wearing Sacred, Thread, Marriage, Baby-shower, Land Reverence, Laying of Foundation Stone Ceremony or Entering a new building/house, Ceremony performed before occupying a new dwelling, Journey of a long duration/distance, Commencing of new business/profession/industry etc. We have a tradition to consult the auspicious day, time, moments minutely before starting any occasion/ceremony. It is clearly seen that there is a great impact of planets, status of planets at the time of birth in the horoscope and constellations at the time of ceremony in our routine life. In astrology it is clarified that the person can be free from depression, sickness, physical-social-economical-mental or supernatural troubles by planting a tree/plant relevant to the constellation existing at the time of his/her birth. This is only the reason why our ancestors have revered the trees as Gods and placed them equivalent to the divine elements/Gods-Goddesses. For this purpose a specific structure had been prepared for devotees to worship a worth-worshipping tree/plant according to the status of divine constellations at the time of birth of a person. According to Constellation, Human being is always dominated by the presence of Sun, Moon and other planetary structures. The purchasing power of Gems/Pearls is too costly for poor. Since ancient times, plants were considered invaluable to Gems/Pearls. Tribal inhabiting in forests are "Nature lovers" and use plants in various forms and ways. They believe that the dominance of weak and obstacle causing factors can be minimized by wearing or wrapping plants or their parts around their body. So, certain

II. MATERIALS & METHODS

The present paper deals with a preliminary study on plant species associated with the planets at Punitvan. Its reports botanical name, local name, family, and morphological characters of various angiosperm plants which are planted in the Punitvan according to the planets. We have taken photographs and collected information with several trips. The species were arranged according to Bentham and Hooker system of classification by using the flora of Gujarat state.

III. ENUMERATION

The details of all the twenty seven constellations are given hereunder to help you understand their importance in entire life span.

(1) Ashwini: It is situated at 0o to 13o 20' in the first zodiac sign of Aries. It is shaped as a mouth/face of horse and there are three stars in it. This constellation has windy (Vaayu) nature (Prakruti) and it directs towards the humanbody above the legs. It has blood-red colour. This is divine constellation, its origin (Yoni) is Ashwa, East (Purva) Yunja and Adhya Nadi. The Nirayana Surya stays in this constellation from 14th April to 27th April. During 14 to 17 April it is in first phase (Charan), from 17th to 20th April in second phase (Charan), on 20th April in third phase (Charan) and on 21st April in fourth phase (Charan). Its lord of Situation (Dasha-naath) is Ketu. Ashwini, Megha and Moola are the constellations of Ketu.

Zer-Kochalu:(*Styrox nuxvomica*) Such shell-plants are used as medicinal herbs in ailment of Fever, Weakness, Neurotic problems, Hair-fall, Hair Skin of Skull etc.. They soothe the wounds, skin-boils, abscesses; leaves of this plant are used in poultice form. Nowadays this plant is used as insecticides to protect crop. It is dangerous in excessive usage. The seeds of this

plant can be used only after complete purification. Nux Vomika is worshipping plant for those persons born within the tenure of this constellation. The deity of Ayurveda is God Ashwinikumar. Shell-trees are too much useful in many diseases. The persons born in this constellation are therefore related to God Aswinikumar and a plant like Nux Vomika.

(2) **Bharani**: This constellation is situated at 13o20' to 26o40' in the Aries. It is shaped like a feminine generative organ with three stars situated in it. Its origin (Yoni) is Gaja, East (Purva) Yunja, Manushya Gana and Madhya Nadi. Its Lord of Situation (Dashanaath) is Shukra (Venus). It has a span of 20 years of Dasha. It is of feminine gender with Royal virtues. It directs towards the human body's lower parts of legs. Its colour is red and God is Yama (God of Death). The Nirayana Surya stays in this Nakshatra from 29th April to 11th May. It is in the first phase (charan) from 28th to 30th April, from 1st May to 3rd May in second phase (charan) from 4th May to 7th May in third phase (charan) and from 7th May to 10th May in fourth phase (charan). A period of 36 minutes of entering (Pravesh) is known as Visha Nadi (Venom).

Amala [*Phyllanthus emblica*]: Jam of unripe fruits, pickles of this fruits are made which are full of energy, digestive and immunative. Its taste is astringent and is helpful in urinal and indigestion problems. Dry fruits are very useful in bleeding, diarrhea and constipation. The fruits are having abundant elements of Vitamin-C. If used with contents of Iron, it soothes the patients suffering from Jaundice, Indigestion, Asthama, Coughing etc. Those who belong to this constellation, this tree is as good as a worshipping tree. If the person recites hymn (Mantra) of this Nakshatra sitting under the tree as shown below, his all the problems are solved and gets good results.

(3) **Krutika**: It begins from 26o40' of Aries and till 10o of Taurus is the status of this constellation which is named after the first son of Lord Shiva : Kartikeya. It is shaped like a shaving-tool's end or an end of arrow having six stars in it. Its god is Agni Dev (God of Fire), Class (Varg) of Garuda, Origin (Yoni) of Mash (Aries), Devil (Rakshasa) Gan, East (Purva) Yunja and Antya Nadi. Its God of Situation (Dasha Naath) is the Sun (Surya) and Dasha (tenure) is 6 years. It remains from 12th May to 14th May in first phase (charan) from 15th May to 18th May in second phase (charan), 18 to 21st May in third phase (charan) and from 22nd May to 28th May it is in the fourth phase (charan).

Cluster Fig. : (*Ficus racemosa*): Oudumber is extremely useful and virtuous tree. It is cool by nature. Birds, insects and worms are attracted towards its fruits because of sweet taste and worms are found in their fruits. But the fruits are dried and crushed into powder form for storage purpose. A sweet food is prepared using this powder after adding milk, sugar and flour. The leaves of this tree are a very good fodder for domestic animals. The nector dribbling from its roots is used to prepare Oudumbarasava. This Asava is very useful remedy for patients suffering from Small-Pox, Chicken-Pox, Measles etc.. This is also used in case of diabetes patients. The person born in this Nakshatra should worship this tree and recitation of the following Mantra under this tree will give an expected result of good fortune.

(4) **Rohini**: Rohini means a red cow in sanskrit and it is the name of mother of Lord Balam/Balabhadraji, elder brother of Lord Krishna. She is daughter of Kashyap rushi and Surabhi. Beginning from 10o of Taurus (Vrushabh Rashi) and ending at 23o 20' of the same is called Rohini Nakshatra. It is having a shape of a chariot with five stars in it. It is also called as a Cart (Shakat). The Nirayan Sun (Surya) remains in this constellation in first phase (Charan) from 26th to 28th May, second phase (Charan) from 29th to 31st May, third phase (Charan) from 1st to 4th June and during 4th to 8th June in fourth phase (Charan). Its first phase (charan) has varg (class) of Garuda where as the class(Varg) of 2nd 3rd and 4th phase (charan) is Mruga. Its Origin (Yoni) is Snake (Sarpa), Gana is Human

(Manushya) East (Purva) Yunja and Antya nadi. Its God of Dasha (Dasha naath) is the Moon (chandra) with a tenure of ten years.

Jamun tree [*Syzygium cumini*] The fruits of this tree are sweet and tasty. Fresh fruits and their juice is useworthy for patients of diabetes. Generally the fruits are ripe during monsoon which are useful in ailments. The young children can be free from stomachache, indigestion, lack of appetite gripping. In case of scorpion's bite, the juice of leaves of this tree is very effective. Its wood is used in construction, furniture as well as fuel. The person born during the influence (Prabhav) of this constellation is suggested to worship this tree.

(5) **Mrugshirsha** : This constellation has status in Taurus (Vrushabh) Rashi from 23o20' till 6o40' of Gemini (Mithun) Rashi. It has a shape of the head of a deer/antelope having three stars arranged in it. The God of this Nakshatra is Moon (Chandra), class (varga) of its first and second phase (charan) is deer (Mruga) whereas the class (varga) is Cat (Marjar) class (varg) of 3rd and 4th phase (charan). Its origin (Yoni) is Snake (Sarpa), dev-gana, East (Purva) yunja and Madhyam Nadi. Its vishottari God of position (Dasha-naath) is Mars (Mangal) which has tenure of seven years. The nature (Guna) of this Constellation is hot-tempered (Tamasika) Origin (Yoni) is impotent (Napunshak) and it has supremacy (Aadhipaty) on the eye-brow of a man. It has silver (Ruperi) colour.

In this constellation the Nirayan Surya stays from 8th to 11th June in first phase (charan), 12th to 15th June in second Phase (charan), from 16th to 18th June in third phase (charan) and from 19th to 21st June in fourth phase (charan).

Catechu Tree : (Kher tree) : (*Acacia chundra*)

These trees are found in areas of Gujarat, Punjab, Bihar, Madhya Pradesh, Maharashtra and Gadhwal-Kumaon areas of Himachal Pradesh. They are in majority states of India. Extract or powder of Catechu tree wood is its main product being used with betel leaf. This extract or powder (Katho) is used to prepare ayurvedic medicines such as Swalp Khadir, Khadirashti, Khadirashtak etc. This tree is a useful medicine for skin diseases particularly Albino (Kustharoga) and toothache as well as pain of molar teeth (Daadh). If the person of this Nakshatra sits and worships following hymn under Catechu tree, his problems are solved and gets good result.

(6) **Aadra**: This constellation exist in Gemini (Mithun) from 6o40' to 20o0'. The class (varg) of 1st, 2nd and 3rd phase (charan) is Cat (Marjar) and that of 4th phase (charan) is Lion (Lio-Sinh). Its origin (Yoni) is Shwana, Manushya Gana, Madhya Yunja and Aadhya Nadi. Its shape is like an only bright-

shining star. Ardra means wet. Lord Rudra (Shiva) is its God (Devta) and its vishattari nath (God) is Rahu (Dragon's head) having tenure of 18 years. It has command on nerves system of human body. Aardra Nakshatra's body parts are hands, shoulder and neck. Some learned people consider its impact on eyes. Its colour is green. It is in the tribe of lowest caste (Executioner- Butcher). It has hot tempered virute (Tamasik Guna). The Nirayan Sun (Surya) remains in this constellation in first phase (charan) from 22 to 25th June in second phase (charan) from 26th to 28th June, from 29th June to 1st July in third phase (charan) and in the fourth phase (charan) from 2nd to 6th July. It is believed that this Nakshatra is the best period for commencing education of a child.

Sisam: (*Dalbergia sissoo*)

Indian Rosewood is a deciduous rosewood tree, also known as sisu, sheesham, tahli, Tali and also Irugudujava. It is native to the Indian Subcontinent and Southern Iran. In Persian, it is called Jag. It is the state tree of Punjab state (India) and the provincial tree of Punjab province (Pakistan). It is primarily found growing along river banks below 900 metres (3,000 ft) elevation, but can range naturally up to 1,300 m (4,300 ft). The temperature in its native range averages 10–40 °C (50–104 °F), but varies from just below freezing to nearly 50 °C (122 °F). *D. sissoo* is a medium to large deciduous tree with a light crown which reproduces by seeds and suckers. It can grow up to a maximum of 25 m (82 ft) in height and 2 to 3 m (6 ft 7 in to 9 ft 10 in) in diameter, but is usually smaller. Trunks are often crooked when grown in the open. Leaves are leathery, alternate, pinnately compound and about 15 cm (5.9 in) long. Flowers are whitish to pink, fragrant.

(7) Punarvasu : This constellation exists between Gemini 20o to 3o20' of Cancer. 1st, 2nd and 3rd phase (charan) of this constellation are in Gemini and 4th phase (charan) is in Cancer. Its first and second phase (charan) are of Cat (Marjar Varga) and third as well as fourth phase (charan) are of Cancer (Mesh Varga). Its origin (Yoni) is Marjar, Devgana, Madhya Yunja and Aadhya Nadi. Punarvasu means to dwell-reside again. There are four stars in this Nakshatra. Aditi is its God of worship. Aditi is the mother of Lord Vishnu and the Sun. She is wife of Kashyam Rushi. There are twelve Aaditya who are her sons. Lord Rama was born during this constellation when it was in the fourth phase (charan). Its colour is like lead. It has command over the nose. It is a male constellaiton and is endowed with virtues.

Bamboo-Tree: (Vaans) : (*Dendrocalamus strictus*) : This tree is generally found in every part of India. It is mostly grown in Western and Southern India. In Gujarat it is found in the forests of Dang and Rajpipla. This tree is of many varieties in case of its length, thickness etc. Every bamboo tree is having knots (Ganth) from which a very effective medicinal object named Vansh-Lochan is obtained. This herb/medicinal object is used not only in India but also in Japan and China. The leaves of this are boiled and pasted on the joints of human body to treat rheumatism (Sandhiva). This constellation's person is advised to worship the bamboo tree. Similar to bamboo's usefulness, the person belonging to this Nakshatra is ready to help others.

(8) Pushya: The Pushya constellation being a very prosperous is having three stars in it. It exists in 3o20' to 16o40' of Cancer (Kark). The class (Varg) of first, second and third phase (charan) is Aries (Mesh) and that of fourth phase (charan)

is dog (Shwan). The origin (Yoni) of this Nakshatra is Aires (Mesh), Dev gana, Madhya Yunja and Madhya Nadi. Its swami (God) is Saturn (Shani) which has a tenure of 19 years. Pushya means to nurture, to strengthen. It is having hot tempered virtue. Its colour is reddish black and has command on face. Its swami (God) is Bruhspati (Jupiter). Bharatji, brother of Lord Rama was born in this constellation.

Peepal Tree : Sacred Fig (*Ficus religiosa*) This tree is grown in every part of India. It is a sheddy tree with speedy growth. The followers of Hinduism and Buddhism worship this tree and consider it as a sacred tree on the earth. Its soft leaves, buds and fruits are used as a food during famine. Its furits are favoured food of birds and leaves are a good fooder for domestic animals. Its wood is used as wood-board for furniture. Its tender leaves and bark are used as medicine. The bark of this tree is a very effective medicine in skin diseases particularly eczema. This costellation is believed to be a very sacred and auspicious. There is a tradition of purchasing gold, jewellery, ornaments during the day of Gurupushyamrut Yoga or Amrutsiddhi Yoga. The Peepal tree is very sacred and is worshipping tree for persons of this Nakshatra. The people belonging to this Nakshatra are found spiritual, peaceloving, calm and full of perseverance because of this sacred tree.

(9) Aashlesha : This constellation exists in Cancer (Kark) from 16o40' to 30o. Ashlesh means to hug or to embrace. Its class (varg) is shwan (Dog), origin (Yoni) is Marjar (Cat), Rakshasa (Devil) Gan, Madhy Yunja and Anty Nadi. This is a virtuous Nakshatra. Its Dasha naath is Mercury (Budh) having tenure (Dasha Varsh) of 17 years. It is circle shaped or a snake shaped with five stars in it. Its deity; is Serpant-God. Laxman and Shatrughna, borthers of Lord Rama were born during the period of this constellation. The Nirayan Surya (Sun) remains in this constellation from 3rd to 10th August. Its command is on Ears. Its colour is reddish black with Stree Yoni (Female Origin).

Naagkesar : Mesua Tree (*Mesua ferrea*)

This middle sized tree is found in the Himalayan range, Andaman Islands, Southern India and North-East India. It is found in a range of 1500 mts. in Andaman Islands. It is also found in Nepal. This tree is ever-green, beautiful tree with blue coloured round-stems. Its stem is straight and sticky. The pistil of its flower is known as Naagkeshar. It is always used as medicine. This tree having large quantity of leaves is grown generally in the compound of temples, gardens and road-sides. Its wood is very strong and is known as Iron-wood. Naagkeshar is the worshipping tree for persons of "Aashlesha", "Vishakha" and "Anuradha" constellations. The Gods of them are Naag (Snake God), Indra and Surya (Sun) respectively. It is believed that the flower, pistil and the tree are respectively worshipped by these Constellations. The God of this constellation is Serpant God.

(10) Magha : This constellation remains in Leo (Sinh) from 0o to 13o20'. There are five stars in a straight line. Some people consider six stars in it and imagine it as a figure/shape of a house. The Gods of this constellation are forefathers (Pitruo), Class (Varg) of Mouse (Mushak), its origin (Yoni) is of Mouse (Mushak), Rakshas (Devil) Gana, Madhy Yunja and Antya Nadi. It has command over lips and chin. Its colour is creamy and virtue is hot-tempered (Tamasik). Its origin (Yoni) is lady.

Banyan Tree (Vat Vruksha-Vad) (*Ficus benghalensis*)

This tree is found everywhere in India. Banyan Tree is symbol of long life-span, strength and prosperity. It is huge with spreaded green leaves and airy-roots resulting into a great and unending tree. All the parts of this tree are used as medicine. Its gum is used to treat boils, joint-pain, toothache and cracks of heels. Its fruits are given to stop diabetes and germ is a resulting medicine in family-planning and guineaworm. In Indian civilization, Banyan tree is of great importance. A chaste & devotional wife worships this sacred tree on full-moon day (Poornima) of Jyestha month (Eighth month of Vikram Era). There is a mythological ancient incident of Satyavan who was dead. But his chaste-devotional wife Savitri worshipped this tree : observed the vow of the tree and could get her husband alive from death-bed. Majority Indians worship this tree.

(11) Purva Falguni : This Constellation exists in Leo (Sinh) from 13o20' to 26o40'. The God of this constellation is Bhag which one of the names of Surya (Sun). He is the son of Aditi. Its shape is of a bed-stead's four legs. In the two square sides of these legs three are two stars on each one. The class (varg) of first phase (charan) is Mouse (Mushak) and that of the second, third and fourth phase (charan) is dog (Shwan). Its origin (Yoni) is Mouse (Mushak), Manushya Gan, Madhya Yunja and Madhya Nadi. Its Vishottari God (Vishottari Dasha-Naath) is Venus (Shukra) with a tenure of 20 years. It has covetous-greedy quality. It has command on the right hand. Its colour is light blue. The Nirayan Sun (Surya) reamains in this constellation during the period from 31st August to 12th September.

Kesudo-Khakhharo : [*Butea monosperma*] This tree is found in every part of Gujarat. Its flowers having red colour of rays of rising Sun are main characteristics. These flowers are very useful on boils and skin ailments so it is called Shataghra. The coal of this tree is destroyer of stinking smell/bad-odour. Its gum is useful in bleeding and diarrhoea. The seeds of the flower are useful to treat worms.

(12) Uttara Falguni: This constellation exists in Leo (Sinh) 26o40' to 10o of Virgo (Kanya). The class (Varg) of 1st and 2nd phase (charan) is Dog (Swan) and that of 3rd and 4th phase (charan) is Mouse (Mushak). Its origin (Yoni) is of a cow, Manushya Gana, Madhya Yunja and Aadhya Nadi. The shape is like legs of bed-stead with two stars. Its God is Aryama. It is one of the twelve Aaditya. The Sun remains in this Constellation for a period from 13th September to 26th September.

Payer-Peepar - Khadak : Indian Laurel [*Ficus rumphii*] This tree is found in Gujarat, West Bengal, Central India and Himachal Pradesh. They are grown in the forests of Southern Parts and on road-sides. This tree is similar to peepal tree with similar medicinal characteristics. The bark decoction of this tree can treat wounds of burn. The people belonging to this constellation may suffer from back-pain, neuro-ailments, bleeding etc.

(13) Hast : This Constellation stays in Virgo from 10o to 23o20'. There are five stars in it arranged in a shape of palm/paw. The Nirayan Surya (Sun) exists in this constellation for the period from 27th September to 10th October. The class (varg) of first phase (charan) is Mouse (Mushak), second phase (charan) is Aries (Mesh) and that of third and fourth phase is Dog (Swan). Its origin (Yoni) is Mahishini (Queen/Female Buffalo), Madhya Yunja, Aadhya Nadi and Dev-gena. Its God of situation (Dasha - Naath) is Moon (Chandra) which has a tenure of ten

years. Lord Sun (Suryanarayan) is the God of this constellation. There are twelve Aaditya and Surya is one of them. It has command on the fingers of hand and is having dark green colour.

Jasmine Plant : [*Jasminum auriculatum*] Jasmine plant is grown in compound, gardens and parks. Jasmine leaves are used on jaw-pain, mouth-boils and anaemia. Jatyadi Oil made from its flowers is used on the unhealing wounds which are not getting well for a longer period. Hast is a very powerful constellation but its plant is a delicate one. The person should follow the worship under this tree/near the plant and recite following hymn (Mantra) which will remove all the troubles from the life and there will be peace, prosperity and fulfilment of all wishes.

(14) Chitra : Chitra mean a brightening, shining, gorgeous sharp pearl. Sometime it seems like a lamp. This constellation is made of only one star and is a symbol of prosperity. Lord Vishwakarma is the deity for worship for the persons of this constellation. It remains at 23o20' of Virgo to 6o40' of Libra. The class (Varg) of first two (1&2) phase (charan) is Mouse (Mushak) and for remaining two (3&4) phase (charan) is deer/antelope (Mruga). Its origin (Yoni) is Tiger (Vyaghra), Rakshasa (Devil) Gana, Madhya Yunja and Madhya Nadi. Its Vishottari God is Mars (Mangal) with tenure of seven years. It has a tenure of seven years. It is a female (Stree) constellation having command on the neck. It is having hot-tempered (Tamasik) virute (Guna).

Bili Vruksha : Bael Tree [*Aegle marmelos*] This green tree is found in lower sloppy regions of the Himalayas, Western, Northern and Southern India. It is grown everywhere as a sacred tree in India. The fruit of this tree is sweet-hot, bitter, digestive and stimulative. So it is used as a medicine in indigestion, diarrhoea, acidity and gripping. Its root, bark and leaves are used in Typhus/Typhoid (Enteric fever). The oil extracted from its seeds is used as a remedy of Scrofula (Kanthmala). The sticky substance on the seed is used to join broken things. It is also used in drawing, painting, colouring. Its mixture with lime powder is used as cement. This tree is a favourite one of Lord Shiva and its God of worship is Lord Vishwakarma. It is believed that this tree must have been associated with Chitra constellation because of its great ability and power. The scientific name of the fruit is "Anvardhak". In Greek mythology a golden fruit was grown in the garden in Herra, which was worshipped by the deities-Eagle Gods. In protuguese language its meaning is Marmolis which is a golden fruit. They worshipped this golden fruit by calling it Eagle-Marmolis- a devine fruit.

(15) Swati: This is a constellation of Libra (Tula) having status from 6o40' to 20o. There is only one star in this constellation and shape is of a coral (Paravalun). The class (Varg) of first to third phase (charan) is deer/antelope (Mruga) and for the 4th phase (charan) is Snake (Sarp). Its origin (Yoni) is Mahishini (Queen/female buffalo) Dev gana, Madhya Yunja and Antya Nadi. Its command is on the chest having black colour. This is a female origin (Stree-Yoni) constellation with hot-tempered nature (Tamasik Guna). Its Vishottari Dasha-Naath (God of Condition) is Dragon's Head (Rahu) with tenure of 18 years. The Sun exists in this constellation from 24th October to 6th November.

Arjuna Tree (Arjun Sadad) (*Terinalia arjuna*) This is a big evergreen tree with spreaded branches with vast shed. It is naturally found on the banks of the rivers and streams. It is also

grown in the gardens-parks and roadsides for shed-purpose. This tree-wood is used for making agricultural tools, building material, small boats, rafts, Ply-wood and water-tubs. The bark of this tree is used for rearing tussar silk-worms. The bark is also used as a medicinal object in heart-disease and joining of fractured bones. The extract of fresh leaves is useful in ear-pain.

(16) Vishakha: This constellation exists in Libra (Tula) from 20° to 30° of Scorpio (Vruschik). Its third phase (charan) is in Libra and fourth phase (charan) is in Scorpio (Vruschik). It is in the shape of an Arch (Toran) with 4 Stars in it. The class (Varg) of this Constellation is Snake (Sarp), Origin (Yoni) is Tiger (Vyaghra), Rakshasa (Devil) Gana, Madhya Yunja and Anty Nadi. It is a female's origin (stree-Yoni). It is endowed with Virtues (Satvaguni). The Sun usually remains in this constellation from 7th November till 19th November. Indra (King of Gods) and Agni (God of Fire) are Gods of this constellation.

VIKLO: (*Mytenus emarginata*) Shrub or small tree up to 6 m high; bark pale brown, smooth, cracked; branches terete, with pale lenticels; spines axillary or terminating short lateral shoots. Leaves thick, coriaceous.

(17) Anuradha: This constellation exists in Scorpio (Vruschik) from 30° to 16°40'. It has four stars arranged in a shape of Lotus (Kamal) or Umbrella (Chhatri). The class of this constellation is Snake (Sarp Varg), Antya Nadi, Madhy Yunja, Dev-gana and origin (Yoni) of Tiger (Vyaghra). Its gender is male. Its God of position (Dasha-Naath) is Saturn (Shani) which has a tenure of 17 years. Maitra is its God of worship. Maitra is one of the twelve Aaditya.

Borsalli: (*Mimusops elengi*) is a medium-sized evergreen tree found in tropical forests in South Asia, Southeast Asia and northern Australia. English common names include Spanish cherry, medlar, and bullet wood. In it is called *maulsari* in Hindi, *bakul* in Sanskrit, Bengali, Malayali, Manipuri, *magizamaram* in Tamil, and *ranja* in Kannada. Its timber is valuable, the fruit is edible, and it is used in traditional medicine. As the trees give thick shade and flowers emit fragrance, it is a prized collection of gardens. The bark, flowers, fruits, and seeds of *Bakula* are astringent, cooling, anthelmintic, tonic, and febrifuge. It is mainly used in dental ailments like bleeding gums, pyorrhea, dental caries, and loose teeth. Extracts of flowers are used against heart diseases, leucorrhoea, and menorrhagia, and act as antidiuretic in polyuria and antitoxin. The snuff made from the dried and powdered flowers is used in a disease called *ahwa* in which strong fever, headache, and pain in the neck, shoulders, and other parts of the body occurs. Ripened fruits facilitate a cure for burning urination. The ripe fruit pounded and mixed with water is given to promote delivery in childbirth. The powder of dried flowers is a brain tonic and useful as a snuff to relieve headache. Decoction of bark is used to wash the wounds.

(18) Jyestha: Jyestha means the biggest. This constellation exists in Scorpio (Vruschik) from 16°40' to 30°. There are three stars in the shape of an earring (Kundal). The God of this constellation is Indra. Its first phase (charan) is of Sarpa-varga (Snake-class) and class (varg) of 2nd, 3rd and 4th phase (charan) is Deer (Mruga). Its origin (Yoni) is of Deer (Mruga), Rakshas (Devil) Gana, Aadhya Nadi and Antya Yunja. It is endowed with

virtues (Satvaguni) It has female origin (Stree Yoni), cream colour with commad on right-side of the body.

Shimalo: [*Bombax malbaricum*] This tree is found everywhere in India. It blossoms during summer without leaves. It is thorny with attractive shape of branches. Different parts of this tree are used as medicine. Its red-coloured gum is hard, energetic and cold but creates brain-power. Its thorns are useful in pimples. The wood is soft and therefore it is used in match box, packing and plywood industries.

(19) Mula : Mula means the root of a tree/plant/dynasty and also means the very first of its kind. It remains in the sagittarius till 13°20'. A group of eleven stars in the shape of the tail of a lion is its outlook. The Goddess wearing black clothes-Nirit is its Goddess. She swells in the kingdom of dead. It represents the evils. The 1st and 2nd phase (charan) of this Mula constellation is Deer (Mruga) and 3rd as well as 4th phase class (Varg) is Mouse (Mushak). The Dog (Swan) is its origin (Yoni), Rakshas (Devil) Gana, Antya Yunja and Aadhya Nadi. Its command is on the left side of the body with bluish-red colour. This is an impotent (Napunshak) constellation.

Garmalo: [*Cassia fistula*] : is known as the golden shower tree and by other names, is a flowering plant in the family Fabaceae. The species is native to the Indian Subcontinent and adjacent regions of Southeast Asia. It ranges from southern Pakistan eastward throughout India to Myanmar and Thailand and south to Sri Lanka. It is closely associated with the Mullai region of Sangam landscape. It is the national tree of Thailand, and its flower is Thailand's national flower. It is also state flower of Kerala in India and of immense importance amongst Malayali population. It is a popular ornamental plant and is an herbal medicine. *Cassia fistula* is widely grown as an ornamental plant in tropical and subtropical areas. It blooms in late spring. In Ayurvedic medicine, the golden shower tree is known as *aragvaha*, meaning "disease killer". The fruit pulp is considered a purgative, and self-medication or any use without medical supervision is strongly advised against in Ayurvedic texts.

(20) Purvashadha : This constellation stays in Sagittarius (Dhana) from 13°20' 26°40'. Its shapes is like Tusk with four stars. The class (varg) of 1st phase (charan) is Mouse (Mushak), 2nd is Snake (Sarp), third phase (charan) is Mouse (Mushak) and fourth phase-class (charan-varg) is Dog (Swan). Its origin (Yoni) is Monkey (Vanar), Manushya (Man) Gan, Anty-yunja and Madhya Nadi. Lord Varun (Rain God) is its God-deity and its lord of position (Dasha Naath) is Venus (Shukra). Its tenure is 20 years. Generally the Sun is in this constellation for the period from 29th December to 10th January.

Netar: [*Calamus rotang*] is one of the scandent **rattan** palms used for Malacca cane in the making of furniture, baskets, walking-sticks, umbrellas, tables and general wickerwork, and is found in Southwest Asia. The basal section of the plant grows vertically for 10 metres or so, after which the slender, tough stem of a few centimetres in diameter, grows horizontally for 200 metres or more. It is extremely flexible and uniform in thickness, and frequently has sheaths and petioles armed with backward-facing spines which enable it to scramble over other plants. It has pinnate, alternate leaves, 60-80 cm long, armed with two rows of spines on the upper face. The plants are dioecious, and flowers are clustered in attractive

inflorescences, enclosed by spiny spathes. The edible fruits are top-shaped, covered in shiny, reddish-brown imbricate scales, and exude an astringent red resin known medicinally and commercially as "Dragon's blood". *Calamus* is a genus of some 300 species found in the tropics of Africa and Asia. They are mostly slender-stemmed leaf-climbers, where the pinnae at the outer end of the leaf have been modified into stout, backward-pointing spines.

(21) Uttarahadha : This constellation remains in Sagittarius (Dhan) from 26o40' to 10o of Capricorn (Makar). The first phase (charan) is of Sagittarius (Dhan) and the remaining phases (2-3-4 charan) are of Capricorn (Makar). There are four stars of a bed-stead shape. Vishwadeva are God of this Nakshatra. These Gods have command on brain-cells of a person. The class of 1st and 2nd phase is Mouse (Mushak varg) and 3rd & 4th phase (charan) class (varg) is Lion (Sinh) (Leo). Its origin (Yoni) is Mangoose (Noliya) Manushya Gana, Antya Yunja and Antya Nadi. Its God-master is Sun and the tenure is 6 years. The Sun remains in this constellation for a period from 11th January to 23rd January.

Jack Fruit tree (Fanas) [Artocarpus heterophyllus] This tree is found in hot regions. It is an evergreen, huge & fruitful tree. Its average height is 15 mts. It is found in Northern India, Eastern States and Western ghat of South India. It is also grown in hot-humid regions. West Bengal, Bihar and South India states sow the seeds of this tree. In South India, the fruits are grown with a period of 8 to 10 years. But in Northern part they grow later than this. The fruits are hanging on the main stem or main-big branches. Pickles and vegetables are made from unripe-raw fruits. The ripe fruit is very tasty and healthy-nourishing. Its wood is used in furniture, musical instruments and wood-carving. Small fiber got from beating green wood give Safron/orange colour. This colour is used by Buddhist Monks in colouring sacred clothes. The Gum extracted from this tree is also found useful. This tree should be worshipped by the people of Uttarahadha constellation.

(22) Shravan : This constellation is of Lord Vishnu. Vishnu means the only one who has achieved the highest heights. Some people consider only 22 constellations and they count Abhijeet as the 22nd constellation so 22nd is Shravan. Shravan means to hear. There are three stars in it, and is called as three steps of Lord Vishnu. The deity of this constellation is Lord Vishnu. It is also believed that this constellation pertains to Goddess Saraswati,

the Goddess of Learning. Goddess Saraswati is worshipped on the bright fifth day (Shukal Panchami) when the Sun is in Shravan constellation and Moon is in Revati Constellation.

Aakado (Calotropis gigantea) This tree is found everywhere in India. It is grown in forests, sandy soil, barren land and ruined houses. We consider this as a useless tree and avoid a medicinal herb. Its leaves, roots, bark are used in cough, asthma, lack of appetite etc.

(23) Dhanishtha Dhanishtha mean wealthy-rich. This is a constellation of four stars in shape of a Mrudang (Drum Played at both ends). Its first and second phase (charan) are in Capricorn (Makar), third & fourth phase (charan) are in Aquarius (Kumbha). Its class (varg) is Cat (Manjar), origin is Sinh (Lion-Leo), Anty Yunja and Madhya Nadi. The Sun stays in this constellation from 7th to 19th February. Its God of condition

(Dasha-Naath) is Mars (Mangal) which has tenure of seven years. It has silver-blue colour and origin (Yoni) is woman (Stree).

It possesses hot-tempered virtue (Tamasik Guna). The deities of this constellation are Ashta Vishwadeva-Ashta Vasava. They are spiritual deities are like the Sun. Their nos are eight so good-auspicious work should not be done during the period.

Khijado (Sami) (Prosopis cineria) This tree is found in Gujarat, Punjab, Rajasthan and other States. This tree is of two types in size i.e. big and small. It is very useful in cough, phlegm, Psychosis and other ailments. It is a good fodder for domestic animals in dry-areas. Its leaves, bark and pod are used in these ailments. The person under influence of this constellation has too much thoughtfulness so he should worship this tree and recite following hymn (Mantra) sitting under the tree.

(24) Shatbhisha-Shattaraka-Shattara : Shatbhisha or Shattaraka or Shattara constellation is from 6o40' to 20o of Aquarius (Kumbh). Its all the four phases (charan) are in Aquarius. This constellation is in a circle shape with 100 (hundred) stars in it Varun (Rain God) is its deity. It remains during the period from 20th February to 3rd March. Its first phase (charan) is Manjar (Cat) class (varg) and remaining three are of Mesh (Aires) varg (Class). It has Horse Origin (Ashwa Yoni), Rakshas (Devil) Gana, Antya Yunja and Aadhya Nadi. Its master-Swami is Dragon's head (Rahu) which has period of 18 years. Its command, is on right thing. It is of neuter (Napunshak) gender (Jati) and possesses hot-temper (Tamasik Gun) virtues.

Kadamb : (*Anthocephalus cadamba*) This is an evergreen tree with huge-sheddy leaves of medium size and round shape. It is found everywhere in India. In the Himalayas it is found at the height of 1200 mts. The fruits of this tree are green-yellow with sweet juice in lucrative shape. Its wood is soft. It is used in furniture, building material, tea container boxes and packing material. The wood is useful in carving & designing, Gum, Wax and resin are also available from this tree. The bark and juice of leaves is useful in Cardiac problems, bloodpressure and Rheumatism. Its bark and roots are very effective to children in case of fever and stomachache. This tree is very favoured by Lord Krishna.

(25) Purva-Bhadrapad: This constellation exists at 20o of Aquarius (Kumbh) till 3o20' of Pisces (Min). Its three phases (charan) are in Aquarius (Kumbh) and 4th phase (charan) is in Pisces (Min). It is a conch shape with two stars and deity is Lord Shiva. In this constellation 1st and 2nd phase (charan) are of Mesh Varg (Aries class), 3rd & 4th phase (charan) are of Sarp varg (Snake class). Its origin (Yoni) is Lion (Sinh-Leo), Manushya Gana, Antya Yunja and Aadhya Nadi. The Sun remains in this constellation from 4th to 14th March.

Mango Tree (Mangifera indica) Mango tree is found in hot and semi-hot regions in hilly as well as plain regions. This tree is grown in Hamachal Pradesh, Orissa, Assam, West Bengal, Bihar, Gujarat, Uttar Pradesh, Tamilnadu, Maharashtra and areas of Western Ghar and Eastern Ghat. Mango tree is a very useful tree and everyone loves its fruits. Mango is considered as one of the best and sweetest fruit of the world. Pickles and Powder are made from unripe fruits. Its wood is used for fuel and building material. During festivals and auspicious occasions, green leaves of mango tree are tied in string and kept at the entrance door for good omen. During the Yagna leaves are kept on the pot. During

the Yagna ceremony its wood is considered sacred as a fuel. For the person born during this constellation, Mango tree is considered as a sacred tree for worship.

(26)Uttara Bhadrpad: This constellation exists in Pisces (Min) from 30^o20' to 160^o20'. Uttara Bhadrpad means a beautiful left-leg. It gives strength to control anger. It also denotes long-distance travel, sacrifice and spiritual progress. It is constellation of two stars. Its first phase class (charan varg) is Snake (Sarp), second is Aries (Mesh) third is Lion (Sinh-Leo) and that of fourth is Snake (Sarp). Its origin (Yoni) is Cows (Gau), Madhya Nadi, Antya Yunja, Manushya Gana and Master (Swami) is Saturn (Shani). Its duration is 19 years. Snake God is its deity and the Sun remains in this constellation from 17th to 30th March.

Neem Tree (Limado) (*Azadirachta indica*) Hot atmospheric areas of dry weather and forests of this area have abundant growth of this neem tree. This tree is grown everywhere. In the North and Western part of India. It is grown largely. This tree has a quality of insecticide. It is sheddy tree for travellers. In towns and villages this tree is grown on road-sides, open land and near houses. A bitter juice is available from every part of this tree. It is given a very important status in Ayurvedic sect of treatment. Soap-cake is made from its extracted oil. It is also effective in some other diseases. Its dried leaves are kept in foodgrains and woolen-clothes to protect them from harmful insects and ants. It is also used for ailment of animals. Its wood is used for building material and agricultural tools. This tree is must to worship for those who are born in Uttara Bhadrpad Constellation.

(27) Rewati: This constellation exists from 160^o40' to 300^o of Pisces (Min). There are 32 stars in the shape of a Mridang (Drum played at both ends). Pusan is its deity. Pusan means the deity giving nutrition and prosperity. Pusan is one of the 12 Aaditya. The class (varg) of 1st and 2nd phase (charan) is Sanke (Sarp) and that of 3rd & 4th is Lion (Sinh-leo). Its origin (Yoni) is Elephant (Gaja), Dev-gana, Purva Yunja, Antya nadi and Swami - Adhipati is Mercury (Budha). Its tenure is 17 years. The sun remains in this constellation from 31st March to 13th April. The command of this constellation is on shin-bone (Ghunti-Ankle). Its colour is blue and stree-Yoni. This constellation possesses endowment of virtues (Satvaguni).

Mahudo (*Madhuca indica*) This is a huge, sheddy evergreen tree found in all the forests of Southern India. It is also found in Guajrat, Maharashtra, Andhra Pradesh, Madhyapradesh. They are grown in some plains of Northern India and some regions of Southern India. Oil is extracted from the seeds of its fruits to use in washing-soap-cakes. In some village on the outskirts of forest this oil is used in cooking. It is believed that this oil is used as mixture in vegetable ghee. A healthy nutritious cattle food is also prepared. The tribal people gather the flowers, dry them and use in routine food. The flowers are also used to prepare wine so it is called wine-tree. Wood is used for building material and leaves are used as fodder for the domestic animals. The flowers of this tree are also used as medicinal herb. The people who are born during the period of this constellation should worship this tree.

IV. RESULTS AND DISCUSSIONS

Total 27 plant species belonging to 24 genera and 18 families were recorded.

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REFERENCES

- [1] D.D.Thakkar, R. R. Shah And R.S. Patel, A Preliminary Study on Plant species associated with astrology at Punitvan, Gandhinagar (Gujarat) India Life Sciences Leaflets 16:541 – 545, (ISSN 0976-1098) June 2011
- [2] K. J. Mehta, Jyotish yatra “Kirit jyotish granthmal”
- [3] Shah, G.L. (1978): Flora of Gujarat State, Part I and II, Sardar Patel University, Vallabh Vidyanagar.
- [4] Vruksh Upasana, Van Vibhagh, Gujarat Rajya.

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Styrox nuxvomica



Phyllanthus emblica



Ficus racemosa



Syzygium cumini



Acacia chundra



Dalbergia sissoo



Dendrocalamus strictus



Ficus religiosa



Mesua ferrea

Plate 1



Ficus benghalensis



Butea monosperma



Ficus rumphii



Jasminum auriculatum



Aegle marmelos



Terinalia arjuna



Mytenus emarginata



Mimusops elengi



Bombax malbaricum

Plate 2



Cassia fistula



Calamus rotang



Artocarpus heterophyllus



Calotropis gigantea



Prosopis cineria



Anthocephalus cadamba



Mangifera indica



Azadirachta indica



Madhuca indica

Plate 3

Word of Mouth and Its Impact on Marketing

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Abstract- As a result different aims were drawn; the initial aim of this research is to study the attention of the customers in word of mouth to power their online purchasing activities. The next aim is to analyze the people influenced by interest of word of mouth. The following aim is to examine the marketing behavior bearing in mind the internet progress and word of mouth, their consideration for word of mouth marketing.

In the form of research questions the aims of study are:

- How community utilizes and multiplies word of mouth information about online purchasing experience?
- How communities perceive word of mouth marketing?
- How marketers take word of mouth phenomenon and how they handle it?

Index Terms- Belief, Power, Inspiration, Self expression, Positive attitude to online marketing, Forwarding of contents, Purchasing decision and Standard marketing.

I. INTRODUCTION

Exact from the start, humans have constantly communicated with each other, sharing and talking about everything, everywhere any time. In this mode, it is really easy to share point of views, experiences, disagreements, or constant advices and to build up informal communications. Therefore, people can easily explain their last experience without any trouble and give their experience about the product, the website, the eminence of the service etc. The past thirty years have seen the fast progress of the Internet and the different way to communicate with each other building sharing of information easier and more efficient.

Within a high-speed moving globe and in our modern customer society, where everything is altering rapidly, where products and services are fast becoming out of date, and where firms suggest to the customers an ever more diverse collection of products and services, customers need to face the brutal competition that engages companies to magnetize customers. Consumer buying behavior is becoming more observant what they buy. (Lange & Elliot, 2012). Even if most of the time they will license the cheapest ones with the top quality, it is not actually simple to be sure that it is the good one. People gather concerning information and opinions about product from people before purchasing. (Attia et al, 2012)

“Word-of-mouth is defined as any positive or negative statement made by customers experiences about a product or company, which is made available to a mass of people and institutions using the Internet (Hennig- et al. 2004). Word of Mouth (WOM) can also be clear as the method of communication between two noncommercial people and without benefit in the business they are talking about (Taylor et. al, 2012)

Following consuming the product, more and more consumers are keen to response, creating an exchange of

information between consumers and increasing more and more the Word-of-Mouth fact. Appreciation to the Internet, consumers have the widest likely cause of information to be successful in this way. A bundle of blogs, forums and social networking websites in the World Wide Web present customers the means of getting and sharing this kind of information (Chu & Kim, 2011). Thus, the Word-of-Mouth trend developed firstly through Face-to-face communication's way is now also available by means of all the technologies together with the Internet, most important consumers to the e-Word-of Mouth trend (Fakharyan&Elyasi, 2012). The Internet enhanced the technique to be in touch with people around you or around the world. Online word-of-mouth became more admired with better use of online social network tools such as Facebook, MySpace, and Twitter. Communication vehicles such as face-to-face connections, phones, mobile devices, and even e-mails are replaced by social networks (Ho, J. Y., & Dempsey 2010).

Marketing is a significant division of the companies' strategies. These strategies are more and more inventive and disturbing in people lives. Currently, Word-of-Mouth is also a great aspect in marketing and more above all in e-Marketing. The diverse tools used by marketers in order to pass on information to likely customers are present everywhere on the Web, from advertisements to opinion on blogs or forums. (Hung & Li, 2007). Whether companies like it or not, people chat online about a variety of products and services. Companies frequently are not successful in trying to stop public online discussions of their products by limitation the use of their company names and brands in discussion groups (Huang, J. H., & Chen, Y. F, 2006).WOM also called E-WOM (Electronic Word of Mouth) can be originating in effective communities: consumer reviews, blogs, forums, and social networks (Yi-Wen Fan & Yi-Feng Miao 2012). Communal norms or opinions in the effective communities affect approval of eWOM, mainly between regular internet users (Kozinets, et. al 2010).

It is ever harder to make a choice to purchase a computer or even a coffee machine. Many people take friend's advices and remain alert of all the substitutes given to them. Many analysts say that the person can make the accurate and stable decision (Ren et al, 2013). Most persons found that social set-ups have a greater influence on others than themselves, and that third person influence undesirably on individual's behavioral aim related to word of mouth communication (Cengiz& Yayla,2007).. Online word of mouth occurs just among few people, but a message is sent by people on various discussion platforms where many other users notice it directly.

II. LITERATURE REVIEW & HYPOTHESIS DEVELOPMENT

Early studies on WOM have shown that it has an important impact on customer decisions (Allsopet al.2007), and helps to

present a good post-purchase wakefulness. Word-of-Mouth might have different kinds of special effects in the present world. Initially, it could be optimistic or unconstructive effects. Secondly, it could have an effect on the product, the brand, the service or even the employees' performance within the company (McGriff, J. A., 2012). Word-of-Mouth's effects might have dissimilar targets. A successful product sharing could be affected by positive word of mouth and lack of negative word of mouth (Mcgriff, J. A., 2012). An additional target could be the entrance of a brand in a fresh market. If the brand has not a good representation by the Word-of-Mouth distribution, it will be really hard for the company to set off its products and services in this fresh market.

In the earlier period, online shopping has crossed the space to become primarily well-known, particularly among the little and wealthy (Chai, S., & Kim, M, 2010). Nonetheless, due to the quality concerns and other customer supposed risks (Thorson & Rodgers, 2006), the challenges of e-shopping, mostly with respect to awareness and doubt, have begun to surface (Sharma & Arroyo, 2012). Consumers who want to purchase products from online markets, they need positive, dependable, and honest evaluation about products. Online systems and electronic-Word-of-Mouth (e-WOM) help customers make such up to date decisions.

At present new technologies are all over the place around us. These new technologies altered our way to communicate and to interconnect with people. People now use more technology platforms such as email, chitchat, phone or social networking websites (Herr et. al. 1991) than previous to, when they used face-to-face communication or mails. Usability of these technologies makes them more eye-catching and facilitates people's communication. The communication's technology, which is the most motivating for Word-of-Mouth, is the social networking websites in World Wide Web. These kinds of websites could be finding in the form of blogs, forums or personal pages such as Facebook or MySpace (Vilpponen et al 2006). They are typically created by some people who broaden the site to their own personal networks and steadily the number of people following and concerned in this site grows up (Thurauet. al. 2009). (Brown et. al.2007) studied the impact for an individual to control another individual by social networking websites. They accomplished in the importance of this technology to share out an idea from individual to individual and then from this individual to one more individual. Furthermore they ended that someone with few friends will have a better impact on his friends when he will pass on a message than someone with a lot of friends (Brown et. al. 2007).

In corporation, a significant effect of Word-of-Mouth is the customer purchase (Osmonbekovet. al. 2009). From short-range effect to lasting effect, Word-of-Mouth communication is a good way for enterprises to catch the attention of new customers. It is achievable to measure it thanks to Word-of-Mouth referrals and to the sign-up processes (Thurauet. al. 2009). If customers never heard about a brand or if they never thought to buy a product or a service by this brand, the actuality that some connections suggest this brand to them will most likely affect their behavior and guide them to choose this brand over another one. A lot of people seek out recommendation from other people before buying something. The first persons that you will talk with are family

members, and then you will give more response to someone with experience and information in this field. The persons most affected by this are people in towering uncertainty-avoidance culture (Osmonbekov.et. al. 2010), who need to be more at easiness and who will ask advice from their dependable relatives. One of the strongest networks of communication in the market is word of mouth (Allsop et al). Word-of-Mouth has a dissimilar impacting people that are without a fundamental knowledge of this part of business .When you do not have any experience in a part of business you will be more biased by someone who will tell you something positive or negative about a picky brand. (Goldsmith, R. E., & Horowitz, D 2006).Alternatively if you have your own standard brand you will be less tempted by another brand that a comparative advises you to purchase. Though Word-of-Mouth communication about the brand that you are usually using is negative you will be perhaps extra affected.

H1:Customer perceived belief, power; inspiration in their links is absolutely associated to their engagement in WOM behaviors in making decision on the basis of marketing

H2: The self-expression of WOMmessage has a straight positive outcome on the possibility that the message will be mutual with others.

H3: High (versus low) perceived WOM interactivity will give way further positive attitudes to the online marketing i.e. website, impressions of the applicant, and voting intentions.

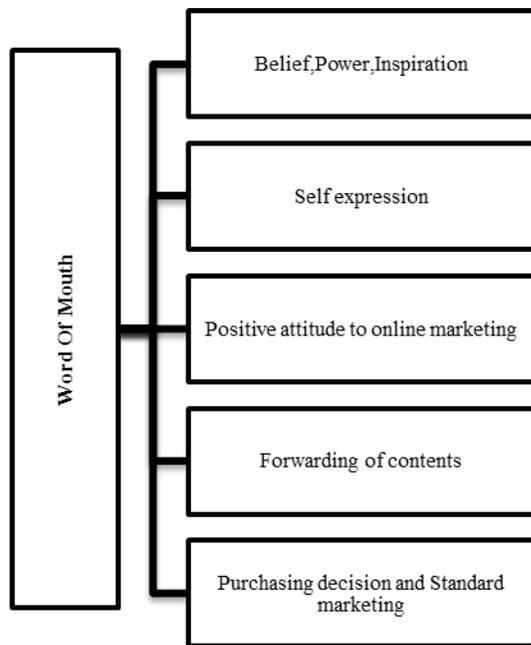
H4:The need to belong will positively affect the forwarding of Contents through all possible means of communications i.e. electronic media, print media, social media etc.

H5: Word of mouth positively affects the purchasing decision and standard marketing

III. METHODOLOGY

3.1 Research design:

Impact of word of mouth on purchasing behavior of communities will be seen in this research. And for that descriptive study will be done on consume attitudes and behaviors in relation to shopping, personal productivity, advertising, and entertainment.



3.2 Population and sampling:

To confirm that the sample selected is representative of the population, stratified sampling will be used in this research where the population will be broken down into categories, and a random sample will be taken from each category. For this study, a well-designed questionnaire will be exercised. The questionnaires will direct to 150 respondents constituting the sample size.

3.3 Data collection:

Data will be collected through the use of primary or secondary sources. Primary research design will be included both quantitative and qualitative method ie structured questionnaire and unstructured interview will be conducted. Questionnaire will help to view the public opinion more broadly. Interview will give an excellent result due to respondent's expertise experiences. Secondary data will be included help taken from articles, research papers, blogs, etc. related to word of mouth impact on purchasing behavior of online communities.

3.4 Procedures and measures:

The questionnaire will be circulated to different respondent. The respondents will be from two different ecommerce websites. The interview questions would be like marketing behavior of company, word of mouth impact on overall marketing, changes in marketing due to awareness of internet. Questionnaires would be like how customer responds to changes of new product/services. The second questions would be like customers are satisfied from marketing purchasing experience, the last part would be like how customer perceive word of mouth, and they can give any additional comment regarding word of mouth online purchasing behavior. Responses will be used to test the hypothesis

The respondents will be given four options to choose one from 4. ordinal scale will be used and Likert scale will be used whether they agree or disagree with the statements.

IV. CONCLUSION

Impact of word of mouth on marketing arises due to social media where people see comments of the people who did shopping from such places. They see whether or not it would be effective for them to buy such things or not. so marketers become aware of people choices now and they try to improve or produce better quality, due to customers loyalty.

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REFERENCES

- [1] Allsop, D. T., Bassett, B. R., & Hoskins, J. A. (2007). Word-of-mouth research: principles and applications. *Journal of Advertising Research*, 47(4), 398.
- [2] Attia, A. M., Aziz, N., & Friedman, B. A. (2012). The impact of social networks on behavioral change: a conceptual framework. *World Review of Business Research*, 2, 91-108.
- [3] Brown, J., Broderick, A. J., & Lee, N. (2007). Word of mouth communication within online communities: Conceptualizing the online social network. *Journal of interactive marketing*, 21(3), 2-20.
- [4] Cengiz, E., & Yayla, H. E. (2007). The effect of marketing mix on positive word of mouth communication: Evidence from accounting offices in Turkey. *Innovative Marketing*, 3(4), 73-86.
- [5] Chai, S., & Kim, M. (2010). What makes bloggers share knowledge? An investigation on the role of trust. *International Journal of Information Management*, 30(5), 408-415.
- [6] Chu, S. C., & Kim, Y. (2011). Determinants of consumer engagement in electronic word-of-mouth (ewom) in social networking sites. *International Journal of Advertising*, 30(1), 47-75.
- [7] Fakharyan, M., Reza, M., & Elyasi, M. (2012). The influence of online word of mouth communications on tourists' attitudes toward Islamic destinations and travel intention: Evidence from Iran. *African Journal of Business Management*, 6(33), 9533-9542.
- [8] Fan, Y. W., & Miao, Y. F. (2012). Effect of electronic word-of-mouth on consumer purchase intention: The perspective of gender differences. *International Journal of Electronic Business Management*, 10(3), 175.
- [9] Goldsmith, R. E., & Horowitz, D. (2006). Measuring motivations for online opinion seeking. *Journal of interactive advertising*, 6(2), 1-16.
- [10] Hennig, T., Gwinner, K. P., Walsh, G., & Gremler, D. D. (2004). Electronic word-of-mouth via consumer-opinion platforms: what motivates consumers to articulate themselves on the internet?. *Journal of interactive marketing*, 18(1), 38-52.
- [11] Hennig, T., Malthouse, E. C., Friege, C., Gensler, S., Lobschat, L., Rangaswamy, A., & Skiera, B. (2010). The impact of new media on customer relationships. *Journal of Service Research*, 13(3), 311-330.
- [12] Herr, P. M., Kardes, F. R., & Kim, J. (1991). Effects of word-of-mouth and product-attribute information on persuasion: An accessibility-diagnostics perspective. *Journal of Consumer Research*, 454-462.
- [13] Huang, J. H., & Chen, Y. F. (2006). Herding in online product choice. *Psychology & Marketing*, 23(5), 413-428.
- [14] Hung, K. H., & Li, S. Y. (2007). The influence of eWOM on virtual consumer communities: Social capital, consumer learning, and behavioral outcomes. *Journal of Advertising Research*, 47(4), 485.
- [15] J. Y., & Dempsey, M. (2010). Viral marketing: Motivations to forward online content. *Journal of Business Research*, 63(9), 1000-1006.
- [16] Kozinets, R. V., De Valck, K., Wojnicki, A. C., & Wilner, S. J. (2010). Networked narratives: Understanding word-of-mouth marketing in online communities. *Journal of marketing*, 74(2), 71-89.

- [17] Lange-Faria, W., & Elliot, S. (2012). Understanding the role of social media in destination marketing. *Tourismos. An International Multidisciplinary Journal of Tourism*, 7(1).
- [18] Mcgriff, J. A. (2012). A conceptual topic in marketing management: the emerging need for protecting and managing brand equity: the case of online consumer brand boycotts. *International Management Review*, 8(1), 49-54.
- [19] Ren, L. C., Wu, M., & Lu, J. T. (2013). Research on the Classification of Reviewers in Online Auction. *International Journal of Computer Science Issues*, 10(1), 1694-0814
- [20] Sharma, R. S., Morales-Arroyo, M., & Pandey, T. (2012). The Emergence of Electronic Word-of-Mouth as a Marketing Channel for the Digital Marketplace. *Journal of Information, Information Technology, and Organizations*, 6, 2011-2012.
- [21] T. W., Osmonbekov, T., & Czapslewski, A. J. (2006). eWOM: The impact of customer-to-customer online know-how exchange on customer value and loyalty. *Journal of Business research*, 59(4), 449-456.
- [22] Taylor, D. G., Strutton, D., & Thompson, K. (2012). Self-Enhancement as a Motivation for Sharing Online Advertising. *Journal of interactive marketing*, 12(2), 28.
- [23] Thorson, K. S., & Rodgers, S. (2006). Relationships between blogs as ewom and interactivity, perceived interactivity, and parasocial interaction. *Journal of Interactive Advertising*, 6(2), 39-50
- [24] Vilpponen, A., Winter, S., & Sundqvist, S. (2006). Electronic word-of-mouth in online environments: exploring referral network structure and adoption behavior. *Journal of Interactive Advertising*, 6(2), 71-86.

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