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Association between Intima-Media Thickness of the Carotid Artery and Risk Factors for Cardiovascular Disease in Patients on Maintenance Hemodialysis

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Abstract- Cardiovascular risk factors were recorded and then carotid intima-media thickness was measured by using B-Mode high-resolution ultrasonography, 1 cm proximal to the carotid bulb in the posterior wall. Finally, correlation between other risk factors and CIMT was made. Total 106 patients were participated in the study but 6 patients were lost to follow up. 100 patients with chronic and advanced renal disease were evaluated, including 55% females and 45% males. The mean age of these patients was 60.2 ± 13.1 years, with a range of 25-81 years. Correlations between CIMT and age ($P = 0.023$), dialysis duration ($P = 0.017$), number of cigarettes smoked ($P = 0.026$), diastolic blood pressure ($P = 0.013$) and fasting blood sugar ($P = 0.045$) were significant. Risk factors for cardiovascular disease in patients on hemodialysis are of significant interest because of the high prevalence and frequency of the disease in this group of patients. However, in the present study, we were not able to find a very consistent and definite role for some risk factors in our patients. More studies are required to make clear the role of these factors in patients on hemodialysis.

Index Terms- CIMT, ESRD, maintenance hemodialysis, cardiovascular risk factor

I. INTRODUCTION

Patients with end stage renal failure commonly have different cardiovascular problem and cardiovascular disease is the most common cause of death in patients with end-stage renal disease and accounts for most of the morbidity in this group. Renal data show that CV diseases are the cause of death in 51-55% of dialysis and 37% of kidney transplant recipient patients in the western countries^(1,2,3). Burden of chronic kidney disease is very much alarming in our country. In United States one of nine people suffers from cardiovascular disease is the most common cause of morbidity and mortality in patients with end-stage renal disease. Atherosclerosis is a systemic disease, carotid and coronary vessels are at comparable risk for developing pathologic changes. For this reason, increase in the thickness of the intima-media layers of carotid arteries can be a harbinger of coronary atherosclerosis and also a prognostic factor for cardiovascular accidents.

Atherosclerosis, which is the most important cause of mortality and morbidity in patients with ESRD, begins many years before the development of clinical manifestations.^(4,5) Studies have shown that hemodialysis patients have advanced changes in the walls of their arteries, which can present as increased intima-media thickness (IMT) in the carotid and femoral arteries^(6,7) Considering the fact that atherosclerosis is a systemic disease, carotid and coronary vessels have equivalent risks for developing atherosclerosis, increased carotid IMT (CIMT) can be used as a sign of atherosclerosis in the coronary arteries and as a prognostic factor after CV accidents.⁽⁸⁾ In multiple studies, a significant association has been shown between pathologic changes in coronary vessels and increased IMT in the carotid arteries⁽³⁾. The aim of this study was to assess vascular changes in hemodialysis patients in the course of the disease and the CIMT is highly correlated with other CV risk factors in our population. In this study we present our findings on the use of high-resolution carotid ultrasonography as a non-invasive technique for diagnosing, and thus slowing or halting the progress of atherosclerosis in patients on dialysis.

In this study, we evaluated the status of carotid intima-media thickness (CIMT) in patients with ESRD on dialysis and analyzed its association with other risk factors for cardiovascular diseases.

II. MATERIALS AND METHODS

This cross-sectional study was carried out in Department of Medicine, CSM Medical University, Lucknow, UP, India during January 2009 to December 2011 in patients with renal failure, who were referred for hemodialysis to the nephrology unit, and fulfilled the inclusion criteria of the study, were evaluated. Patients with ESRD on regular hemodialysis and who gave written consent for participation were included in the study. Patients in whom carotid Doppler ultrasonography could not be performed were excluded from the study. Data required for the study were extracted from the record files of patients (regarding CV risk factors). ESRD was defined as chronic advanced kidney disease in which the glomerular filtration rate (GFR) was less than 15 mL/min. Diabetes was defined as the presence of hyperglycemic symptoms (polyuria, polydipsia) plus random blood glucose concentration ≥ 200 mg/dL or fasting blood sugar

≥ 126 mg/dL as per ADA guidelines.⁽⁹⁾ Hypertension was defined as systolic blood pressure ≥ 140 mmHg or diastolic blood pressure ≥ 90 mmHg.⁽¹⁰⁾ Obesity was defined as body mass index (BMI) >30 kg/m²,⁽¹¹⁾ and hyperlipidemia was defined as plasma cholesterol levels ≥ 240 mg/dL or plasma low-density lipoprotein (LDL) levels ≥ 160 mg/dL⁽¹²⁾ or plasma triglyceride levels ≥ 150 mg/dL.⁽¹³⁾ Carotid Doppler ultrasonography was performed by a single operator expert ultrasonologist and intima media thickness (IMT) was measured; the operator was blinded about the history and laboratory findings of the patients.

The IMT was defined as a hypo-echogenic space between two echogenic lines containing intima-media interface and media-adventitia interface on the posterior wall of the carotid artery^(6,14,15). For performing carotid Doppler ultrasonography, the patient was asked to lie down on the examination table in the supine position. His/her neck was rotated in a superior and leftward direction so that the right carotid artery was exposed. Following this, using a B-mode high-resolution ultrasonography system (HDI 5000 Sono CT Philips), the length of the artery was determined, and at the site of bifurcation of the common carotid artery (carotid bulb), the posterior wall was exposed and IMT was measured. If atherosclerotic plaques were found on the carotid artery, their presence and number were recorded on the data collection forms. An atherosclerotic plaque was defined as a local thickness of intima greater than 1 mm or two times more than its adjacent normal layer⁽¹¹⁾.

For statistical analysis of data, ratio and rate were used for qualitative variables and mean and standard deviation for quantitative data. Also, χ^2 test was used for comparison of rates and *t*-test was used for comparison of means. Correlation test was used for evaluating the association of quantitative variables. In this study, statistical significant level was considered as *P* value <0.05 .

III. RESULTS

In this study, 100 patients with advanced and chronic renal disease were evaluated; 45% were males and 55% were females. Their mean age was 60.2 ± 13.1 years (range 25-81 years). Past medical history revealed that 45 patients were diabetic (45%), 72 patients (72%) hypertensive, 18 had history of myocardial infarction (MI), 8 had history of cardiovascular accident (CVA) and 18 were smokers. The mean number of cigarettes smoked in this group was 144.75 ± 23.5 cigarettes/ year, with a range of 50-200 cigarettes/year. The mean duration on dialysis was 3.75 ± 4.14 years (range 2-6 years). The mean BMI was 29.88 ± 3.75 Kg/m² (range 18.6 to 35.9); the mean systolic blood pressure was 144.4 ± 23.5 mmHg (range 110-190 mmHg) and mean diastolic blood pressure was 77.8 ± 7.45 mmHg (range 60-90 mmHg).

On high-resolution carotid ultrasonography, carotid plaques were detected in 58 patients (58%). Among them, 68% had a single plaque and 32% had two or more plaques. The mean right CIMT was 0.938 ± 0.304 mL (range 0.40- 1.80 mL). The results of serum bio-chemical tests have been summarized in (Table-1). Correlation coefficients between right CIMT and quantitative variables in the study for detecting their associations are shown in (Table-2). The means of studied variables in patients with and without plaques in the carotid artery are shown in (Table-3).

Data in this study show that 61% of female patients and 63% of male patients had plaques in their carotids. The difference was not statistically significant ($P > 0.05$). In patients with history of diabetes, the prevalence of carotid plaques was 46.5% compared with 19% in non-diabetic patients; this difference was statistically significant ($P = 0.011$). In patients with a history of hypertension, 65.7% had carotid plaques compared with 33.0% in the normotensive patients. Comparison of these rates by χ^2 test showed a statistically significant difference ($P = 0.035$). In patients with a history of MI, 76% had carotid plaques compared with 60% in patients with no history of MI. This difference was not statistically significant ($P > 0.05$). About 33.1% of the patients with a history of CVA had carotid plaques compared with 63.8% without history of CVA, a difference which was not significant ($P > 0.05$). Among patients with history of smoking, 75% had carotid plaques compared with 39.5% among non-smokers; this difference was statistically significant ($P = 0.011$). Patients with longer duration on dialysis and elderly patients had high IMT ($P=0.017$ and 0.023 , respectively).

IV. DISCUSSION

Atherosclerosis is a systemic disease and both carotid and coronary vessels are at equal risk for developing it. For this reason, increased CIMT is a harbinger of coronary atherosclerosis and a prognostic factor for CV outcome. In addition, the risk factors for involvement of both arteries are more or less similar. Findings of this study suggest that presence of diabetes is significantly associated with increased CIMT. Our findings are in corroboration with findings reported by Modi et al from India⁽¹⁴⁾ and Ishimura et al from Japan.⁽¹⁶⁾ It seems that diabetes acts as a risk factor for developing atherosclerotic plaques in patients on hemodialysis.

In the present study, there was no association between history of MI and CVA, and CIMT, which is different from the findings of Modi et al⁽¹⁴⁾ The difference may be related to the existence of multiple risk factors in this group of patients; thus, the other risk factors might have a role to play in patients with increased CIMT and without previous history of MI. In this regard, smoking has shown a significant association.

Our study showed a direct association between diastolic blood pressure and CIMT. Such association was not seen for systolic blood pressure. Study conducted by Abdolghaffar et al,⁽¹⁷⁾ showed significant association between systolic and diastolic blood pressure and CIMT in non-HD CRF patients. Ishimura et al from Japan⁽¹⁶⁾ and Poyrazoglu HM et al from Turkey⁽¹⁵⁾ failed to show significant association between these two variables.

In our findings, diabetes is a risk factor for developing plaques in the carotids. However, there was no significant correlation between CIMT and other estimated variables. Definite conclusions about correlation between other evaluated variables and CIMT can be drawn only after further studies with more participants.

This study shows a direct and significant correlation between CIMT and duration on dialysis; the CIMT increased with a direct association with duration on dialysis. In our study, age of the patients had a positive and somewhat significant association with CIMT such that in the older patients, average level of CIMT was more than in the younger group. Similar results have been reported by Modi et al.⁽¹⁴⁾ These results are predictable when one

understands the pathophysiology of atherosclerosis and its known association with aging process.

V. CONCLUSION

We summarize that there is a significantly increased frequency and prevalence of cardiovascular risk factors in patients on

hemodialysis. These factors, based on previous investigations, play a key role in the development of atherosclerosis. In this study, age, dialysis duration, number of cigarettes smoked, diastolic blood pressure and diabetes were shown to be atherogenic.

Table 1: Results of laboratory test in the studied patients (N=100)

Biochemical parameter	Minimum	Maximum	Mean	Standard deviation
Hemoglobin (g/dl)	6.4	14.5	10.4	1.73
Blood urea nitrogen (mg/dl)	22	110	66	17.45
Creatinine (mg/dl)	3.1	9.80	6.45	2.29
Phosphorus (mg/dl)	2.95	9.75	6.35	1.64
Calcium (mg/dl)	7.35	13.0	10.17	1.28
Albumin (gm/dl)	3.1	9.4	6.25	1.36
Triglyceride (mg/dl)	33	334	1183.5	64.86
Cholesterol (mg/dl)	60	235	147.5	40.30
Low density lipo-protein (mg/dl)	42	192	117	30.32
High-density lipoprotein (mg/dl)	17	100	58.5	16.54
Fasting plasma glucose (mg/dl)	85	248	166.5	41.20

Table 2: Correlation coefficient between right carotid intima media thickness and quantified variables in the studied patients

Variables	Pearson correlation coefficient with right CIMT	P-value
Age	+0.475	0.025
Number of plaque	+0.245	0.167
Duration of dialysis	+0.436	0.18*
Number of cigarette studied	+0.430	0.027*
Systolic blood pressure	+0.215	0.136
Diastolic blood pressure	+0.454	0.014*
Hemoglobin	+0.130	0.366
Blood urea nitrogen	-0.103	0.483
Creatinine	-0.01	0.493
Phosphorus	-0.216	0.142
Calcium	-0.216	0.142
Albumin	-0.158	0.276
Triglyceride	+0.165	0.256
Cholesterol	+0.075	0.608
Low density lipoprotein	+0.064	0.665
High density lipoprotein	0	0.998

Fasting plasma glucose	+0.345	0.046*
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* Significance

Table 3: Mean of the evaluated variables in patients with and without plaques in the carotids.

Variables	Mean		P values
	Patients without plaques	Patients with plaques	
Age (years)	52.83±14.65	63.5±10.9	0.022*
Duration on dialysis (years)	2.16±3.15	4.15±4.66	0.025*
Body mass index	25.1±3.74	25.2±3.65	0.785
Number of cigarette smoked (pack/year)	100±70.65	158±82.1	0.018*
Systolic blood pressure (mmHg)	145.15±23.32	142.1±23.85	0.870
Diastolic blood pressure (mmHg)	72.2±5.6	88.04±8.22	0.058
Hemoglobin (gm/dl)	10.36±1.58	10.90±1.75	0.285
Blood urea nitrogen (mg/dl)	58+80±16.80	63.82±17.75	0.317
Creatinine (mg/dl)	8.85±1.96	7.85±2.5	0.145
Phosphorus (mg/dl)	5.94±1.42	6.10±1.75	0.732
Calcium (mg/dl)	8.94±0.95	9.45±1.46	0.165
Albumin (gm/dl)	4.86±1.58	4.46±1.24	0.275
Triglyceride (mg/dl)	134.21±62.45	150.51±65.65	0.392
Cholesterol (mg/dl)	137.75±44.75	154.75±36.12	0.577
Low density lipoprotein (mg/dl)	107.06±32.3	110.36±29.12	0.970
High density lipoprotein (mg/dl)	37.25±14.86	39.10±17.5	0.58
Fasting plasma glucose (mg/dl)	118.8±36.56	134.48±44.48	0.033*
Right carotid intima-media thickness (mm)	0.76±0.26	0.97±0.33	0.030*

*significance

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A working Framework for the User-Centered Design Approach and a Survey of the available Methods

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Abstract- User-Centered Design (UCD) is a philosophy and a process that places the person at the centre and focuses on cognitive factors as they come into play during peoples' interactions with things. It concerns and can improve itself with both usefulness and usability. A key aspect of successful User-Centered Design is evaluating early and throughout the UCD process. User centered design is receiving increasing attention in recent years. Various methods and tools are used within organizations to improve the understanding of user and task requirements, support the iteration of design and evaluation. User-Centred Design Methods can be extremely valuable although using them in the right way, for the right reasons and at the right time is critical. It will differ from project to project to decide exactly which method to use, and when and how to use.

Index Terms- User-Centered Design, Multi-disciplinary Design, Participatory Design Methods, And Profiling Methods.

I. INTRODUCTION

The User-Centered Design (UCD) can be defined in many ways, but all definitions are characterized by a focus on the user, and on incorporating the user's perspective in all stages of the design process. Donald Norman describes UCD as "a philosophy based on the needs and interests of the user, with an emphasis on making products usable and understandable" ([1] Norman 2002, p.188). By this definition, actual user involvement is not a part of UCD by necessity. However, involving the users in the User-Centered Design process is a common way of ensuring that their needs and interests are being met.

UCD is a project approach that puts the intended users of a site at the centre of its design and development. The salient features of the UCD approach are: firstly it involves the stakeholders directly during the whole of the development process and secondly the processes are carried out in an iterative fashion, with the cycle being repeated until the projects usability objectives have been attained. This makes it critical that the participants in these methods accurately reflect the profile of the actual users.

In this paper we present the User-Centered Design principles in section 2. In section 3 from the literature, we present a comparison of the most common user-centered design methods outlining their cost and showing when to use them. Then in

section 4 we propose taxonomy of the User-Centered Design methods and why this is essential for the User-Centered Design framework. Based on the taxonomy we tabulate the existing User-Centered Design methods as proposed by the researchers showing the number of stakeholders' participation and the field of application of the respective methods. In the next section we present an analysis and discussion where we discuss the advantages and limitation of each method

II. USER-CENTERED DESIGN PRINCIPLE

ISO 13407 outlines four key human-centered design activities as: Requirements gathering, Requirements specification, Design, Evaluation. The User-Centered Design process has also been formalized in the [4] ISO-standard 13407 Human-centered design processes for interactive systems (ISO 1999). The standard describes UCD as an iterative process which is depicted in figure 1, and also states the following key principles:

- 1- The active involvement of users and clear understanding of user and task requirements.
- 2- An appropriate allocation of function between user and system.
- 3- Iteration of design solutions.
- 4- Multi-disciplinary design teams.

In order to make the users an active part of each step in this process there are a number of empirical methods, such as: Interviews, Surveys, Workshops, Focus groups, Field studies, Usability testing.

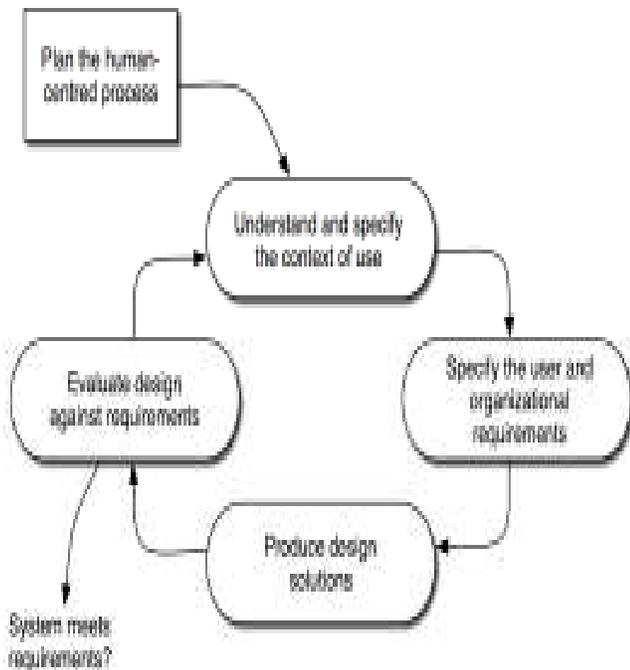


Figure 1. The human-centered design process, ISO-13407

User-Centered Design is a user interface design process that focuses on usability goals, user characteristics, Environment, tasks, and workflow in the design of an interface. UCD follows a series of well-defined methods and techniques for analysis, design, and evaluation of mainstream hardware, software, and web interfaces. The UCD process is an iterative process, where design and evaluation steps are built in from the first stage of projects, through implementation. [6]Rubin (1994) presents the UCD principles as: “to give early focus on requirements and tasks for Empirical Measurement and testing of product usage and also focuses on iterative Design.” The goal of UCD is to produce products that have a high degree of usability. [5] ISO 9241-11 (1998) defines usability as the “extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use.” [6]Jeffrey Rubin (1994) describes usability objectives as: Usefulness, Effectiveness (ease of use), Learnability, Attitude (likeability).

III. BROAD CLASSIFICATION OF AVAILABLE UCD METHODS

User-Centered Design is a design philosophy in which the emphasis is on the user and the aim is at the high level of usability. The UCD expert is focused on usefulness, ease of use and ease of learning for the user. This approach comprises a set of steps, methods and tools designed. It

Should be used at the early stage of the process that designers may find greatest use of the UCD methodology’s method ([16] Rauterberg.M, 2003). There are three phases of the UCD approach i.e. understanding the users, designing the product and evaluating the user’s interaction with the product. These three phases include specific deliverables and goals ([17]Kravetz.) In this paper we are considering twelve methods of User-Centered Design namely:

1. Card Sorting
2. Contextual Inquiry
3. Focus Groups
4. Interviews
5. Log File Analysis
6. Paper Prototyping
7. Surveys
8. Task Analysis
9. Usability Test and
10. Expert Review
11. Guided Walkthrough
12. Heuristic Evaluation

The following chart compares the most common User-Centered Design methods, outlines their cost and shows when to use them.

Empirical Methods: In these methods, data and the information are gathered directly from the users through observations and these methods are well known and widely used to evaluate the usability of a product. This is due to their effectiveness and cost-efficiency in discovering usability problems. These are the few methods within the User-Centered Design process that does not involve any direct contact with end users. Inspection methods are “expert” evaluations. These methods are useful when users are unavailable or when objective, high-level observations are needed.

Objective:

Inspection methods leverage domain expertise and best practices to provide quick and specific recommendations for product enhancements.

Methods:

1. Walkthrough
2. Heuristic Evaluation
3. Expert Review

The following chart compares the user-centered design methods; based on the taxonomy we tabulate the existing User-Centered Design methods as proposed by the researchers showing the number of stakeholders’ participation and the field of application of the respective methods.

Table 1: Comparison of UCD Methods

Classification	Cost	Output	Early Design & User requirements	Time resources required	When to use
Card Sorting	High	Statistical	Yes	Low	Design
Contextual Inquiry	Medium	Stat. & Non-Stat	Yes	Medium	Requirements Gathering
Focus Group	High	Non-Statistical	Yes	Low	Requirements Gathering
Interviews	Low	Non-Statistical	Yes	Low	Requirements [18] Gathering & Evaluation
Log File Analysis	Low	Statistical	Yes	Low	Evaluation
Paper Prototyping	Medium	Stat. & Non-Stat	No	Medium	Design
Surveys	Low	Statistical	Yes	High	Requirements Gathering & Evaluation
Task Analysis	Medium	Stat. & Non-Stat	Yes	Medium	Requirements Gathering
Usability Test	Medium	Non-Statistical	No	Medium	Design & Evaluation
Expert review	Low	Statistical	No	Low	Design and evaluation
Guided Walkthrough	Medium	Stat. & Non-Stat	No	Medium	Design
Heuristic Evaluation	Low	Statistical	No	Low	Design

IV. TAXONOMY OF USER-CENTERED DESIGN METHODS

User-Centered Design is an iterative development environment [4]. The ISO 13407 standard explains how this can be structured. Iteration can take place in the small,

In these methods, data and the information are gathered directly from the users through observations and interviews. The following methods come under the Empirical Methods.

- 4.1.1. Inquiry Methods
- 4.1.2. Participatory Design Methods
- 4.1.3. Profiling Methods
- 4.1.4. Testing Methods

4.1.1. Inquiry Methods

Inquiry methods are helpful for all projects because they lay the foundation for product projects design and development. It will be the foundation for creating feature sets and core requirement. Inquiry drives early design decisions and is most effective if the target user is clearly and narrowly defined.

Objective:

The objective of Inquiry methods is to become familiar with user needs and expectations, to inform business and user requirements.

Methods:

- 1. Focus Group
- 2. Contextual Inquiry
- 3. Surveys
- 4. Log File Analysis

4.1.2. Participatory Design Methods

Participatory design methods are well suited for projects with complex labeling, taxonomy, or projects interface issues. It is based on users' active involvement in developing the product.

Objective:

Participatory design methods lead to rapid verification of design iterations, which greatly reduces time and costs for fixing design flaws.

Methods:

- 1. Card Sorting
- 2. Paper prototyping Test

4.1.3. Profiling Methods

Profiling methods are particularly beneficial for when users are not accessible, budgets are tight, or development teams are spread out geographically.

Objective-

Profiling methods create empathy for your end users, which help facilitate product design and leads to clarity of the product vision.

Methods:

- 1. Task Analysis

4.1.4. Testing Methods

These methods provide the most value for a project when product concepts have been verified with users.

Objective:

Testing methods reduce usability risks prior to product launch; create benchmarks to which future releases will be compared; and significantly reduce support-related costs.

Methods:

4.2. Inspection Methods

These methods are well known and widely used to evaluate the usability of a product. This is due to their effectiveness and cost-efficiency in discovering usability problems. These are the few methods within the User-Centered Design process that does not involve any direct contact with end users.

Inspection methods are "expert" evaluations. These methods are useful when users are unavailable or when objective, high-level observations are needed.

Objective:

Inspection methods leverage domain expertise and best practices to provide quick and specific recommendations for product enhancements.

Methods:

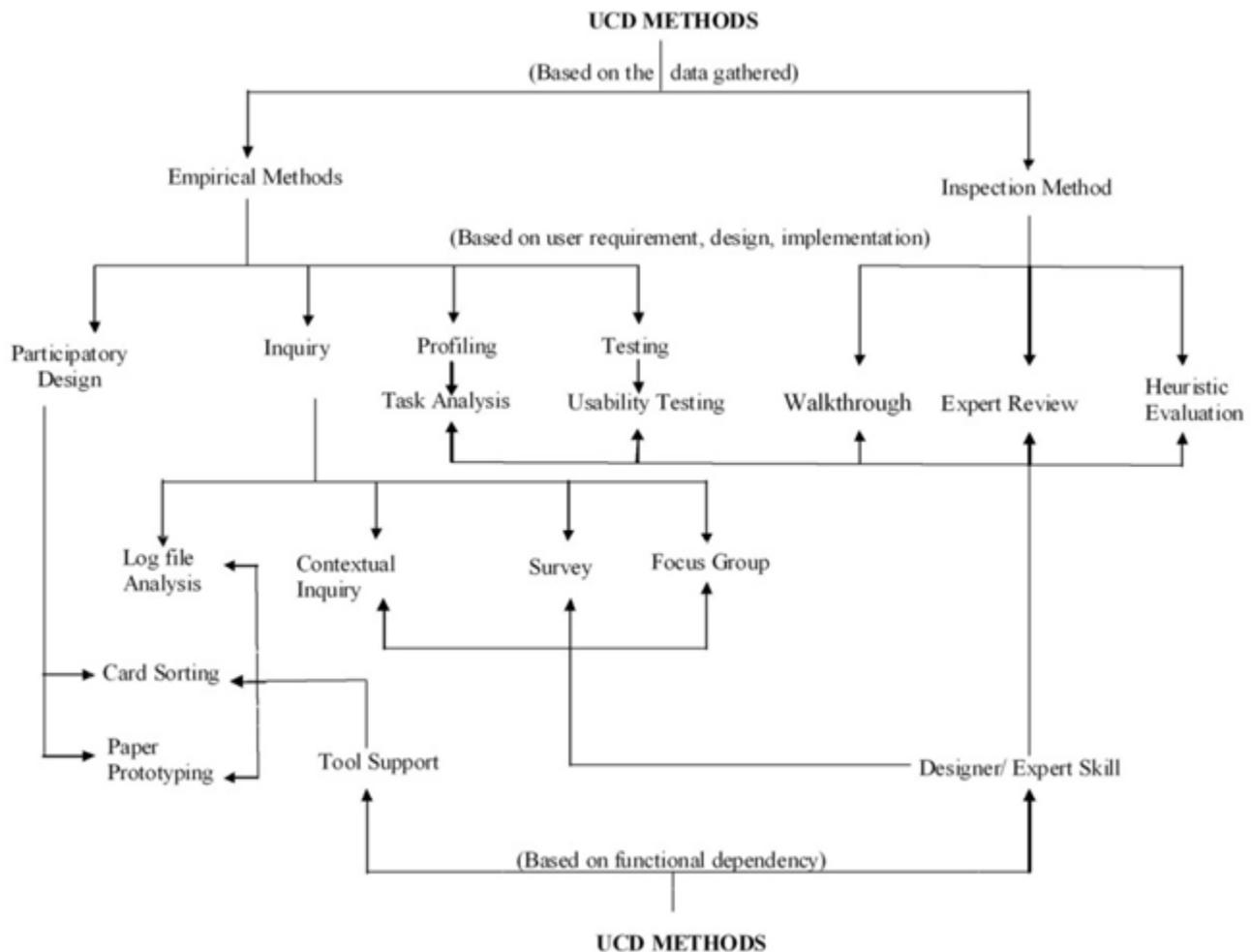
- 1. Walkthrough
- 2. Heuristic Evaluation
- 3. Expert Review

The following chart compares the user-centered design methods; based on the taxonomy we tabulate the existing User-Centered Design methods as proposed by the researchers showing the number of stakeholders' participation and the field of application of the respective methods.

Table 2: UCD Methods description and its application area

Classification	No. of Stakeholders involved	Functional Dependency	Application area
Card Sorting	10-20 users	Tool Support: The tool support is available based on the method. Stakeholder efforts are combined and analyzed statistically through IBM'S EZ which is used as a tool that helps analyze the stakeholder activity. This tool comprises two packages that is U sort and Ez Calc. U Sort is used by card sorting Participants to sort virtual cards or the designer can input after the physical card activity has been done.	designing a new site designing a new area of a site redesigning a site ([9]Maurer,and Warfel, (2004))
Contextual Enquiry	Varies(few-many)	Designer/Expert skill: No primary tool support is available based on the method. Context based enquiries are framed and qualitative analysis is of the collected data is done by the designer It is carried out mostly at the user's work place.	Qualitative data-gathering and data analysis (adapted in the fields of Psychology, Anthropology, and Sociology)
Focus Group	6-12 users/groups	Designer Skill: Targeted stakeholder is invited to a session of discussion. The designers/facilitators manage the discussion skillfully to stay in topic. ([7]Morgan ,1997)	Academic research Product marketing Evaluation research Quality improvement
Interview	Varies(few-many)	Designer/Expert skill: Interviewer asks semi-structured questions either face-to-face or by telephone. Those interviewed may include stakeholders, content experts, support staff, and users themselves. Both parties may choose to view a system online during part of the interview.	Obtaining in-depth data about a particular role or set of tasks Finding out what users want.
Log File Analysis	None	Tool Support: User's actions with a system are collected from server logs and examined later for usage patterns and potential problem areas.	To track site usage (it allows a web administrator to track file use and server traffic)
Paper Prototyping	5-7 users/groups	Tool Support: The tool support is available based on the method. More recently, digital paper prototyping has been advocated by companies like Pidoco due to advantages in terms of collaboration, flexibility and cost. It is throwaway prototyping and involves creating rough, even-hand sketched, drawings of an interface to use as prototypes, or models, of a design.	Communication in the Team, Usability Testing, Design Testing, Information Architecture Rapid Prototyping, ([10]Bevan et. al. (2002))
Survey	Varies	Designer/Expert skill: Users are asked a	To obtain

		standard set of questions on paper, in person, by telephone, or by electronic mail.	quantitative data from users about existing tasks or the current system.
Task Analysis	At least 5 users/groups	Designer/Expert skill: It is to learn about an existing website to analyze the essential rationale. The analysis will involve the purpose of what people are doing, what they are trying to archive, why they are trying to archive it and how they are going about it' ([15] Preece et.al., 2002). The data abstracted helps to build the new requirements or to design new tasks.	It is suitable and recommended for most situations.
Usability Test	5-12 users	Designer/Expert skill: Testing is usually carried out on a one-to-one basis to allow the facilitator to closely observe the user's behavior. A second facilitator may be useful for recording purposes. The key to interpret the results of testing is to look for general trends and behavior patterns that indicate problems with the usability of the site.	Provides recommendations for how a design can be improved. Eye-tracking, teaching method, coaching method, self-reporting Logs
Expert review	3-5	Designer/Expert skill: After examining the system, Design experts give comment in detail on its adherence to principles of good design based on their expertise. Multiple experts are recommended to increase the probability that they will identify the main problems.	To identify usability problems in a product or service
Guided Walkthrough	1-4 users	Designer/Expert skill: Facilitator leads a user through a representation of the system asking questions either during or after the walkthrough to gauge the user's understanding of the system.	Checks structure and flow against user goals
Heuristic Evaluation	3-5 users	Designer/Expert skill: A group of evaluators (HCI experience) systematically apply a set of user-centered heuristics in order to evaluate the system. Multiple experts are recommended to increase the probability that they will identify the main problems.	Websites, e-learning system, groupware, notification system, and games. The method will provide recommendations for design improvements.



"Figure 2. UCD methods diagram"

V. ANALYSIS AND DISCUSSION

In this paper we are considering twelve User-Centred Design Methods, and again classifying/grouping them into different methods namely: Empirical methods, Inspection Methods, Inquiry methods, Profiling Methods, Testing Methods, Participatory Design. These methods are grouped based on different aspects. Some methods based on the way of gathering data that is direct contact with the end users and some are on user requirements, design and implementation. Again UCD methods are classified based on functional dependency such as Tool Support and Designer/Expert Skill.

User-Centered Design methodology is a process for incorporating usability engineering into the systems and web site design process. It is an approach that supports the entire development process with user-centered activities, in order to create applications which are easy to use and are of added value to the intended users.

UCD methodology has been designed to be flexible, so that it can be adapted to the needs of system or web site. Some projects may benefit from completing all of the User-Centered Design tasks; others may only need to complete a few tasks. The larger the number of users, the more important it is to use the complete User-Centered Design methodology. UCD seeks to answer

questions about users and their tasks and goals, and then use the findings to drive development and design.

In UCD, user requirements are considered right from the beginning and included into the whole product cycle. User-centered Design involves simplifying the structure of tasks, making things visible, getting the mapping right, exploiting the powers of constraint, and designing for error.

Among the UCD methods is an excellent way to involve end users in the early stages of design. Task analysis is a profiling method that informs design by identifying and prioritizing the tasks that users will perform with a product, website, or service. This method begins with assumptions about user profiles, gleaned from initial market research. Throughout the design cycle, researchers validate the profiles and eventually create personas, or composite individuals, who ground the design effort in real users.

An Expert Review is an inspection method ([12] Nielsen, J. (1994)) designed to identify usability problems in a product or service. The review is carried out by a small group of usability experts, who analyze the product or service to identify any potential usability issues and the other inspection methods are Walkthrough and Heuristic Evaluation.

So now we can conclude that User-Centered Design provides a structured method for achieving usability in user interface design and the methodology as:

1. emphasizes an early focus on users and their tasks
2. promotes a top-down approach, dealing with high-level design issues first
3. is iterative
4. is scalable, based on the time and resources available to the project
5. Can be integrated with the software development lifecycle.



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Human Face Architecture and Structure of Eyes for Prediction of Mental State of Individual

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Abstract- The focus point of this study is to identify the real psyche, constructed and the manifested psyche of an individual. For this, geometrical spatial technique was used and measurement focus point was the eyes with reference of features, structure and colour. The interaction of eye shapes, forms, sizes and colours with different shapes of the face will produce 2160 real psyches. Mathematically output is as: eye shapes are 10, eye sizes are 3, eye forms are 3 and eye colors are 3 (only three have been selected on the basis of availability of sample identity) and face shapes are 8 [$10 \times 3 \times 3 \times 3 \times 8 = 2160$]. Each psychological state was predicted in three forms as constructed psyche, manifested psyche and psyche that should be (real psyche). Thus, total 6480 (2160×3) psyche are to be identified. Determination of the psyche is based on the degree of associations between geometrical region of the face and eye alignments. Degree of predictability is a product of area of geometrical output of different features of the face with corresponding points of eyes (left and right). This part of study was conducted in laboratory condition on 800 samples of males and females of age group of 20 to 50 years of Allahabad city. But for high level of predictability, reliability and validity research work is going on. Photographs were taken with 10.6 mega pixel Nikon camera on the fixed distance between object and camera (7 feet) with constant zoom and aperture in the fixed light (port light). Characteriology is based on Indian and Western philosophy of human psyche concepts. This study is also focused about the status of the energy consumption and energy management for future utilization.

Index Terms- real psyche, manifested psyche, constructed psyche, geometrical space, psyche engineering, face scaling

I. INTRODUCTION

Face is not only a symbol of beauty of an individual or fixing identity of an individual but it is a predictor of actual psyche of an individual. Face management is based on theories of emotion and on the basis of skill of management as a person may receive positive or negative feedbacks from others. This is only a false notion of perceiving the target individual. On the basis of emotion researches many predictions have been made but these results are only time and situation based predictions. The prediction about a human being should be as he/she is actually in the same contour of face which is not possible by emotional state of behaviours. It does not mean emotion based studies of human behaviour are worthless but they have their own objective

and utility. Electronic (brain mapping) and chemical (NARCO) based researches for human psyche prediction are having their own qualities and limitations to find out hidden psyche of an individual. Their reliability and validity is based on documentation and for accuracy re-measurement is not possible. This is the story of more or less all psychological finding but efforts of the accuracy and predictability at the highest significance level have always attracted psychologists. Psychometricians efforts are acknowledgeable and theories of measurement are focused on behaviour prediction. Their degree of limitation sometimes creates risk in judgment. This piece of work is an effort to make an accurate prediction of an individual as he/she should be. *In this study eye is target of analysis and focus is on eye indicators of different shapes of human faces.* Shape of faces can be determined with certain combinations of facial features. The philosophy of human nature is determined by the philosophy of God and science helps us to understand the causes of that relationship. God and science are two dual characters for the same destination (Thompson 2004). Vedic concept of identification of human nature is also based on the conceptual reality of face contour (see the following hymns)

इन्द्रो मयभिह पुरुरूप इयते¹

Indra (the illumined one) by means of his own *Maya* (the measuring powers from the root *Ma* to measure assume multiform

एकं सन्तम बहुध कल्पयन्ति²

Though it is one they conceive of it in multiform manner.

रुपं रुपं प्रतिरूपो बभुव³

To this form and to that form he assumes counter form

II. EYE AND PSYCHE

The natural architecture of eyes is not only an indicator of a feature of the face but it is also indicator of beauty, vision and **psyche of the person**. Different shapes and size of the eyes have different functions in the human mind. But how to make special detection of eyes from human face for objective of state of mental mechanism? Eye detection is based on two approaches (mosaic image and geometrical face model). The sharp detection also depends on the detection of eye corners as manifest inside

¹ Thompson, R.L (2010). God and Science (Divine Causation and the law of nature. Motilal Banarasidass Publication, Delhi

² As above

³ As above

the eyes window and it is understood by video coding, pattern recognition, natural texture analysis, and classification. Factual dimensions added more information in this regard. For understanding the human psyche through eye is not a simple process but this article is concentrated on such issues that are not related with the appearance of the human eye but beyond it. The management of face and eye expression is a management skill of a person by which he/ she is thinking 'I am a winner and feel I am superior to others'. But the eye can reflect your psyche which is not in your jurisdiction of management. Two main functions of human eyes, sight and motion tell a different story of psyche that is not observable in face and eye. It is believed that eye can express more of the mental process than any other facial feature (Stanton 2008). Eye test is relative of two features as significant indicators of mental character. First, the eye is more impressive feature than any other part of face and second it reflects brilliancy and an appearance of active life. Eye alignment helps in this journey. The eye alignment may be determined in two different manners. First way of determining the eye alignment includes the step of comparing the iris image and the retinal image with a stored image of the iris portion and the retinal portion, the stored image corresponding to eye alignment at a previous time. More specifically, this first manner involves finding an eye position at which the iris image and the retinal image are substantially identical to the stored image. Second manner of determining eye alignment involves finding a relationship between an instrument axis of the imaging system and an axis of the subject's eye. More specifically, the axis of the subject's eye may be the papillary axis. For evaluation of psyche with eye, there is need to understand different dimensions of eyes. These are nine in numbers as : form , size , colour , degree of brightness , shape of commissure , effect by fold , the angle of inclination , relative position of central line , general expression etc.

III. OBJECTIVE

The objective of this study is to determine actual human psyche with interaction of human face and eye features.

IV. HYPOTHESIS

The interaction of face and eye dimensions will produce different states of psyche of human beings.

V. PLANNING OF STUDY

This study is based on the architectural analysis of the face and eyes. Focus point of this study is the prediction of human psyche with measurement of alignments of eyes (right and left) and eyes to different shapes of human face .Psychological states of human beings are based on characteristics of the interactional function of the face and eye features. Thus the following steps were followed for this study:

1. The photographs (three directional ; camera face , 60° left and 60° right tilt) will be taken in the laboratory setup
2. The architectural analysis will be done of the face geometry
3. The association values of both the components (face and eyes) will be calculated
4. The functional value of these features will be assigned individually
5. The psyche will be determined on the basis of association value and functional characteristics of the face structure and eyes geometry with colours of pupil.
6. The actual energy of the selected feature will determine the actual status of the human psyche

VI. ENGINEERING OF STUDY

A blue print of the study is given in diagram 1 and table 1 .This planning shows that different combinations of eye and human face are possible. Besides to this, the architectural measurement of the eyes and the relationship of the eyes to different parts of the face will show the particular psyche of human beings. The accuracy of prediction of psyche is based on face engineering and their scale values (areas and angles of the defined geometric shapes).

Diagram 1: Indicator of psyche with interaction of eyes and face

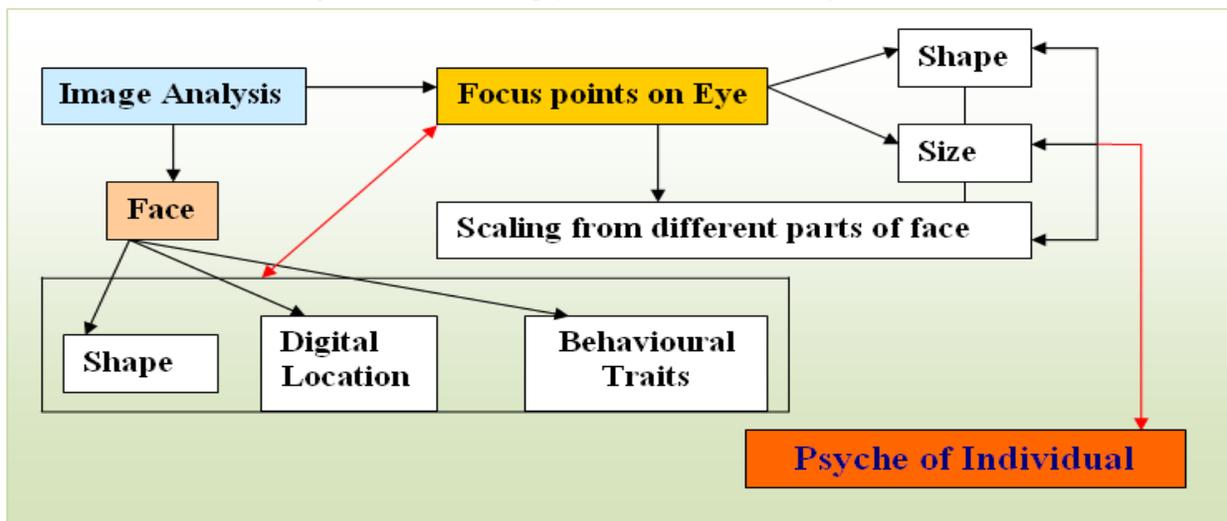


Table 1: Eye and Psyche

Shape	Colour	Psyche			Scaling			
		Construct	Should be	Manifested	Dimension Size		Pixel	
					Length	Width	length	Width
Lotus	Black							
	Brown							
	Blue							
Deer	Black							
	Brown							
	Blue							
Oval	Black							
	Brown							
	Blue							
Cat	Black							
	Brown							
	Blue							
Elephant	Black							
	Brown							
	Blue							
Pearl	Black							
	Brown							
	Blue							
Pigeon	Black							
	Brown							
	Blue							
Peacock	Black							
	Brown							
	Blue							
Frog/ Crow	Black							
	Brown							
	Blue							
Curvilinear	Black							
	Brown							
	Blue							

Besides these, components of eyes forms and size were also included. Three forms and three shapes of eyes are identified. Thus, possible output of psyche are 6480 (10 shapes of eyes, 3 forms, 3 sizes, 3 colours and 8 shapes of the faces) X 3 status of psyche with 3 natures of psyche

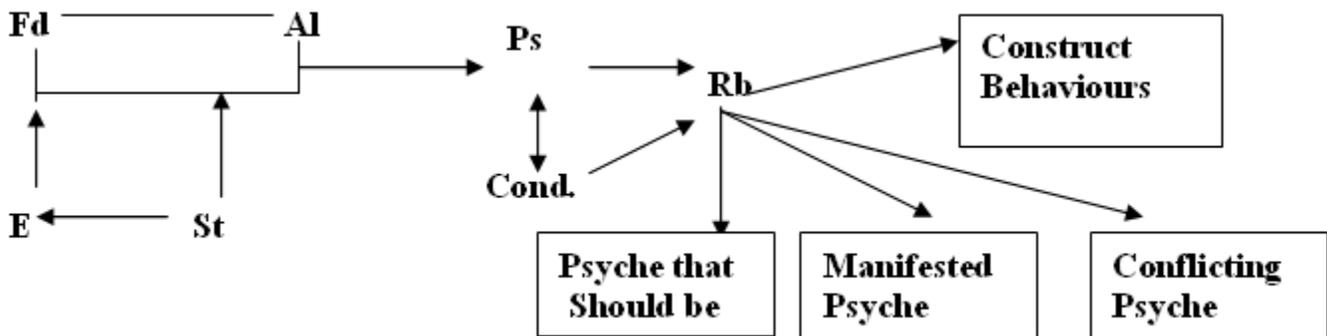
Special: Detail for this may be seen in the self developed dictionary (dictionary is not attached herewith)

Assumptions

$$B = \{f \times e \quad (f = \text{face}, e = \text{eye})\}$$

1. **fn** (No. of faces) is the product of different shape and size and it has different sets of eye . Means any type of face may have any type of eyes.

2. Interaction of face and eyes will run as per following loop



Fd – Face design, Al – Alignment, St – Stimulation, Rb – Real behaviour, Cond . – Conditions, E = Eye

- *Three psychological states are possible: 1. Face is self responsible for psyche 2. Eye stimulation is responsible for psyche, 3. Interaction of face design and eye design produces behaviour*
- *Construct behaviours govern the psychological world of human beings but are controlled and regulated by the architectural frame of the face and pertinent parts of the face*
- *Conditions influenced on or influenced by psychological state of an individual*
- *Fd and Al are natural designs of God's creation that have some objective but stimulation enforced to it for action as per own rules*
- *Construct behaviour is not the behaviour of an individual*
- *Gap between construct behaviour and real behaviour will lead to conflict*
- *More and more gap between construct and real behaviour will nurture to strong pseudo behaviour*
- *Frequency of pseudo behaviour leads to strong construct behaviour which is perceived in normal state as a natural behaviour*
- *Breaking point: Delineate the natural behaviours*

VII. PARTICIPANTS

Study was conducted on 800 participants of Allahabad city. Both male and female participants of age group 20 to 50 years of different professions were in the sample.

VIII. PROCEDURE

Photographs of the participants were taken in studio setting of Psychology lab at participants' convenience. All the photographs were taken from 10.6 mega pixel Nikon camera on a fixed light setting (port light) and fixed distance of 7.0 feet from the object on constant zoom lens of camera. Geometrical analysis of face and eyes were done manually as per defined scale points given in table: 1. Decision boundary of human psyche is based on positive and negative landmarks of distance matrices. Mathematical formulae were developed for analysis of the state of psyche.

Scaling

Scaling of the alignments is based on the decision parameter of table 2. Scale values of all photographs were calculated in three directions of photographs for minimization of errors. The output of psyche is based on the average of camera facing, left and right tilt of face direction. Scaling of an individual is given in table: 2

Table 2: Scaling of Face Parameters

SN	Define range of measurement	Camera Facing			Left Tilt			Right Tilt			Average
		Length Cm	Angle	Area	Length Cm	Angle	Area	Length	Angle	Area	
1	REyLCLEa	2.6, 2.55, 1.5	72°, 72°, 36°	1.84649	3.3, 3.1, 1.5	70, 27, 83	2.3123, 1	-			2.07940
2	REyRCLEa	1.5, 3.5, 3.5	81°, 73°, 26°	2.5640, 2	1.5, 4.0, 3.8	70, 22, 88	2.8447, 7	-			2.70439
3	REyLCREa	1.5, 1.9, 1.7	75°, 57°, 48°	1.2162, 7	-			2.2, 2.3, 1.55	65, 40, 75	1.6336	1.42493
4	REyRCREa	1.5, 1.3, .80	30, 60, 90	.51961	-			1.4, 1.35, 1.55	68, 56, 56	.87977	.69969
5	REy-NOSE	.90, 1.2, 1.6	81, 46, 53	.53440	1.2, .80, 1.5	87, 60, 33	.47811	1.4, 1.9, .90	42, 111, 27	.59693	.53648
6	REy-Mouth(LRCP)	.90, 1-4, 1.9, 1.7	74, 123, 60, 103	2.07	1.5, .80, 1.9, 1.6	60, 83, 115, 102	2.0125	1.5, .90, 1.7, 2.0	55, 107, 128, 70	2.22	2.10083
7	REy-CentralOfForehad	.90, .90, 1.5	28, 98, 54	.37312	.75, .80, 1.2	40, 82, 58	.29406	.95, 1.7, .90	122, 28, 30	.30999	.32572
8	REy-Chin	3.1, 2.8, .90	68, 96, 16	1.23693	.80, 2.7, 3.0	80, 16, 84	1.0463, 4	.90, 2.9, 3.2	69, 98, 17, 4	1.2798	1.18770
9	LEyLCLEa	1.5, 1.4, .90	67, 36, 77	.61644	1.5, 1.6, 1.6	60, 54, 66	1.0599, 9				.83821
10	LEyRCLEa	1.5, 1.8, 1.9	61, 73, 46	1.26554	1.5, 2.6, 2.4	65, 34, 81	1.7726, 6				1.5191
11	LEyLCREa	1.5, 3.3, 3.4	80, 72, 28	2.44327	-			3.95, 3.8, 1.5	22, 69, 89	2.8370	2.64013

12	LEyRCREa	1.5, 2.4 2.5	78, 67 35	1.74539	-			2.9, 3.1 1.5	27, 67 86	2.1591 0	1.95224
13	LEy-NOSE	.90, 1.8 1.9	40, 115 25	.80249	2.1, 1.5 .90	37, 18 125	.58556	.80, 1.8 1.3	45, 108 27	.46759	.61855
14	LEy-Mouth(LRCP)	1.8, 2.0 .90, 1.5	70, 110 54, 126	2.28	1.0, 1.6 1.7, 2.0	63, 130 50, 17	2.405	1.7, 2.1 1.5, .80	110, 50 70, 130	2.185	2.29000
15	Eyes to Mouth	1.5, 2.6 1.6, 1.75	112, 108 68, 72	3.43375	2.3 , 1.5 1.7, 1.6	63, 83 109, 105	3.2350 0	1.7, 1.7 2.6, 1.5	110, 110 ,70 , 70	3.4850 0	3.38458
16	LEy-CentralOf Forehad.	1.5, .90 .90	31, 121 28	.37312	.80, 1.45 .85	29, 90 61	.28526	.80, 1.4 .95	114, 36 30	.36538	.34125
17	LEy-Chin	.90, 3.15 2.9	65, 57 58	1.29312	3.1, 2.8 .80	56, 15 105	1.0837 8	.80, 3.0 3.3	65, 80 35	1.1585 9	1.17849

Human psychological states

Human psychological states are possible to classify in three states 1 construct psyche, 2 actual psyche and 3 manifested psyche. These psychological states are explained in certain assumptions and mathematical formulation and then these states will predict with general to specific form.

A. Construct psyche

Construct psyche is designed and formulated by an individual for his / her face management. He/ she always make an effort on how project a safe face. This type of behaviour is normally known as emotional management of behaviour and it is based on face revelation of behaviour. The face observation is based on behavioural determinants which is determined by this approach.

$$\text{Construct psyche (CP)} = \frac{\Delta\gamma}{\gamma} \times 100$$

$\Delta\gamma$ = Asymptote of construct psyche, γ Dissatisfactory psychological state, 100 used for minimization of decimal points
 $\Delta\gamma = \sum \text{Area of geometrical shape}$
 $\gamma = \text{Std of geometrical area} \times \text{No. of (equilateral rectangle + Square + Isosceles)}$

Incensement in $\Delta\gamma$ is positively related with γ . Means γ is functionally related with $\Delta\gamma$

The level of $\Delta\gamma$ indicates that the construct of psyche of X- which is not on his/ her control but has now become the mental state of the individual.

Construct mental state focuses on the dreaming reality (α)

$$\alpha = \alpha_1 + \alpha_2 + \dots + \alpha_n$$

Thus $\alpha_n + \gamma = \text{Construct psyche}$

Degree of predictability of different states of constructed psyche is dependent on the SGA (standard geometrical areas) output (see table 3)

Table: 3 SGA state of reality

SGA Output	State of reality of Construct Psyche
0.70	Very high construct psyche
0.60	High construct psyche
0.50	Threshold constructed psyche

-0.50	Precipitative construct psyche
-0.40	Personate construct psyche

B. Psyche that should be

This is a matter of deep investigation and micro analysis of the facts. Efforts near to reach at accuracy has been made but it is not much sufficient as should be. Thus, Psyche should be (β) is the different of $\gamma - \alpha$

It is not only this but it is beyond this. All possible combination of face and eyes functionally predict the accuracy of psyche that should be. The search engine runs in the following direction

$$\text{Str.e} + \text{Fs} \rightarrow \text{pts}$$

Str.e = structure of eye, Fs = Face shape and pts = Psychology that should be

$$\text{pts} = \Delta\gamma - \{ \gamma - \alpha \}$$

pts may be positive or negative , that is main determinants of psychological state of human being in particular psychological contour.

Human psyche is generated by unconscious problem solving process (UPSP) but modified by conscious problem solving strategies (CPSS). If UPSP dominates CPSS then construct behaviour formation become very fast and manifested behaviour governs with human centered built for human based on human model , but this is not always possible . It may be vice-versa, means CPSS may also dominate on UPSP. In that condition actual psyche (psyche that should be) framed by conscious level of awareness. The whole process may be understood by multi-model fusion system and following statistical output:

$$\Delta \text{ap} = 1 - \{ \Delta \text{cp} + \Delta \text{mp} \}$$

Δap ; change of actual psyche , Δcp ; change of construct psyche , Δmp ; change of manufactured psyche , 1 is shows the perfection of ap but perfection is difficult to determine .AAM (Active appearance model)was used for detection of psyche . AAM (developed by Edward et al 1998) based on alignment of face. Human face shape is not rigid but it is deformable. Deformability of the face is the differential delectability of the face and face psyche .Thus, ap is directly related to deformability (d) . Deformability of two faces and pairs of eye is sensitive detection but fractal dimension analysis and

histogram technique are helpful for destination. Differential deformation (d^{-}) is product of alignments of face and their respective area. This moment is exact in position for prediction of psyche with combination of psyche if:

1. $fX_1 \neq fX_2$ then psyche will be (fX ; face of X-person)
 - A. Similar but not exact to $X_1 = X_2$.
 - B. $fX_1 = fX_2$, d^0 has functional equality with deformity. The same with fX_n

Deformity can be determined by alignment and its functional mathematical output as area of fractal dimension

2. $fX_1 = fX_2$ then it depends on box counting technique and its mean area. The boxes are the geometrical design of X- individual face. The boxes area mean will be functionally different from face to face. It is possible by 2D but for sensitive discrimination (sd) 3D is essential to use. The further researches of this study are based on 3D and valley field extraction will be used for prediction of accuracy. Che

3. If fX_1 & fX_2 are significantly different from each then discrimination is simple and will determine classification and natural texture analysis.

Calculation of SGA of actual psyche may be possible by Mean standard of

- a. All well shaped geometrical shapes
- b. Any geometrical shape of geometrical output

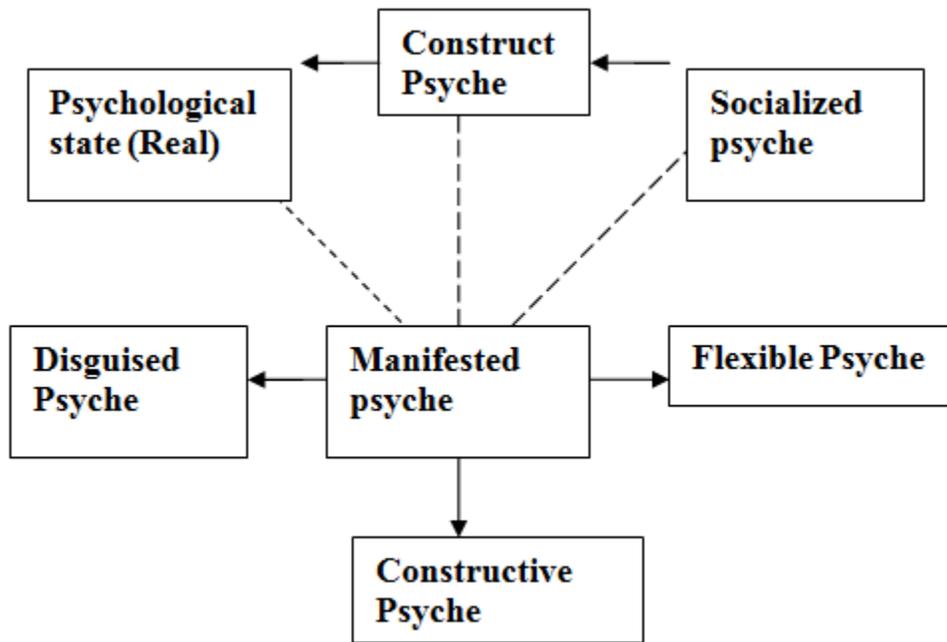
SGA. $PTS = (b-a) - \text{std. error}$

- i. If difference is positive then PTS (psyche that should be) dominates by either manifested or constructed psyche
- ii. If difference is in minus then PTS is strong
- iii. If output is zero then diffused PTS

C. Manifested psyche

Manifested psyche is a psyche which an individual displays in ongoing actions and behaviours. More or less it is directed by construct psyche but manifested and construct psyche is not one. This is a managed construct psyche. Manifested psyche may be designed and projected with

1. Manifested psyche is a function of socialized psyche



2. Manifested psyche is the product of

$$M \text{ psy} = \beta - CP$$

$$M \text{ psy} = dp + fp + C \text{ (Constructive Psyche)}$$

3. Geometrical output of M. psyche is
 - Major differences in angles and length of alignments (1 cm)
 - Major differences in angles (50^0)

Assumptions

A. If M psy is dominated by β , the reflection of psyche will be in the form of

- i. less deigned behaviour
- ii. more constructive behaviour
- iii. low disguised behaviour
- iv. unproductive flexible psyche

B. If M psy is dominated by construct psyche then it will be in form of

- i. high productive flexible psyche
- ii. poor constructive psyche
- iii. high disguised psy

Detection of actual psyche with eye

Detection of actual psyche is the ultimate objective of this study. Thus, part of information with eye and face here can be the predicted psyche at the degree of validity not reliability. The combined effects of all variables will be in position to predict the reliability and validity of the actual psyche. The focus points on eye specially in this study is concentrated on

1. Formation of actual psyche is determined by eye alignments
2. The alignment vector (V^{-}) indicates the differential position of psyche

3. Interaction of eye vectors alignment with face feature and not the appearance will indicate the psyche which should be real
4. The imaginative real to real of real is determined by the accuracy of measurement of face alignment and eye alignment
5. Analysis of joint of features space will predict the standard errors of the accuracy. Thus final output is a product of vector of alignment plus face shape alignment with eye alignment minus standard error (joint of feature space)

IX. RESULTS

Statistical analysis shows the status of finding as following:

1. Standard deviation was found high in female face geometry (Comb. Sd = 0.41)) in comparison to male (Comb. Sd = 00.27)
2. Test of equality was calculated and found significance of differences (> 0.974) in left corner of right eye to right ear.
3. Variable tolerance test is showing highest tolerance in variables (see table 4)

Table: 4 Tolerance Test

Variables	Within-Groups variance	Tolerance	Minimum Tolerance
Right corner of left eye to left ear	.174	.000	.000
Left corner of left eye to right ear	.315	.000	.000
Right corner of left eye to right ear	.203	.000	.000
Left eye to centre point of nose	1.197E-02	.000	.000
Left eye to left and right corner point of lips	.149	.000	.000
Corner points of eyes to corner point of lips	.338	.000	.000
Left eye to central of forehead	8.803E-03	.000	.000
Left eye to chin	1.361E-02	.000	.000
Eye form	.764	.000	.000
Eye colour	.167	.000	.000
Height of document size	.902	.000	.000

4. It was as found that discriminant functions were highly predictive with certain variables with many pairs but zero tolerance potentiality shows that variable stable with conformity (see table 5).

Table: 5 Canonical Discriminant Function Coefficients

Variable	Function
Left corner of right eye to left ear	-6.710
Right corner of right eye to left ear	-4.469
Left corner of right eye to right ear	-5.924
Right corner of right eye to right ear	4.472
Right eye to centre point of nose	7.689
Right eye to left & right corner point of lips	-.300
Right eye to central of forehead	11.396
Right eye to chin	-2.869
Left corner of left eye to left ear	2.301

5. Box's test of equality of covariance matrices of Canonical Discrimination function shows the gender determinants of the function (see table 6)

Table: 6 Box's test of equality of covariance matrices of Canonical Discrimination function

Sex	Rank	Log Determinant
Male	1	-.242
Female	1	.561
(identity matrix)	1	.000

6. The classification function coefficients shows that male and female actual psyche can be determined with geometrical output (see table 7)

Table: 7 Classification function coefficients

Variables	Sex	
	Male	Female
Left corner of right eye to left ear	-889.485	-985.739
Right corner of right eye to left ear	2477.993	2419.661
Left corner of right eye to right ear	-130.700	-185.176
Right corner of right eye to right ear	-3776.641	-3682.489
Right eye to centre point of nose	-706.444	-371.173
Right eye to left & right corner point of lips	-374.946	-378.432
Right eye to central of forehead	-70.647	242.473
Right eye to chin	3264.834	3196.124
Left corner of left eye to left ear	-1446.639	-1383.959
(constant)	-2322.198	-2222.383

- Status of correlations with different geometrical areas of male and female sample show that many pairs have high positive correlation but few are negative and some are also non significant at the standard criteria of statistical norm. A summary of correlational output is presented here due to huge numbers of their output and it will take pages for whole presentation.

X. DISCUSSION

Findings of this study will enable are to explain about the judgments of mental mechanism of human beings. Contour of eyes and face geometry have capacity of prediction with accuracy about the hidden psychological state. The geometrical output and mathematical assumptions with statistical calculation are sufficient indicators of defined variables, which are taken here for prediction of the individual psyche. Mind engineering concept which is taken here can predict about sufficient information about the psychological state of reality of an individual in an ideal as well as nurtured state of human psyche.

Status of standard deviation (SD) of face geometry focused on about the female status and found it different to the male. High range of SD of female predicted that female psyche is likely to be inconsistent to the male (a special study will be planned to prove this concept) . Variation in psychological state of female is not their construct or manifested psyche but that is actual psyche, which depends on the face engineering. Two dimensional study of the face architecture and pertaining parts of face especially of eyes expressed that there is need to understand the psyche within the geometrical outcome. . Privitera and Stark (2000) evaluated 10 different algorithms for detecting regions of interest by comparing output of such algorithms to eye tracking data. They concluded that it was unreasonable to expect an algorithm to be able to predict the location of every region of interest. The framework employed in this work allows for further exploration of gaze behaviour and validation of attention models, hence leading to improved algorithmic detection of regions of interests. This study enables us to reach the reality of prediction with geometrical finding and psychological outlooks. Dissatisfaction in Privitera and Stark finding is also filling by this study. Eye to ear geometrical output indicates that human psyche governs with certain natural architecture of face which is varied in males and females. It is also supported by tolerance test. This test highlights the geometry of eye with different parts of face have maximum tolerance but few are creating a challenge and motivating further research in this field. Status of canonical correlation expressed about the strength of this study and focused that architecture of face has ability of prediction about the mind mechanism as what should rather than what is. Box test of equality supported this fact.

The focus area of this study is to point out psychological state of an individual was obtained in sound position and a dictionary of such psyches was developed containing 6480 psyche parameters. Validations of these psychological states are based on geometrical reality of located area. Three psyche; actual, manifested and construct have been identified with the finding of this study. These psyches are based on different natural architectural features of eyes, face shapes and geometrical areas with attention point of eyes to different features of face as nose, ear, lips, forehead and chin. Statistical parameters were used for

making discrimination from one psyche to another psyche with the reason that this will support the predictive validity of the psychological state and reliability of the identified psyche of an individual. $\pm 1 \sigma$ was decided for actual psyche but for manifested $\pm 1 \sigma$ and for constructed psyche it was decided that $\pm 2 \sigma$ as a range parameter for prediction. Extremely low range of actual psyche in geometrical measurement indicates that actual psyche is based on the *all or none of the principle*. Means their existence may or may not depend on the reality parameter with low fluctuation. If fluctuation in psyche is being displayed it never be an ideal state of reality. Ideal state of reality focuses the nucleus of mind of human beings. It is a natural form nurtured by designed features of biological parameters. Manipulation in any form is an indicator of misleading information about the target person. Manifested psyche is product construct psyche which is a tiny part of the constructed psyche and controlled by actual psyche. If manifested psyche is dominated by constructed psyche with high degree then manifestation of psyche would be artificial and beyond the nature of individual, but many times manifested psyche is governed by actual psyche. If this will happen in that situation hesitation of expression may be observed in the presentation of an individual. Thus, identification of all three psychological states of mental reality is important for understanding the individual state of life parameters. Lord Krishna said about the state of human beings. According to him 'human being is neither nature nor destructor but human is independent and neutral' (see the following *shyolaka*)

मूलप्रकृतिविकृतिः महदादाः प्रकृतिविकृतयः सप्तः ।

षोडशकस्तु विकारो न प्रकृतिर्न विकृतिः पुरुषः ॥ (shankhya sutra 3)⁴

Explanation

The nature of human beings is natural. Means there is no pollution in the human psyche. There are seven proud and they have five values are the combination of nature and destruction of human psyche. The eleven sensitive organs and five constant objects collectively inseparable produce sixteen elements of nature and destruction.

The authenticity of the finding of psyche is based on the classical study parameters to modern space-time parameters of the study. Rogers Penrose (1996) proposed model of objective reduction will help to understand the human psyche .

XI. APPLICATION OF THIS STUDY

Finding of this study may be used in intelligence department for identification of the real person for judicial inquiry. Intuitional / organizational authority may also use this finding for proper placement of an individual to save the energy of human resource and promotion of organizational health.

XII. CONCLUSION

On the basis of finding of this study is it can be concluded that face engineering has certain value with human psyche. It is not just a feature for discrimination between X- individual and Y- individual but it is a construct of reality of complete human being

⁴ Vishva kee rachna aur sanhar in Shrimadbhagvatgeetarahasya or Karmayoga – Balgangadhar Tilak Parichit Books , New Delhi , 2010 , P 151

and mental functioning is one of the functional dimensions of this study.

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An Adaptive Framework for the Selection of Embedded Operating Systems

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Abstract- The embedded system area today is faced with the challenge of implementing the applications that can execute efficiently on limited resources and that meet nonfunctional requirements such as timeliness, robustness, dependability and performance. At the core, these requirements need to be managed by the operating system. Thus, an embedded operating system has to address not only the aforementioned issues but also the issues arising out of the requirements of newer embedded applications. Such types of constraints are difficult to meet in an embedded operating system and this is the reason that the contemporary embedded operating systems are designed for specific application areas. This research work aims at identifying a common and adaptive framework for embedded operating systems so that a customized embedded operating system can be generated according to the requirements of an application.

Index Terms- embedded system, RTOS, embedded system design.

I. INTRODUCTION

Embedded systems can be defined as computing systems with tightly coupled hardware and software that are designed to perform a dedicated function. The word embedded reflects the fact that these systems are usually an integral part of a larger system.

It is not hard to find a large variety of applications where embedded systems play an important role, from small stand-alone systems, like a network router, to complex embedded systems supporting several operating execution environments as can be found in avionic applications. This variety of applications also implies that the properties, platforms, and techniques on which embedded systems are based can be very different. The hardware needs can sometimes be achieved with the use of general purpose processors, but in many systems specific processors are required, for instance, specific digital-signal-processing devices to perform fast signal processing. Memory management capabilities are necessary in some systems to provide memory protection and virtual memory. Special purpose interfaces are also needed to support a variety of external peripheral devices, energy consumption control, and so on.

Nowadays, the use of processor-based devices has increased dramatically for most of the daily activities, both professional and leisure. Mobile phones and PDAs are used extensively. Consumer electronics (set-top boxes, TVs, DVD players, etc.) have incorporated microprocessors as a core system component, instead of using specific hardware. This trend is expected to grow exponentially in the near future.

A. Research issues in embedded operating systems

Embedded applications are characterized by the following common features which also indicate the constraints to be managed by the embedded operating system.

1. **Limited resources:** There are often strong limitations regarding available resources. Mainly due to cost and size constraints related to mass production and strong industrial competition, the system resources as CPU, memory, devices have been designed to meet these requirements. As a result of these limitations, the system has to deal with an efficient use of the computational resources.
2. **Real-time application requirements:** Some of the applications to be run in these devices have temporal requirements. These applications are related with process control, multimedia processing, instrumentation, and so on, where the system has to act within a specified interval.
3. **Embedded control systems:** Most of the embedded systems perform control activities involving input data acquisition (sensing) and output delivery (actuation). Deterministic communications are also another important issue.
4. **Quality of service:** Feedback based approaches are being used to adjust the performance or quality of service of the applications as a function of the available resources.
5. **Rapid development and deployment:** Due to fierce competition in embedded systems applications the design time, prototyping time and deployment time play a critical role as these timings decide the time-to-market.

The challenge is how to design and implement applications that can execute efficiently on limited resource and that meet nonfunctional requirements such as timeliness, robustness, dependability and performance. Although these requirements belong to the embedded applications they need to be managed by the operating system. Thus, an embedded operating system needs to address not only the aforementioned issues but also the issues arising out of the requirements of newer embedded applications. Such types of constraints are difficult to meet in an embedded operating system and this is the reason that the embedded operating systems are designed for specific application areas. In this paper we have proposed a common and adaptive framework for embedded operating systems, so that a customized embedded operating system can be generated according to the requirements of an application.

This paper is organized as follows: in section 2 we survey the related work in selecting the RTOS and reconfiguration of it. Section 3 describes the important parameters of Embedded operating Systems and its role in embedded system design. In Section 4 we explain our idea of and adaptive framework for the selection of embedded operating systems. Section 5 provides the conclusion and direction of future work.

II. RELATED WORK

In this section, a survey of related works in the area of reconfigurable real time operating systems is presented. The past decade has seen a significant research work on selecting the RTOS. Designers are impressive task when selecting the RTOS for specific applications like Space, Security, military, process industry, communications, robotics, Data Acquisition, consumer electronics and so on in which each application demands specific requirements.

Embedded operating systems allow you to develop applications faster. They can require a little more overhead, but as the technology improves, the overhead seems to diminish. In Greg Hawley, he has provided criteria for selection of RTOS based on the processor and based on the requirements. He also considered many other parameters like, company profile, licensing policy technical support etc.

In a selection methodology for the RTOS market various method are adopted for space applications. This paper describes the elimination criteria for selection of RTOS to a very specific space application and ranked the existing commercial RTOS that are available in the market but they have not provided the generic framework for RTOS selection. In [20], how to select your RTOS described the framework for selection of RTOS for a class of applications and its characteristics that meets the application but it doesn't provided the methodology to select the RTOS based on the designers/developers requirements which are incorporated in this paper. Criteria for selection of a RTOS need to be much more flexible and much less specific.

Since 1940, several optimization problems have not been tackled by classical procedures including: Linear Programming, Transportation, Assignment, Nonlinear Programming, Dynamic Programming, Inventory, Queuing, Replacement, Scheduling etc. Embedded systems are special-purpose systems. They are often designed to perform very specialized tasks. Any operating system running on such a specialized system could benefit greatly from adapting to specific requirements. Therefore, configurable operating systems seem advantageous for embedded systems. The requirements for a dynamic configuration system for embedded operating systems are as follows

(i)The system should allow low-level resource managers to be configured to allow maximum flexibility. (ii)The run-time overhead should be minimal. (iii)The memory footprint should be small. (iv)The system should not require a hardware memory management unit. (v)Re-configuration should be reasonably fast compared to the lifetime of an application. (vi)Real-time computing should be possible in between re-configurations.

It has been shown that embedded operating systems can be configured dynamically by loading and linking code into the system at run-time.

A lot of work has been produced in the domain of adaptive architectures. Different techniques have been introduced for

clock and voltage scaling [8], cache resources [5], and functional units [9] allocations. These approaches can be classified in the category of local configurations based on specific aspects. Real Time Operating System (RTOS) for hardware management has been recently introduced. Proofs of concepts are exhibited in [9, 4]. These experiments show that RTOS level management of reconfigurable architectures can be considered as being available from a research perspective. In [7], the RTOS is mainly dedicated to the management (placement/communication) of hardware tasks. Run-time scheduling of hardware tasks/algorithms are described in [4]. In [9], the scheduling layer is an OS extension that abstracts the task implementation in hardware or software; the main contribution of this work is the communication API based on message passing where communication between hardware and software tasks is handled with a hardware abstraction layer. Moreover, the heterogeneous context switch issue is solved by defining switching points in the data flow graph, but no computation details are given. In [6], abstraction of the processor and programmable hardware component boundary is supported by hardware thread interface concept, and specific real time operating system services are implemented in hardware. In [10, 12] service oriented architecture is discussed for the design and development of embedded applications. The current state of the art shows that adaptive, reconfigurable, and programmable architectures are already available, but there is no real complete solution proposed to guarantee safe configuration of operating system with reference to application requirements. It motivates for the investigation of an adaptive framework for embedded operating system generated for application specific requirements.

III. SELECTION OF RTOS

Ranking RTOS is a tricky and difficult because there are so many good choices are available in the market . The developer can choose either commercial RTOS (44% developers are using) or open- source RTOS (20) or internally developed RTOS (17 %).This shows that almost 70% of developers are using the RTOS for their current projects and are migrating from one RTOS to another due to various reasons. To handle the current requirements of the customers, developers are using 32 bit controllers in their projects in which 92% projects/ products are using RTOS and 50% of developers are migrating to another RTOS for their next project. This influences importance of the selection of right RTOS to a particular project so that it meets all the requirements and fulfills its intended task.

In all of the related work authors have used the elimination criteria which are manual and it takes more time and need the detailed specifications of all the existing commercial RTOS's. In order to select RTOS, the designer first identify the parameters for selection based on the application and the intended requirements are provided to the systems through an interactive user friendly GUI.

A. Important embedded operating system parameters

Among the different parameters for selecting the RTOS, the ones used in our system are: 1. Interrupt Latency, 2. Context switching 3. Inter task Communication (Message Queue mechanism, Signal Mechanism, Semaphores), 4.Power management (Sleep mode, Low power mode, idle mode, Standby mode) 5. No. of Interrupt levels 6. Kernel Size 7.Scheduling

Algorithms (Round Robin Scheduling, First Come First Serve, Shortest Job First, Preemptive Scheduling etc), 8.Interrupt Levels, 9. Maintenance Fee 10 Timers 11. Priority Levels 12.Kernel Synchronization (timers, mutexes, events, semaphores etc), 13. Cost, 14. Development host, 15.Task switching time and 16 Royalty Fee. There are more parameters like target processor support, Languages supported, Technical support etc. are also important which are considered by the developer. We have used the knowledge base for storing the features of an embedded operating systems Then we use our framework for selecting embedded operating system, which is described in the following section. Our system will output a set of EOS from which one will be selected by considering the processor support, languages supported and Technical Support etc which are also important.

IV. PROPOSED FRAMEWORK

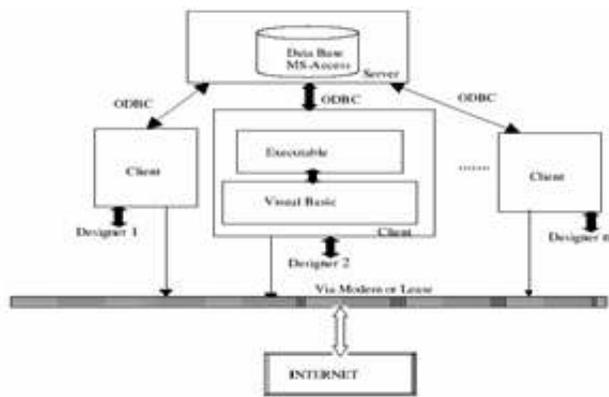


Fig. 1 Architecture of the System

We have developed a graphical user interface so that the user can specify the weights for the parameters of the RTOS for his application. The parameters specified by the user using the GUI are given below.

- Development Methodology – Cross Weight – 1
- RTOS Supplied as – Object Weight – 2
- Development Host – UNIX Weight – 3
- Standard – POSIX .1 Weight – 4
- Kernel ROM – 280K/4M Weight – 5
- Kernel RAM – 500K/4G Weight – 6
- Priority Levels – 512 Weight – 7
- Multi process Support – No Weight – 8
- Multiprocessor Support – No Weight – 9
- MMU Support – No Weight – 10
- Royalty free – No Weight– 11
- Standard phone support – Paid Weight – 12
- Preferred phone support – Paid Weight – 13
- Base price – 7495\$ Weight – 14
- Maintenance fee – 15% of list price Weight– 15
- Task switching time – 4us to 19us Weight – 16

A. Fitness function

The fitness function is the weighted sum of the parameters given in section 3, each of which contribute the “goodness” of the final selection of embedded operating system. Fitness is s evaluated by using the fitness function (FF) which is given by

$$FF = \sum (W_i F_i)$$

Where W_i is the wait of the i^{th} parameter and F_i is the fitness value of the i^{th} parameter.

Let us first consider the weights. Each application of an embedded system will have specialized requirements. The requirements can be characterized using the parameters specified in section 4 by assigning appropriate weights. The weights change depending on the application. For example, for children toys, cost may be the main criteria and hence will have maximum weight while for robotic applications response time would be the parameter with maximum weight. To meet these specifications, the user has to specify the weights for each parameter so that an appropriate OS will be selected. In the fitness function, W_i is the weights assigned by the user. consider, now, the fitness values. The parameters of RTOS given above have different values for different RTOS. For example, the interrupt latency can be 5ns for one RTOS and 15ns for another. The different values are mapped to a scale and the value on the scale is the fitness value. For example, if the scale for interrupt latency is 5 to 15 then, for the RTOS with 5ns as interrupt latency, the fitness value is 1 as it is better to have low interrupt latency. Since the values of these parameters are available beforehand for the RTOS that are available in the market, the fitness values are precompiled at the time of generating the database of RTOS. However, the designer can alter the values if needed. Now, by using the fitness function FF defined earlier, we evaluate the overall fitness value for the given criteria.

The user gets an appropriate RTOS just by giving the specifications and the desired accuracy and the whole search based on those specifications is carried out by the system and hence the result is provided through an easy designed interactive GUI. The user has the option of specifying the accuracy percentage to carry out his search which could vary depending on the level of strictness required, which is an efficient method compared to other methods which uses the elimination criteria. The user has the provision of selecting more than one option in each parameter thus making his search more advanced in terms of parameters. Choosing the most appropriate RTOS can still result in significant cost savings, improved level of technical support and high levels of product integration.

V. CONCLUSION

Embedded applications have become a popular these days due to the complexity in the system. To meet those complexities, the developers are given the invariable task of making the embedded software. There are quite large number of embedded operating systems are available in the market and one dose get confused as to which one such that it provides the efficient embedded systems design in terms of cost, power consumption, reliability, speed etc. In this paper, we described a Simple adaptive framework that is designed to find the suitable embedded operating systems for a specific application. The methodology described for RTOS selection is unique and efficient for large number of RTOS's. It has user-friendly graphical interface (GUI) though which the designer can alter the specifications and specify the new requirements for embedded operating system selection for a given application. It generates the optimal RTOS based on the requirements that are entered by the user keeping in mind the amount of accuracy required. This is done with the help

of fitness function. Our analysis and the developed system gives the user a portal to decide a real time operating system which most suits his choice of parameters and is the most optimal one available for that purpose. The designer has an option of choosing from pre-defined input or can specify his/ her own input.

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Hindi & Telugu Text-to-Speech Synthesis (TTS) and inter-language text Conversion

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Abstract- In this paper, I am explaining single text-to-speech (TTS) system for Indian languages (Viz., Hindi, Telugu, Kannada etc.) to generate human voice or speech (text to a spoken waveform). In a text-to-speech system, spoken utterances are automatically produced from text. This paper present a corpus-driven text-to-speech (TTS) system based on the concatenative synthesis approach. The output generated by the proposed text-to-speech synthesis system resembles natural human voice. It accepts input in two forms: manual user entry and from file (text or MS Word document). Proposed system supports multiple way of output; direct to computer speakers, Wav file, or MP3 file. Generated output can have different accent, tone based on selected languages. The proposed text-to-speech system will be implemented in C#.Net (Windows Form Application) and runs on Windows platforms. This paper has examples for Hindi (North Indian) and Telugu (South Indian) languages' to elaborate proposed system. This It also elaborates inter-language text conversion (*not translation*). Therefore, Hindi text will be converted into Telugu text and vice-versa. The research and development of this TTS done for my M. Tech major project.

Index Terms- text-to-speech, indian language, hindi, telugu, speech synthesis, concatenation, text conversion.

I. INTRODUCTION

The function of Text-To-Speech (TTS) system is to convert the given text to a spoken waveform. This conversion involves text processing and speech generation processes. These processes have connections to linguistic theory, models of speech production, and acoustic-phonetic characterization of language. To build a voice/speech for a language text, the steps involved are as follows (elaborated in Figure 1):

- Indian Language Analysis: Preparation of phoneme & diphoneme list used in a language. Have enumeration to represent these phones (viz. phonetics).
- Building input sound inventory to support all phoneme & diphoneme
- Define letter to sound rules/mapping
- Text Analysis: Analysis of input text (language) and converting into phoneme enumeration.
- Getting sound file (or content) for each enumerated value and concatenating them to construct speech.
- Evaluation of resultant speech

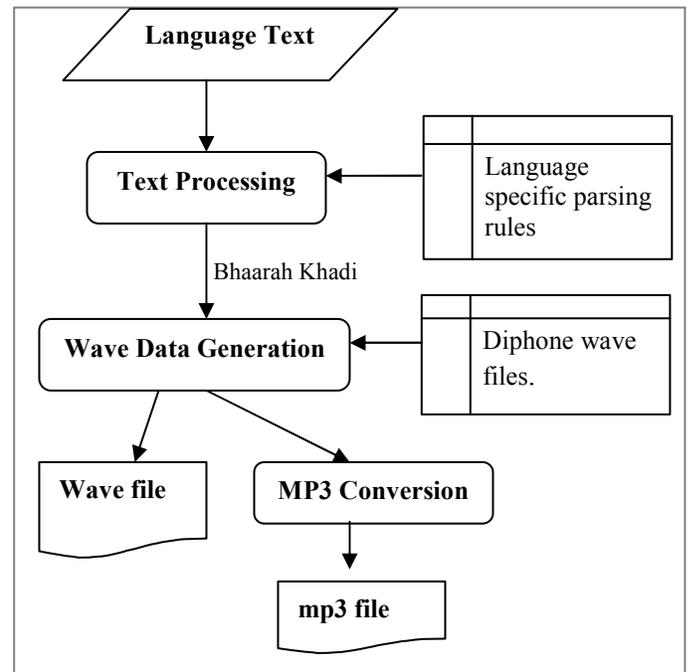


Fig. 1 Block diagram of text to wave file generation

II. INDIAN LANGUAGE ANALYSIS

The scripts of Indian languages have originated from the ancient Brahmi script. The basic units of writing system are characters which are orthographic representation of speech sounds. A character in Indian language scripts is close to syllable and can be typically of the following form: C, V, CV, CCV and CVC, where C is a consonant and V is a vowel. There are about 35 consonants and about 18 vowels in Indian languages.

An important feature of Indian language scripts is their phonetic nature. There is more or less one to one correspondence between what is written and what is spoken. The rules required to map the letters to sounds of Indian languages are almost straight forward. All Indian language scripts have common phonetic base.

Available character sets (windows default, UNICODE) for computers do not supports Indian languages (Hindi, Gujrati, Telugu, Kannada etc). Therefore, we use custom fonts (from different vendors, viz., Ankit (Hindi), Tikkana (Telugu)) to work with Indian languages. These fonts still use character sets like windows default or UNICODE. However, their graphical

representation will be different. For example vowel V_A is represented by character "v" in Hindi and "@" in Telugu.

Table 1: Vowels in Hindi & Telugu

Alphabet	Hindi		Telugu	
V_A	अ	v	అ	@
V_AA	आ	vk	ఆ	A
V_I	इ	b	ఇ	B
V_I2	ई	bZ	ఀ	C
V_U	उ	m	ఉ	D
V_U2	ऊ	Å	ఁ	E
V_E0			ఎ	H
V_E	ए	,	ఏ	I
V_AE	ऐ	,s	ఐ	J
V_O0			ఓ	K
V_O	ओ	vks	ఔ	L
V_O2	औ	vkS	ఌ	M
V_REE	ऋ	_	ఋ	F
V_AM	अं	a	ం	=
V_AHA	अः	¢	ః	>

Table 2: Consonants in Hindi & Telugu

Alphabet	Hindi		Telugu	
C_K	क	d	క	N
C_KH	ख	[k	ఖ	O
C_G	ग	x	గ	Q
C_GH	घ	?	ఘ	R
C_ONG	ङ	³	ఙ	S
C_CH	च	p	చ	T

Table 3: Consonants in Hindi & Telugu

Alphabet	Hindi		Telugu	
C_SH	श	'k	శ	q
C_SHH	ष	"k	ష	r
C_H	ह	g	హ	v
C_TR	त्र	=		
C_GY	य	K		
C_SHR	श्र	J		
C_KSHH	क्ष	{k	క్ష	x

English language always have vowel characters right of its associated consonant. However, in Indian languages, vowel may appear both sides (left, right) of consonant. In English, whether vowel positioned at start or mid or end of word, its appearance will not be changed (Capitalization rule is exception here.). Whereas, if vowel appear at start of word, it will have its full form. Appearance at mid or end, it will have its half form (In Hindi, we refer MAATRAA, In Telugu, GUNITALU). This will vary language to language, vowel to vowel. Table 1 shows that how vowel V_I appears in Hindi & Telugu.

Table 4: Vowel & consonant appearance in words

Hindi	Alphabet	Telugu	Alphabet
इमली	V_I, C_M, C_L, V_I2	ఇలు	V_I, C_L, C_L, V_U
किसान	C_K, V_I, C_S, V_AA, C_N	కిసాని	C_R, V_AA, C_G, V_I

III. SOUND INVENTORY

Building a sound inventory involves making a decision on basic unit of synthesis, enumeration of phonemes, recording, labeling and finally coding the data.

A. Basic unit of synthesis

The basic unit of synthesis can be a phoneme or diphone or syllable or word or phrase or even a sentence. Theoretically, larger the basic unit, fewer will be the concatenation points during synthesis and better the quality of produced speech. I have used diphone as unit of synthesis to have optimal size of sound inventory and maintaining quality of synthesized speech.

B. Enumerating the diphone set

In Hindi, combination of a consonant & a vowel sound/phone/alphabet and placing it into a table, referred as **Baarah Khadi**. As per best of my knowledge, Hindi language has enough vowel, consonant and Baarah Khadi sounds to represent (sound) all Indian languages sounds. Therefore, if we provide a unique identifier to each tabular entry in Baarah Khadi then we refer it as language neutral sound/phone identifier (similarly, Phonetics in English language).

Table 5: Bhaarah Khadi ID and language symbols

Bhaarah Khadi	Hindi		Telugu	
BK_A	अ	v	అ	@
BK_AA	आ	vk	ఆ	A
BK_I	इ	b	ఇ	B
BK_I2	ई	bZ	ఀ	C
BK_K	क	D	క	N+
BK_K_A	क	d	క	N{
BK_K_AA	का	dk	కా	N}
BK_K_I	कि	fd	కి	Ni
BK_K_I2	की	dh	కి	N□

Compare to other Indian languages, still we have few vowels and consonants that not exists in Hindi. like, V_O0, V_O0 etc. This can overcome by adding these additional alphabets into proposed system's Baarah Khadi. I have considered a phone-set which is a super set of Hindi and Telugu languages.

Thus, with a 40-phone inventory, one could collect a 16 * [1(V) + 38(C)] = 646 diphone inventory and create a synthesizer

that could speak anything, given the imposition of appropriate prosody.

C. Diphone Database Construction

Designing, recording, and labeling a complete diphone database is a laborious and a time consuming task. The overall quality of the synthesized speech is entirely dependent on the quality of the diphone database. I have recorded voice (wave file; maintaining constant pitch, volume, and speech rate during the recording) for each phoneme & di-phone (each Baarah Khadi entries has its own sound clip file). Which helps to increase quality of output speech. All the samples were recorded at sampling rate of 48 kHz (16 bit sample; mono channel and Audio format is PCM). The recorded samples were segmented manually with WavePad sound editor. After labeling, the segmentation results were visually inspected and corrected by checking all results using WavePad sound editor.

IV. LETTER TO SOUND RULES/MAPPING

Font Characters Mapping

Mapping is required for font characters of a Indian language to represent vowel and consonant alphabet. Details of vowel appearance (before or after) with respect to consonant is also needed while parsing language text. There are also other challenges. There will possibility in different fonts that a vowel or consonant or Bhaarah Khadi may have multiple symbols or characters. Table 5 shows (partial list of Baarah Khadi) mapping of Baarah Khadi, language's alphabet and its associated Unicode characters. I am maintaining Baarah Khadi mapping into XML files to read programmatically language details.

```
<FontDefinition FontName="Ankit">  
<BK ID="BK_A" Type="V" SymbolA="v"></BK>  
</FontDefinition>  
<FontDefinition FontName="Tikkana">  
<BK ID="BK_A" Type="V" SymbolA="@"></BK>  
</FontDefinition>
```

Conversion of One language text to another

As each language has its own font character mapping definition (alphabet & Baarah Khadi), it is each to convert one language text into other language text by using Baarah Khadi (Intermediate processing results while text to speech conversion).

V. INPUT TEXT ANALYSIS & PROCESSING

The text-to-speech conversion process can be divided into following stages:

A. Text Entry

If input text is provided by manual entry, then there should be form or UI to read it. I have used Windows forms for user entry.

B. Text Analysis

Text analysis is the task of identifying words in the text. The first task in text analysis is to make chunks out of input text - tokenizing input text. At this stage, the input text is also chunked into reasonably sized utterances. For many languages, tokens are white space separated and utterances can, to a first approximation, be separated after full stops, question marks, or exclamation points. Apart from chunking, text analysis also does text normalization. Text normalization includes "Token Identification" which is the task of identifying special symbols, numbers and "Token to Words" which convert the identified tokens to words for which there is a well defined method of pronunciation.

C. Pronunciation

Having properly identified the words, their pronunciation can be found by looking them up in a lexicon, or by applying letter-to-sound rules to the letters in the word. For Hindi & Telugu languages pronunciation can almost completely be predicted from their orthography, pronunciation can be found using a set of Letter-to-Sound (LTS) rules (Baarah Khadi mapping).

VI. SPEECH CONSTRUCTION (WAVE OUTPUT GENERATION)

There are four basic approached to synthesizing speech, namely waveform concatenation, articulatory synthesis, formant synthesis and concatenative synthesis. One of the common approach to synthesis is Concatenative Synthesis.

A. Concatenative Synthesis

Concatenative synthesis uses actual short segments of recorded speech that were cut from recordings and stored in an inventory ("voice database"), either as "waveforms" (uncoded), or encoded by a suitable speech coding method. It involves taking real recorded/coded speech, cutting it into segments, and concatenating these segments back together during synthesis.

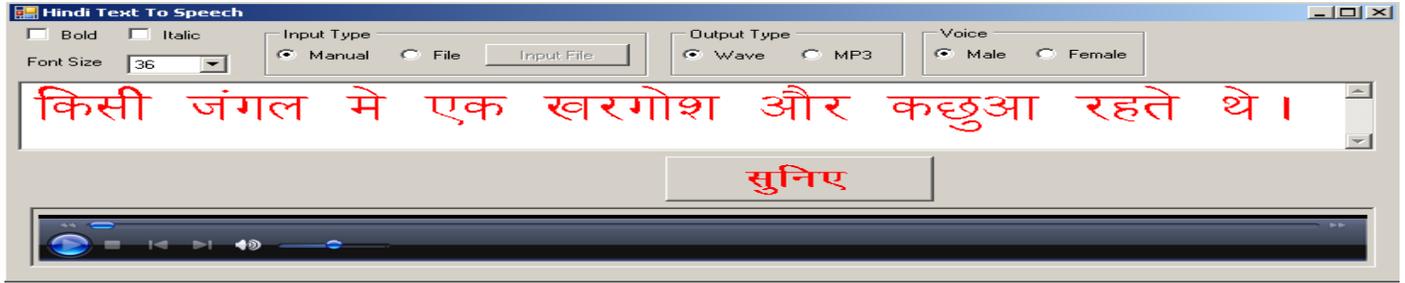
B. Sound Generation Rules

Sound rules vary from language to language. To synthesize a particular language, required units (diphones) from the database which doesn't contain any language specific information and these selected units were then typically altered by signal processing functions to meet the language specific target specification generated by different modules in the synthesizer. This need to be considered while converting Baarah Khadi to sound for a language. For example, when Telugu speaker speaks a word which ends with consonant (no MAATRAA; default V_A phone) then speaker will give stress to V_A sound. Sound V_A is not stresses by Hindi speakers.

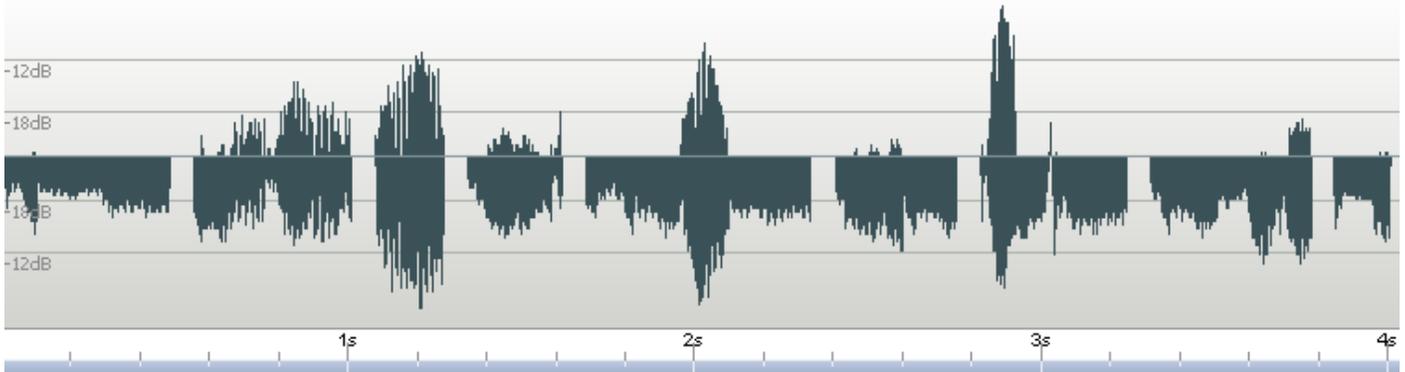
VII. EVALUATION OF RESULT

This implementation has been tested with text from Rabbit and Tortoise story for both Hindi & Telugu language.

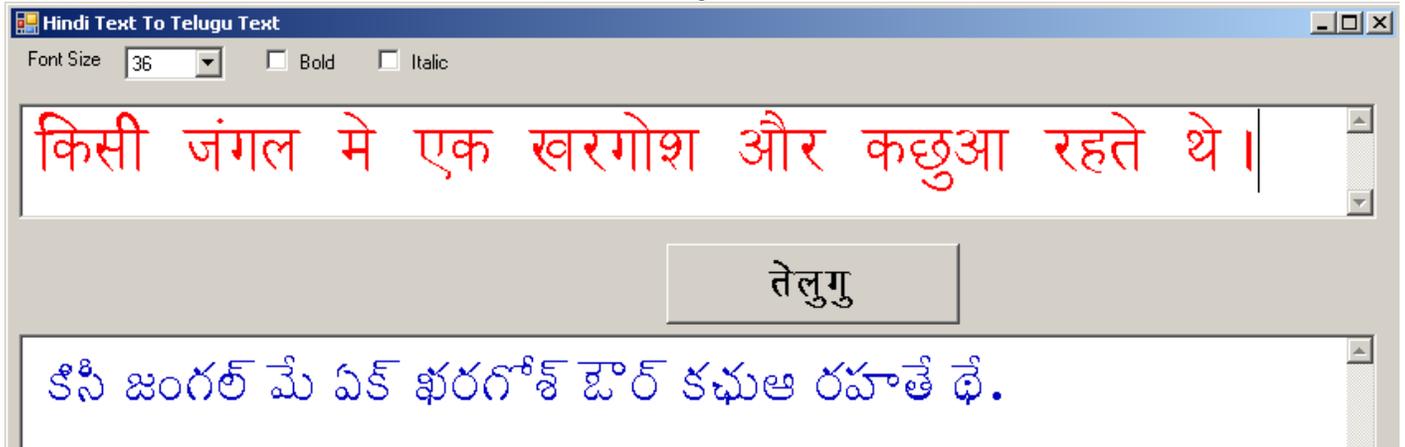
Hindi Language Text Entry



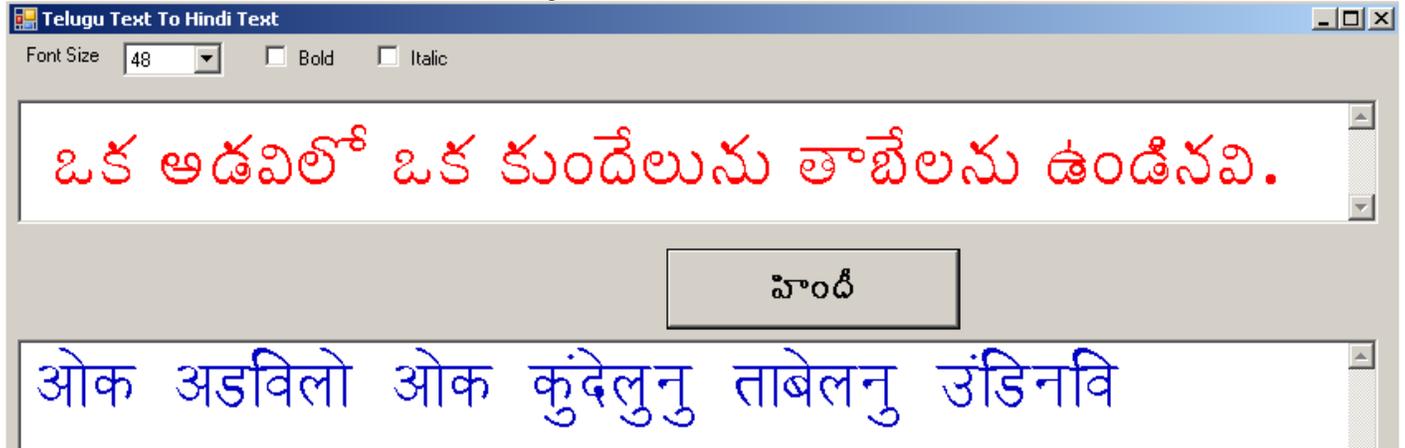
Generated wave file (wave form)



Hindi Text to Telugu Text Conversion



Telugu Text to Hindi Text Conversion



VIII. CONCLUSION

This system has limited to two voices (a male and a female). This can be enriched with multiple voices (for both male and female) with minor changes in code and reach sound inventory (recording voice samples). For now, its implementation is limited to support Hindi & Telugu. To support new language, say Kannada, it require Font Characters Mapping and little extra C# coding to plug language text parsing and pronunciation rules. This system has difficulty to support language like Tamil which words are pronounced based on context.

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A Study of Congestion Aware Adaptive Routing Protocols in MANET

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Abstract- Routing protocols for mobile ad hoc networks (MANETs) have been explored extensively in last few years. Much of this work is targeted at finding a feasible route from a source to a destination without considering current network traffic or application requirements. Routing may let a congestion happen which is detected by congestion control, but dealing with congestion in reactive manner results in longer delay, and unnecessary packet loss and requires significant overhead if a new route is needed. Routing should not be aware of, but also be adaptive to, network congestion. Adaptation to the congestion helps to increase both the effectiveness and efficiency of routing. These problems are solved by the congestion-aware routing protocols in certain degree. These protocols which are adaptive to congestion status of mobile ad-hoc network can greatly improve the network performance. In this paper, we present the survey of congestion adaptive routing protocols for mobile ad-hoc network. Finally, the future direction of congestion-aware routing protocols is described.

Index Terms- Ad hoc networks, congestion aware routing, congestion metric, congestion adaptability.

I. INTRODUCTION

Wireless ad-hoc network is usually defined as a set of wireless mobile nodes dynamically self organizing a temporary network without any central administration or existing network infrastructure. The node in the wireless ad-hoc network can serve as routers and hosts. So, they can forward packets for other nodes if they are on route from source to destination. Routing is important problem in wireless ad-hoc network. Traditional working protocols cannot work well in wireless ad-hoc network because of the characteristics of the wireless ad-hoc networks. Since, mobile nodes have limited transmission capacity they mostly intercommunicate by multihop relay. Multihop routing is challenged by limited wireless bandwidth, low device power, dynamically changing network topology, high vulnerability to failure. To answer these challenges, many routing algorithms in MANETs were proposed. There are different dimensions to categorize them: proactive routing Vs reactive routing or single path routing Vs multipath routing. In proactive protocols, route between every two nodes are established in advance even though no transmission is in demand. In reactive protocols, route is discovered when needed transmission and released when transmission no longer takes place. Congestion is one of the most important restrictions of wireless ad-hoc network. It may deteriorate the performance of whole network. In the current design routing is not congestion-adaptive. Routing may let the congestion happen which is detected by congestion control. But dealing with congestion in

reactive manner results in longer delay and an unnecessary packet loss and requires significant overhead if the new route is needed. But, now there is another dimension for categorizing for routing protocols: congestion adaptive Vs congestion un-adaptive routing. Our motivation is that congestion is dominant cause for packet loss, long delay, and high overhead in MANETs.

These problems become visible in large scale transmission of traffic intensive data such as multimedia data where congestion is more probable and negative impact of packet loss on the service quality is of more significance. In this paper we studied congestion routing protocols like CRP (Congestion Adaptive Routing Protocol) [7], ECARP (Efficient Congestion Adaptive Routing Protocol) [11], CARP (Congestion Aware Routing Protocol), CADV (Congestion Aware Distance Vector) [12], CARA (Congestion Aware Routing plus rate Adaptation) [12], CARM (Congestion Aware Routing Protocol for Mobile Ad-hoc Network) [12].

The remaining part of the paper is organized as follows: In section II we provide the studied congestion aware routing protocols. In section III comparison between these algorithms is presented. In section IV we concluded the paper.

II. ALGORITHMS

There are many routing algorithms in mobile ad-hoc networks for routing and congestion free networks. Some of them are explained below:

A. Congestion Adaptive Routing Protocol (CRP)

Congestion Adaptive Routing is a congestion adaptive unicast routing protocol for mobile ad-hoc network. CRP protocol tries to prevent congestion from occurring in the first place. In CRP, every node appearing on a route warns its previous node when prone to be congested. So, CRP uses the additional paths called as "bypass" for bypassing the potential congestion area to the first non congested node on the primary route. It reduces packet delay. But, at the same time CRP tries to minimize bypass to reduce protocol overhead. Hence, the traffic is split over bypass and primary and adaptively to network congestion. Hence, 1) power consumption is efficient. 2) Congestion is resolved beforehand and at the same time there is small packet loss rate. CRP is on-demand and consists of the following components.

1) *Congestion Monitoring:* When no. of packets coming to the node exceeds its carrying capacity, node becomes congested and its starts losing packets. Various metrics are used for node to monitor congestion status. Main parameters are percentage of all packets discarded for lack of buffer space, the average queue length, the no. of the packets timed out and retransmitted, average packet delay. In all these parameters, rising number indicates growing congestion.

Table 1: Splitting Probability Adjustment

Congestion	Bypass status=green	Bypass status=yellow	Bypass status=red
Next primary node is green	$P:=p+(1-p)/4$	$P:=p+(1-p)/3$	$P:=p+(1-p)/2$
Next primary node is yellow	P unchanged	P unchanged	$P:=p+(1-p)/4$
Next primary node is red	$P:=p-(1-p)/2$	$P:=p-(1-p)/4$	Find another bypass

2) *Primary Route Discovery*: Sender discovers the route to the receiver by broadcasting the REQ packet toward receiver. The receiver responds REQ by sending the REP packet on same path that the REQ previously followed. This is called primary route and nodes on this are called primary nodes. To reduce traffic due to the primary route discovery and better deal with Congestion in the network, 2 strategies are adopted 1) REQ is dropped if arriving at a node which is having congestion status as “red” 2) REQ is dropped I arriving at node already having a route to destination .

3) *Bypass Discovery*: A primary node periodically broadcasts a UDT i.e. update packet. This packet contains the nodes congestion status and set of tuples [destination D, next green node G, distance to green node, n] for each node appearing as a destination in primary table. For this reason is when node P receives an update packet from next primary node P_{next} about the destination D, P will be aware of congestion status of next. This causes the congestion to know about the next green node of P which is n hops away from primary route. But if the next hop is yellow or red, congestion will be there if data packets continue to be forwarded on $P \rightarrow P_{next}$. But, CRP tries to keep congestion from occurring in the first place, P node starts to select bypass route toward G-the next green node of P known from the UDT packet. This bypass search is similar to primary route search, except that 1)the bypass request packet’s TTL is set to $2*m$ and 2)bypass request is dropped if arriving at node already present on primary route. It can be also possible that no bypass is found. So, in such situation packets are delivered to destination by following primary route.

4) *Traffic Splitting and Congestion Adaptability*: When the bypass at a node is found, data packets coming to this node are not necessarily spread over bypass and primary route. To avoid the bypass from being congested no packet is forwarded on bypass unless any primary node is red i.e. congested. The basic idea behind traffic splitting is that when primary link consists of less congested node, traffic on primary link should be increased, otherwise it should be reduced. Bypass and primary routes cannot include more than 2 common nodes, but different bypass paths can share common node. This increases chance to discover a bypass. But, because of this bypass node may become congested if it has to carry large loads of bypass traffic. But, this can be solved, by splitting probability adjustment for congestion adaptation. The probability adjustment is as shown in TABLE I.

5) *Multipath Minimization*: To reduce the protocol overhead, CRP tries to minimize using multiple paths. If the probability p to forward data on a primary link approaches 1.0 , this means the next primary node is far from congested or the bypass route is highly congested. In this case, the bypass at the current node is removed. Similarly, if the next primary node is very congested (p approaches 0) , the primary link is disconnected and the bypass route becomes primary. To make the protocol more lightweight, CRP does not allow a node to

have more than one bypass. The protocol overhead due to using bypass is also reduced partly because of short bypass lengths. Each bypass connects to the first non-congested node after the congestion spot, which should be just a few hops downstream.

6) *Failure Recovery*: CRP is able to quickly resume connectivity after a link breakage by using bypass routes currently available. There are 3 min cases of failure.

Primary link failure: When one of link on primary route fails, the initial node sends a DISC packet towards sender along route. This DISC goes on recording nodes and it stops at node having bypass. This node if finds that its bypass destination is there in DISC, that bypass is not used and DISC is forwarded upstream towards sender till it finds a node with bypass and not having failed node as its destination. If both these cases are not there DISC is sent to the sender and it will find new primary route.

Bypass link or node fails: In this case bypass node which finds this failure sends a BPS_DISC packet through bypass route to primary node and that bypass is removed.

Primary node fails: If node on the primary route fails, its previous node sends DISC packet along primary route. If the bypass node detects some failure, it will also send BPS_DISC packet along bypass until reaching a primary node. When primary node received both these packet, it removes bypass and DISC packet is forwarded along primary route. Then this is handled same as first case. If BPS_DISC packet doesn’t arrive at the primary node on time that bypass is used as primary route. But, if it comes late, it is ignored. But, route remains broken but it will recover soon because another DISC packet will be sent back.

To evaluate the performance of the CRP following parameters are used:

Packet delivery ratio: Percentage of data packets received at the destination out of the number of data packets generated by the CBR traffic sources.

End-to-End delay: It is the accumulative delay in data packet due to buffering of packets, new route discoveries, queuing delay, MAC-layer re-transmission, and transmission and propagation delays.

Routing Overhead: The ration of the amount in bytes of control packets transmitted to the amount in bytes of data received.

Normalized power consumption: The ratio of the amount in bytes of both control and data packets transmitted to the amount in bytes of data received.

B. An Efficient Congestion Adaptive Routing Protocol for Mobile Ad Hoc Networks (ECARP)

An efficient congestion adaptive routing protocol is better than every other routing protocol during heavy traffic loads. The ECARP, routing protocol ensures high availability of alternative routes and reduce the rate of stale routes. ECARP is having mainly AODV as its base. This can be achieved by increasing the parameters of routing protocols (especially in AODV) that normally take more time for link recovery. These parameters are

active_route_time-out,route_reply_wait_time, reverse_route_life, TTL_start, TTL_increment, TTL_threshold and delete_period.

ECARP Congestion Control Algorithm

This algorithm provides solution to improve routing protocols due to constrained environment.

Step 1: Check the occupancy of link layer buffer of node periodically. Let N_c be the congestion status estimated.

Step 2: Compute $N_c = \text{Number of packet buffered in buffer} / \text{Buffer Size}$

Step 3: Set the status for congestion. It can be indicated by three statuses "Go", "careful", and "Stop".

["Go" indicates there is no congestion with $N_c \leq 1/2$], "careful" indicates the status likely to be congested with $1/2 \leq N_c \leq 3/4$ and "Stop" indicates the status already congested, $3/4 \leq N_c \leq 1$.]

Step 4: Invoke congestion control routine when link failed event has occurred in data transfer with using active route or $3/4 \leq N_c \leq 1$.

Step 5: Assume that neighboring will have alternate route or non-congested route to the destination.

Step 6: Make Query to non-congested neighbors for route to destination

Step 7: after obtaining the routes from the neighbors, select route with minimum hops.

Step 8: Once route is finalized start sending the data packets through non-congested route.

Step 9: If there is no alternative route to destination then start splitting the traffic to the less congested route.

Step 10: Traffic splitting effectively reduces the congestion status at the next main node.

C. Congestion aware routing plus Rate Adaptation (CARA)

The base use of CARA protocol is DSR. The route discovery mechanism of DSR is modified. This protocol mainly aims to find the bypass route for congested zones or nodes. This can be achieved by combining the average MAC utilization and the instantaneous transmission queue length to indicate the congestion level of nodes in the network. When source wants to transmit data to the destination node, it broadcasts RREQ packets. When intermediate node receives RREQ, it checks its congestion level. If the congestion level is higher then it discards the RREQ. When RREQ arrives at the destination node, though destination node is congested or not it handles the RREQ and replies RREP. So, route without congested node is established. CARA uses two metrics to measure congestion information first is average MAC layer utilization. The instantaneous MAC layer utilization is considered as 0 only when the medium around the node is available at the beginning of a transmission and as 1 when the node is not idle. (e.g. detecting physical carrier or detecting or back off due to virtual carrier sensing.) As, the instantaneous MAC layer utilization is either 1 or 0 the average value with in the period indicates the use of wireless medium around the node.

Second metric used is instantaneous transmission queue length. If the node has many packets waiting in the queue, it causes long packet latency or even dropping of packets. So we can say that node is congested now.

The above mentioned metric can veraciously reflect the congestion conditions around the node. This protocol tries to minimize the congestion in two ways: 1) It forbids the RREQ

packets to propagate in the congested area. 2) It guides the route around the congested area or nodes instead of across them.

As a result of this no conditional transmission burden generate in these areas.

D. Congestion Aware Routing protocol for Mobile ad hoc networks (CARM)

A congestion aware routing protocol for mobile ad hoc networks uses a metric incorporating data rates, MAC overhead and buffer delay to control the congestion. The CARM protocol introduces a new parameter called WCD (Weighted Channel Delay) to measure congestion level and adopts a route ELDC(Effective link Data-rate Category) to avoid the MDRR(Mismatched data-rate route) problem. The MDRR problem is shown in following fig.2

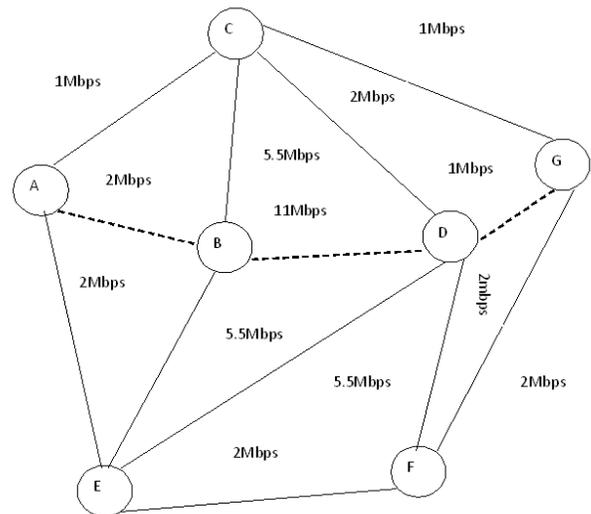


Fig. 2. An example of MDRR problem

The data rate of route shown by dashed (A-B-D-G) is limited by teaming fast link (B-D) with slow link (A-B and D-G).

As mentioned earlier, the CARM protocol introduces a new parameter called WCD (weighted channel delay) to measure congestion and it is given as

$$WCD = a \Sigma \tau Q + (1+b) T_{MACALL} + T_{data}$$

where Q is the number of buffered packets for this link. $T_{data} = L_{data} / R$ is the data transmission time, L_{data} is the length of data in bytes or bits and R is the data rate of the link. T_{MACALL} is total time spent at the MAC layer. The constants a and b are parameters with values between 0 and 1 which are used to weight T_{MACALL} . By weighting T_{MACALL} can avoid misjudgment of congestion as shown in fig.3

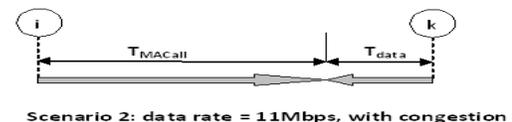
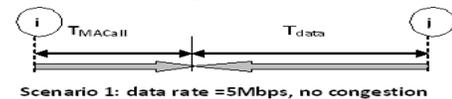


Fig. 3. Two scenarios with the same overall delay but different MAC and transmission delay due to different data-rates and congestion levels.

In CARM, source node broadcasts RREQ packets with ELDC and WCD information when it attempts to transmit data to the destination. Intermediate nodes compare source ID, source sequence, and ELDC of the RREQ packets they receive from neighbors, and drop the RREQ packets whose source ID and source sequence number are the same with that of other RREQ packets received earlier and ELDC is lower than the earlier RREQ packets'. Only the destination node can respond to the RREQ packets by sending RREP packets back to the source along the route from which they came. The route is established when the first RREP arrives at the source. The subsequent RREP packets are cached for the spare routes. The utilization of the congestion metric, WCD, is very special in CARM protocol. Because the priority of route packets is higher than data packets, the route packets can be forwarded without queuing. That is, the congestion level information inherent in queuing delays is lost. The author proposed a RREQ-delay scheme. An RREQ is forwarded with a delay of the WCD that is calculated according to the WCD information in the RREQ at the intermediate nodes. The lower the congestion level of link is, the smaller the delay of RREQ packets are, the earlier the RREQ packets arrive at the destinations. This scheme ensures that the RREQ packets of routes with lower congestion level arrive at the destination first and congested links are eliminated in the routes. This all causes high overhead. So, overhead in case of CARM is very high.

E. Congestion-Aware Distance Vector (CADV)

The CADV protocol is based on proactive protocol, DSDV. In a distance vector routing protocol, every host maintains a routing table contains a distances from itself to possible destinations. A mobile host in ad -hoc network acts like a single server queuing system. Delay in sending packet is related with congestion. In CADV, each entry is related with delay expected. This helps to measure congestion at the next hop. The expected delay is computed follows:

$$E[D] = \frac{\sum D_i}{n} L \tag{1}$$

Where n is the number of sent packets & L is the length of MAC layer packet queue. E [D] estimates the time. A newly arrived packet has to wait before it is send out.In CADV, routing decision is made based on distance to the destination as well as the expected delay at the next hop showed in (1) CADV gives the routes with low expected delay, higher priority. CADV tries to avoid congestion and tries to balance traffic by giving priority to a route having low expected delay.

CADV routing protocol consist of three components:

- 1) *Traffic Monitor*: It monitors traffic going out through the link layer. Currently it keeps track of average delay for sending one data packet in receipt period of time. Time period is specified by route maintenance component.
- 2) *Traffic Control*: It determines which packet is the next to send or drop. It reschedules packets if needed. It supports a drop tail FIFO queue and provides functionality to queue packets.
- 3) *Route maintainance*: It is the main component. It performs the work of exchanging information with neighbors, evaluation and

maintaining routes. It manages the traffic monitor and traffic control component.

CADV better support for QoS. The real time performance of CADV is good, and end to end delay was short. The over head of CADV is unacceptable when the network is large. Through put also decreases the performance of CADV is may be well in the small & steady wireless ad- hoc network.

F. Congestion Aware routing Protocol (CARP)

CARP is an on-demand routing protocol. It uses information gathered from MAC layer to discover congestion free routes. CARP uses combined weight matrix in its standard cost function to check for the congestion level. The multiple paths are computed during the route discovery. Calculate node weight matrix NM which assign a cost to each link in the network and select maximum throughput paths.

$$NM = (L_q * D_{rate}) / (OH_{mac} * D_{avg})$$

- 1) *Route request*: Consider the route

$$S-P1-P2-P3-D$$

To initiate congestion-aware routing discovery, the source node S sends a RREQ. When the intermediate node P1 receives the RREQ packet, it first estimates all the node weight metrics.

The node P1 then calculates its node weight NMP1

$$RREQP1 \rightarrow P2$$

P2 calculates NMP2 and forward the RREQ packet

$$RREQP2 \rightarrow P3$$

Finally the RREQ reaches the destination node D with the sum of node weights

$$RREQP3 \rightarrow D$$

- 2) *Route Reply*: The destination node D sends the route reply packet RREP along with total node weight to the immediate upstream node P3

$$RREQD \rightarrow P3$$

Now P3 calculates its cost C based on the information from RREP as

$$CP3 = (NM_{p1} + NM_{p2} + NM_{p3}) - (NM_{p1} + NM_{p2})$$

By proceeding in the same way, all the intermediate hosts calculate its cost .On receiving the RREP from all the routes, the source selects the route with minimum cost value.

III. COMPARISONS

Congestion is a dominant reason for packet drops in ad hoc networks.CRP sends packets on both bypass paths and primary routes simultaneously. So, incoming traffic is distributed on primary and bypass route depending on current congestion status of network. Congestion is subsequently better resolved .In ECARP some parameters of AODV such as TTL_start, TTL_increment are increased. So, it ensures the high availability of alternative routes and reduces the rate of broken rut removal process. CADV is not congestion adaptive. It offers no remedy when the existing route becomes heavily congested. So, CADV improves AODV in delivery ratio only. The real time performance of the CADV is good and the End-to-End delay is short. The disadvantage of the CADV is that since, each node maintains all the routes to the nodes in the network and changes the route information periodically, the overhead for maintaining

the routing tables is huge. The overhead of the CADV is unacceptable when the network is large or the topology changes frequently. The throughput decreases sharply at the same time. So, CADV may perform well in the small, steady wireless ad-hoc network. By studying the algorithms of CARM, CARA and CADV it is concluded that overhead of the CARM and CADV are higher than CARA, the delay of CADV is shorter than the other two.

IV. CONCLUSION

It is clear from algorithms available for having adaptive solution for congestion in the network as due to vast payload on networks, which may be due to flooding of packets or may be due to repeat requests on the basis of error correction techniques. Congestion metrics still remains a great challenge for the future work. It is quite important to obtain an optimal approach that combines related parameters collected from physical layer, MAC layer to measure congestion. Finally we can conclude that congestion is the problem associated with the network and has to be countered by having compromised solution rather than elimination.

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Improving Compression Performance in Bit Depth SVC with a Prediction Filter

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Abstract- High dynamic range (HDR) is a technique that allows a great dynamic range of luminance between the lightest and darkest area of an image. For video compression, the HDR sequence is reconstructed by inverse tone-mapping a compressed low dynamic range (LDR) version of the original HDR content. In this paper, we show that the appropriate choice of a Tone-mapping operator (TMO) can significantly improve the reconstructed HDR quality. It is used to compress a large range of pixel luminance in to smaller range that is suitable for display on devices with limited dynamic range. we formulate a numerical optimization problem to find the tone-curve that minimizes the expected mean square error (MSE) in the reconstructed HDR sequence. We also develop a simplified model that reduces the computational complexity of the optimization problem to a closed-form solution. It is also shown that the LDR image quality resulting from the proposed methods matches that produced by perceptually-based TMOs

Index Terms- Bit-depth scalable, High dynamic range, video compression, tone-mapping

I. INTRODUCTION

Natural scene contain far more visible information that can be captured by the majority of digital imagery and video devices. This is because traditional display devices can only support a limited dynamic range and color gamut. A classic photographic task is the mapping of the potentially high dynamic range of real world luminances to the low dynamic range of the photographic print. This tone reproduction problem is also faced by computer graphics practitioners who map digital images to a low dynamic range print or screen. For video compression, these advances in display technology have motivated the use of extended gamut color spaces. These include xvYCC (x.v.Color) for home theater and the Digital Cinema Initiative color space for digital theater applications. Yet, even these extended color spaces are too limited for the amount of contrast that can be perceived by the human eye. High dynamic range (HDR) video encoding goes beyond the typical color space restrictions and attempts to encode all colors that are visible and distinguishable to the human eye [3], and is not restricted by the color gamut of the display technology used. The main motivation is to create a video format that would be future-proof, independent of a display technology, and limited only by the performance of the human visual system (HVS). HDR images preserve colorimetric or photometric pixel values (such as CIE XYZ) within the visible color gamut and allows for intra-frame contrast exceeding 5–6

orders of magnitude ($10^6:1$), without introducing contouring, banding or posterization artifacts caused by excessive quantization.

Backward-compatibility can be achieved if the HDR video stream contains 1) a backward-compatible 8-bit video layer which could be directly displayed on existing devices, and 2) additional information which along with this 8-bit layer can yield a good quality reconstructed version of the original HDR content. Such a stream can also contain a residual layer to further improve the quality of the HDR reconstruction. Fig. 1 illustrates the general coding structure used to provide a backward compatible HDR video bit stream.

Several proposals have been suggested to allow the above-mentioned HDR backward-compatibility function within the scalable extension of the H.264/AVC video coding standard [7]–[15]. The contrast of the original HDR content is first quantized into the 8-bit range using a tone mapping operator (TMO) to produce an LDR representation. The LDR sequence is then compressed using a standard video encoder (H.264/AVC). A larger dynamic range video can then be reconstructed by decoding the LDR layer and applying the inverse of the tone-mapping operator to reconstruct the HDR representation. The shape of the TMO can be encoded using supplemental enhancement information (SEI) messages. Finally, a HDR residual signal can also be extracted and encoded in the bit stream as an enhancement layer.

It address the problem of finding an optimal tone-curve for such a backward-compatible encoding scheme. To compute the tone-curve, we propose a method that minimizes the difference in the video quality between the original and the reconstructed HDR video.

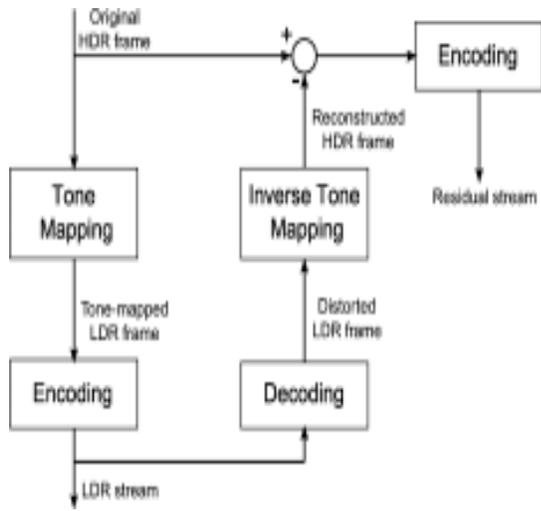


Fig. 1 General structure of the scalable approach used for backward-compatible HDR video encoding. The base layer encodes an 8-bit LDR representation of the HDR input. The enhancement layer encodes the difference (residual) between the inverse tone-mapped base layer and the original HDR source.

The remainder of this paper is organized as follows: an overview of related work is presented in Section II. In Section III, the proposed tone-mapping approach that considers tone-mapping together with compression is discussed in detail. Section IV demonstrates and analyzes the performance of the proposed methods. Finally, we draw our conclusions in Section V.

II. RELATED WORK

Backward compatible HDR video encoding has received significant interest recently. A color space of encoding HDR content based on the luminance threshold sensitivity of the human visual system. They concluded that 10–12 bit luma encoding is sufficient to encode the full range of visible and physically plausible luminance levels. A tone-mapping curve was encoded together with the tone-mapped and residual video sequences. The residual video sequence was additionally filtered to remove the information that is not visible to the human eye.

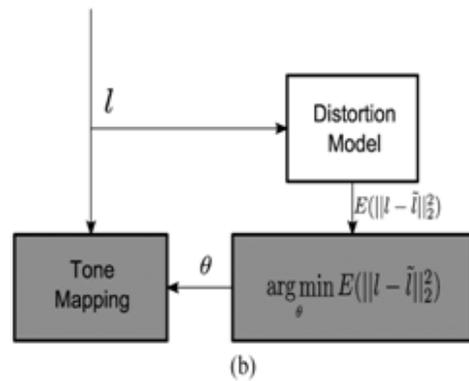
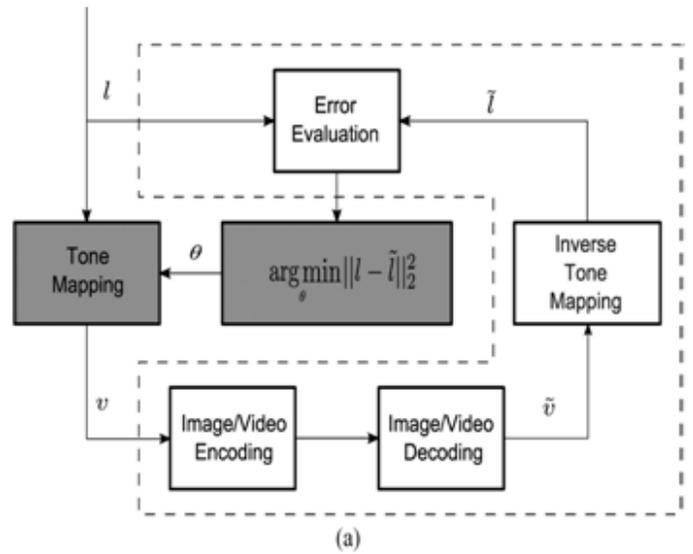


Figure 2: System overview of the proposed tone-mapping method. (a) Demonstrates the ideal scenario where the actual H.264/AVC encoding is employed. (b) Shows the practical scenario which is addressed by this paper.

The primary goal of tone-mapping is to produce the best quality low-dynamic range rendering of an HDR scene that is visually close to the visual high contrast signal.

III. PROBLEM STATEMENT AND PROPOSED SOLUTION

In this section, we present the challenges of obtaining a good quality reconstructed HDR representation in a backward-compatible HDR video encoding system and describe in detail the approach we propose towards overcoming these challenges. The performance of a backward-compatible HDR video and image encoding system depends on the coding efficiency of the LDR base layer and the HDR enhancement layer.

A. Tone-Mapping Curve

The global tone-mapping curve is a function that maps HDR luminance values to either the display’s luminance range, or directly to LDR pixel values. The tone-mapping curve is usually continuous and non-decreasing. The two most common shapes for the tone curves are the sigmoidal (“S-shaped”) or a

compressive power function with an exponent 1 (gamma correction).

The tone-mapping curve can then be uniquely specified by a set of slopes.

$$S_k = \frac{V_{k+1} - V_k}{\delta} \quad (1)$$

which forms a vector of tone-mapping parameters. Using this parameterization, the forward tone-mapping function is defined as

$$V(l) = (l - l_k) \cdot S_k + V_k \quad (2)$$

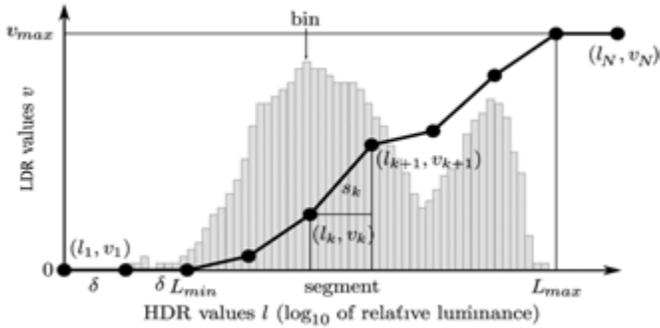


Figure 3: Parameterization of a tone-mapping curve and the notation. The bar-plot in the background represents an image histogram used to compute $p(l)$.

where v is the LDR pixel value, l is the segment corresponding to HDR value, that is

$l_k \leq l < l_{k+1}$. The inverse mapping function is then

$$\bar{l}(v; S_k) = \begin{cases} \sum_{l \in S_0}^{v-v_k} l \cdot p_L(l) \\ \text{for } S_k < 0, S_k = 0 \end{cases}$$

where $S_k \in \{ S_1, \dots, S_N \}$. (3)

When the slope is zero ($S_k=0$), $\bar{l}(v; S_k)$ is assigned an expected HDR pixel value for the entire range S_0 in which the slope is equal zero. $P_L(l)$ is the probability of HDR pixel value.

B. Statistical Distortion Model

As mentioned earlier in Section III, accurately computing the distorted HDR values would be too computationally demanding.

Instead, we estimate the error $\|\bar{l} - l\|_2^2$ assuming that the compression distortions follow a known probability distribution P_C . Under this assumption, the expected value of the error $\|\bar{l} - l\|_2^2$ is

$$E \left[\|\bar{l} - l\|_2^2 \right] = \sum_{l=l_{\min}}^{l_{\max}} \sum_{v=0}^{v_{\max}} \left(\bar{l}(v; S_k) - l \right)^2 \cdot pc(v(l) - \bar{v} / v(l)) \cdot p_L(l) \quad (4)$$

Where $pc(v - \bar{v} / v)$ is the probability that the encoding error equals $v - \bar{v}$. Note that (2) and (3) show that both v and l are uniquely determined by the values of v and l , respectively. It simplifies the expression above by removing the dependency of v on l . Consequently, the continuously relaxed objective function is written as

$$\mathcal{E}(S_K) = \sum_{l=l_{\min}}^{l_{\max}} \sum_{v=0}^{v_{\max}} \left(\bar{l}(v; S_k) - l \right)^2 \cdot pc(v - \bar{v}) \cdot p_L(l) \quad (5)$$

The only unknown variable is the probability distribution of the compression error $pc(v - \bar{v})$, which can be estimated for any lossy compression scheme. In Appendix A we model such distribution for the H.264/AVC I-frame coding. However, we will show in Section III-D that the distribution of the compression scheme error is not necessary to calculate a good approximation of the encoding error.

C. Optimization Problem

The optimum tone curve can be found by minimizing the $\mathcal{E}(S_K)$ function with respect to the segment slopes

$$S_K \arg \min \mathcal{E}(S_K) \quad (6)$$

where S_1, \dots, S_N Subject to :

$$S_{\min} \leq S_k \leq S_{\max} \quad \text{for } k=1, \dots, N$$

$$\sum_{k=1}^N S_k \cdot \delta = v_{\max}. \quad (7)$$

The first constraint restricts slopes to the allowable range, while the second ensures that the tone curve spans exactly the range of pixel values from 0 to v_{\max} . The minimum slope S_{\min} ensures

that the tone-mapping function is strictly increasing and thus invertible and $\bar{l}(\bar{v}; s_k)$ can be computed. we can write

$$\bar{l}(v+1; s_k) - \bar{l}(v; s_k) >_{\log_{10}(1.01)} \quad (8)$$

So that
$$s_k = (\log_{10}(1.01))^{-1} \quad (9)$$

D. Closed-Form Solution

The distortion model in (5) gives a good estimate of compression errors, but poses two problems for practical implementation in an HDR compression scheme: 1) it requires the knowledge of the encoding distortion distribution p_c , and 2) the optimization problem can only be solved numerically using slow iterative. l in the distortion model (5) using the inverse mapping function in (3), this gives

$$\varepsilon(S_k) \approx \sum_{l=l_{\min}}^{l_{\max}} \sum_{\bar{v}=0}^{v_{\max}} p_c(v - \bar{v}).$$

$$p_L(l) \cdot \left(\frac{v - \bar{v}}{S_k}\right)^2 \quad (10)$$

After reorganizing we get

$$\varepsilon(S_k) \approx \sum_{l=l_{\min}}^{l_{\max}} \sum_{\bar{v}=0}^{v_{\max}} p_c(v - \bar{v}).$$

$$= \sum_{l=l_{\min}}^{l_{\max}} \frac{p_L(l)}{S_k^2} \cdot \text{Var}(v - \bar{v}). \quad (11)$$

Since the variance of $(v - \bar{v})$ does not depend on the slopes, it does not affect the location of the global minimum of $\varepsilon(S_k)$. The constrained optimization problem defined in (6) can now be re-written as follows:

$$\arg \min_{s_1, \dots, s_N} \sum_{k=1}^N \frac{p_k}{S_k^2}$$

Subject to
$$\sum_{k=1}^N s_k = \frac{v_{\max}}{\delta} \quad (12)$$

Where $p_k = \sum_{l=l_k}^{l_{k+1}} p_L(l)$ and l_k and l_{k+1}

define the lower and the upper bounds of a segment, respectively. This problem can be solved analytically by calculating the first order Karush-Kuhn-Tucker (KKT) optimality conditions of the corresponding Lagrangian, which results in the following system of equations:

$$\left\{ \begin{array}{l} \frac{-2p_1}{s_1^3} + \lambda = 0 \\ \frac{-2p_2}{s_2^3} + \lambda = 0 \\ \dots \\ \frac{-2p_N}{s_N^3} + \lambda = 0 \\ \sum_{k=1}^N s_k - \frac{v_{\max}}{\delta} = 0 \end{array} \right. \quad (13)$$

where λ is the Lagrange multiplier. The solution to the above system of equations results in the slopes s_k given by

$$s_k = \frac{v_{\max} \cdot p_k^{1/3}}{\delta \cdot \sum_{k=1}^N p_k^{1/3}} \quad (14)$$

Note that the expression derived in (14) does not consider the upper bound constraint imposed on s_k in (7). Let be the set of the index of a segment with a slope that exceeds the upper bound. We overcome the upper bound violation using the following adjustment:

$$s_k = \left\{ \begin{array}{l} \left(\frac{v_{\max} - \sum_{i \in X} \delta_{\max}^{\delta}}{N} \right) \cdot p_k^{1/3} \\ \delta \cdot \sum_{j \notin X} p_j^{1/3} \end{array} \right. \quad \text{for } s_k \in I, \quad (15)$$

IV. EXPERIMENTAL RESULTS AND DISCUSSION

In this section we first validate the proposed methods: optimization using the statistical model proposed in Section III-B and the closed-form solution based on a simplified model derived in Section III-D. Then, our models are further analyzed based on the generated tone curve and the distortion of the reconstructed HDR content. The performance of our models is also evaluated by comparing it with existing tone-mapping methods

A. Model Validation

In this section, we validate that the statistical model of Section III-B results in a tone curve that truly reflects the ground-truth results. Ground-truth results are achieved using the ideal scheme illustrated in Fig. 2(a), where the actual H.264/AVC encoder and decoder are employed to find the truly optimal piecewise linear tone curve

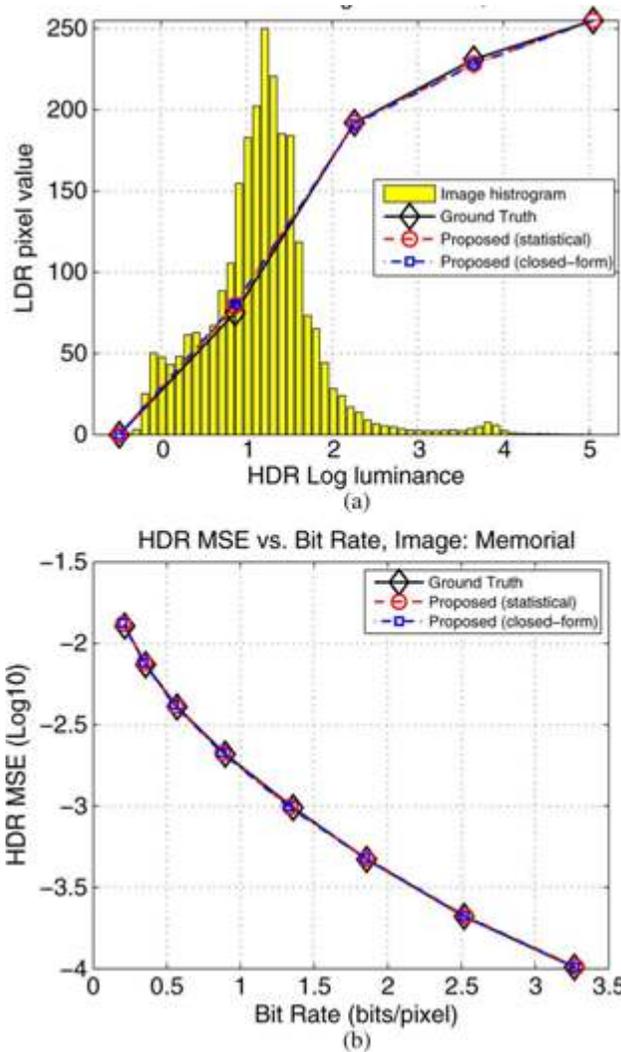


Figure 4: Validation of the proposed models by comparison with the ground-truth solution. The top figure, (a), shows the tone curves computed using the statistical model, the closed-form solution and the ground-truth optimization for the image “Memorial”. The x axis denotes the HDR luminance in the log-10 scale, and y axis is the LDR pixel value. (b) demonstrates the

result of HDR MSE (in log10 scale) versus bit rate (bits/pixel). The lower the MSE value, the better the image quality

B. Dependence of the Tone Curves on QP

Next, we verify that the proposed statistical model can be well approximated by the closed-form solution which produces a tone curve that is independent of QP.

C. Further Analysis of the Closed-Form Solution

The tone curve resulting from the closed-form solution given by (14) can be generalized as follows:

$$S_k = \frac{v_{\max} \cdot p_k^{1/t}}{\delta \cdot \sum_{k=1}^N p_k^{1/t}} \quad (16)$$

In our closed-form solution, t is set to be equal to 3. Note that when $t=1$, (16) is identical to the histogram equalization operation.

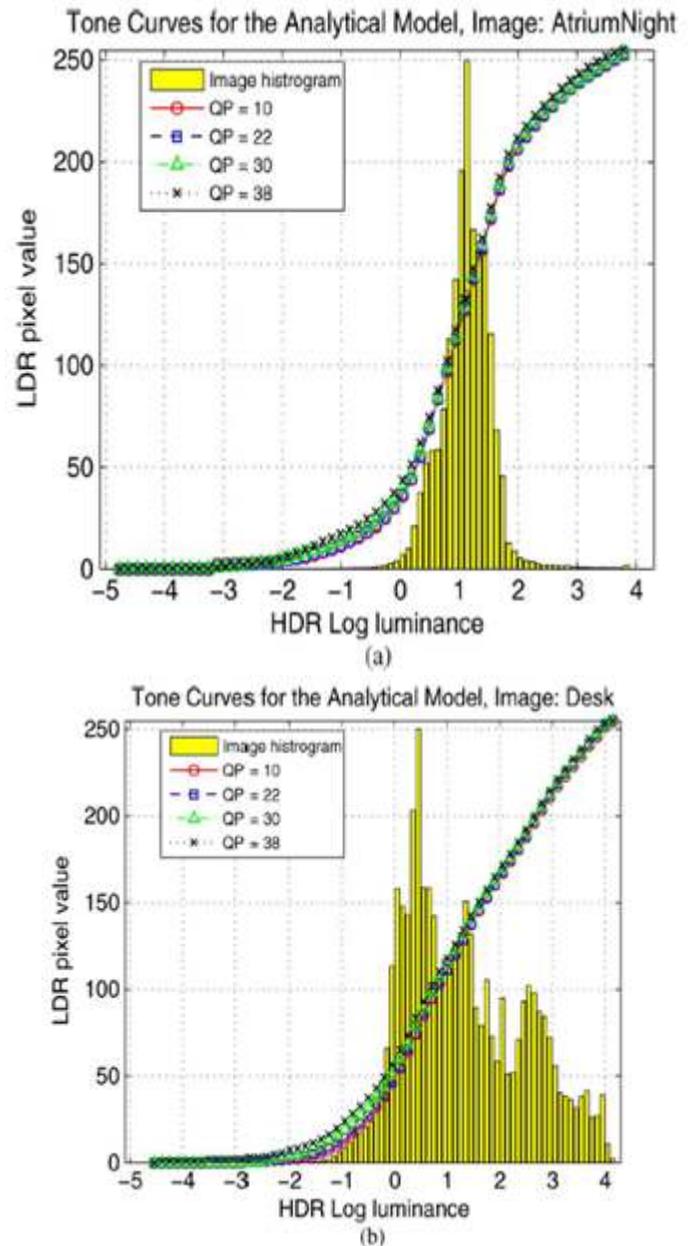


Figure 5: Tone curves generated using the statistical model with different QP values for the images “AtriumNight” and “Desk”. The notation of the axis is the same as Fig. 4(a). The smaller the value of QP, the better the compression quality 87 and 88 segments are used for “AtriumNight” and “Desk” respectively.

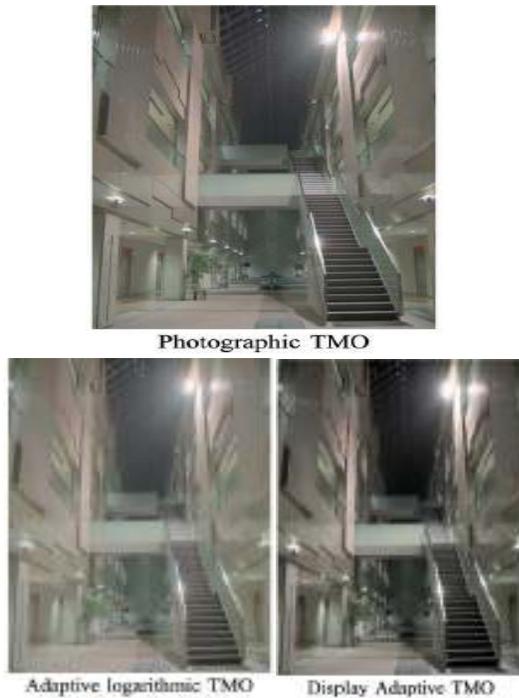


Figure 6: Rate-distortion curves, tone curves and tone-mapped images for the image “AtriumNight”. The first row demonstrates the resulting tone-curves with different TMOs, followed by the results for MSE and SSIM versus bit rates; the second row shows tone-mapped LDR images using the proposed statistical model and the closed-form solution. The third row shows the tone-mapped images using the existing tone-mapping methods. All the tone-mapped images shown are compressed. The compression quantization parameters used for “AtriumNight” is 10. The number of segments used for the histogram is 87.

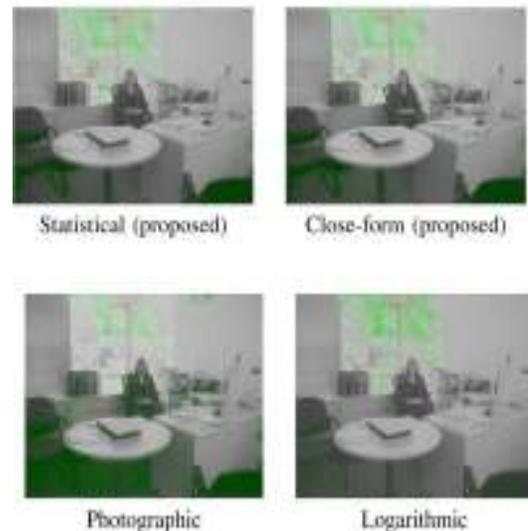
Figs. 6, 7 and 8 display the tone curve, rate-distortion curves and tone-mapped LDR images for three images. Additional results for more images are included in the supplementary material. The LDR images shown in these figures demonstrate that the images tone-mapped using our method also provide good quality. To further demonstrate the quality of the LDR images generated by the proposed models, Fig. 11 shows the distortion maps of the LDR images compared with their original HDR counterparts.



Display Adaptive TMO

Image: Coby; LDR images shown are compressed with QP = 10

Fig.7. Rate-distortion curves, tone curves and tone-mapped images for the image “Coby”. The notation is the same as Fig.6. The compression quantization parameters used for “Coby” is 22. The number of segments used for the histogram is 36.



Adaptive Display

Figure 8. Distortion maps of the LDR images relative to the original HDR images. The LDR images evaluated have not been compressed. In each of the distortion maps, three colors denote three different types of distortions: green for loss of visible contrast; blue for amplification of invisible contrast; red for reversal of visible contrast. The higher intensity of a color correlates with higher distortion of that type.

V. CONCLUSION

In this paper, we showed that the appropriate choice of a tone-mapping operator (TMO) can significantly improve the reconstructed HDR quality. We developed a statistical model that approximates the distortion resulting from the combined processes of tone-mapping and compression. Using this model, we formulated a constrained optimization problem that finds the

tone-curve which minimizes the expected HDR MSE. The resulting optimization problem, however, suffers from high computational complexity. Therefore, we presented a few simplifying assumptions that allowed us to reduce the optimization problem to an analytically tractable form with a closed-form solution. The closed-form solution is computationally efficient and has a performance compatible to our developed statistical model. Moreover, the closed-form solution does not require the knowledge of QP, which makes it suitable for cases where the compression strength is unknown. Although our models are designed to minimize HDR MSE, the extensive performance evaluations show that the proposed methods provide excellent performance in terms of SSIM and the LDR image quality, in addition to an outstanding performance in MSE.

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Dyslipidemia and Oxidative Stress in Maintenance Hemodialysis Patient- An Emerging Threat to Patient

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Abstract- Background: Lipid abnormalities and enhanced oxidative stress in CRF patients on hemodialysis accelerates the process of atherosclerosis resulting in cardiovascular complications. So the aim of this study to investigate the alterations in the serum lipid status in CRF patients on long term hemodialysis and determination of oxidative stress to know the risk of development of cardiovascular complications in these patients.

Methods: This cross sectional comparative study was carried out to determine the pattern of lipid profile and oxidative stress in patients on maintenance hemodialysis (MHD). After taking informed consent total 110 subjects were enrolled for the study in the Department of Medicine, CSM Medical University, Lucknow. Out of which 60 patient of CRF on MHD were taken as a case group, (42 male 70% and 18 female 50%), mean duration of hemodialysis was 4.5±2.05years with frequency of three session/week and each session for four hours. 50 healthy volunteers seeking treatment for other minor problem were taken as a controls (31 male 62% and 19 female 38%).

Results: Mean value of HDL cholesterol is significantly decreased in CRF patients when compared to controls. Serum LDL-C, VLDL-C were also increased in dialysis subjects in comparison to normal healthy controls (p value 0.05 & 0.001). TC/HDL-C and LDL-C/HDL-C ratio were significantly increased (p value < 0.001). S.MDA was significantly increased and SOD was significantly decreased in cases when compare to controls. These changes were more pronounced in hemodialysis patients when compare to controls. We also did the correlation between lipid and oxidative stress parameters, in which S.MDA was positively correlated with all the lipid parameters except HDL-C and SOD was negatively correlated with all the lipid parameters except HDL-C.

Conclusion: This study supports that patients on MHD show abnormalities of lipid metabolism like hypertriglyceridemia, increased total cholesterol and low HDL-C and increased oxidative stress which could contribute to accelerated atherosclerosis and cardiovascular disease that might be responsible for increase in morbidity and mortality.

Index Terms- Dyslipidemia, Oxidative stress, Maintenance Hemodialysis, Malondialdehyde, Superoxide Dismutase

I. INTRODUCTION

Chronic renal failure (CRF) is the state which results from a permanent and usually progressive reduction in renal function, in a sufficient degree to have adverse consequences on

other system.¹ The incidence and prevalence of chronic kidney disease (CKD) are increasing worldwide. According to the 1998 – 2004 National Health and Nutritional Survey (NHANES), the prevalence of CKD in the US population is 15.3%.² In the developing countries, the awareness and burden of CRF on society has been highlighted during last decade. In India incidence of CRF is not well documented because of lack of national registry and data regarding its incidence. It has been estimated that the prevalence of CRF in India may be up to 870 people/million population.³

A patient with CRF leads to many complications over a period of time. The most common include cardiovascular, cerebrovascular and peripheral vascular disease. The incidence of cardiovascular disease is high in patients on hemodialysis (HD).⁴ Approximately 50% of patients with end stage renal disease (ESRD) die from cardiovascular events, which indicate that cardiovascular mortality is 30 times higher in dialysis patients.⁵ The kidney dialysis outcome quality initiative (KDOQI) guide lines state that patients on MHD with fasting triglycerides (TG) > 5.56 mmol/L, Low-density lipoprotein (LDL) > 2.59 mmol/L and non-HDL cholesterol > 3.36 mmol/L should be considered for treatment to reduce the cardiovascular complication in these patients.⁶ Death due to cardiovascular complication in these patients are 4–20 fold higher in CRF patients than any other cause in general population.⁷ These complications are due to many metabolic and endocrinal disturbances among which dyslipidemia is one of the constant feature of CRF. Lipid abnormality can be detected as early as renal function begins to decline (GFR < 50 ml/min) but the type and severity vary among different patients.^{8,9}

CRF patients on hemodialysis are also subjected to enhanced oxidative stress due to reduced antioxidant system and increased pro-oxidant activity¹⁰. During this process polyunsaturated fatty acid, present in cell membrane are oxidized in vivo to form aldehydes of variable chain length like malondialdehyde (MDA). This lipid per-oxidation product can structurally alter DNA, RNA, body protein and other biomolecules¹¹. Lipid abnormalities and enhanced oxidative stress in CRF patients on hemodialysis accelerates the process of atherosclerosis resulting in cardiovascular complications. Keeping in view the mortality associated with CVD in patients on Hemodialysis, this study was carried out to investigate the alterations in the serum lipid status in CRF patients on long term hemodialysis and to determine the oxidative stress to know the risk of development of cardiovascular complications in these patients.

II. METHODS

A hospital based cross sectional comparative study was conducted in Nephrology Unit, Department of Medicine CSM Medical University (Erstwhile KGMC), Lucknow India from August 2010 to July 2011. 60 cases of CRF were selected from dialysis unit & Nephrology OPD and fifty controls group with age, sex matched normal healthy adults without any major illness were enrolled in the study after informed consent and this study was approved by Institutional ethics committee of CSMMU, Lucknow, UP.

A total number of 110 subjects were participated in the study, Out of which 60 clinically diagnosed cases of chronic renal failure > 20 years of age were included in the study. All 60 CRF cases were kept on maintenance hemodialysis for 3-4 hours three times /week receiving dialysis from 6 month to 5 years.

Patients with diabetes mellitus, familial hyperlipoproteinemia and who were on hypolipidemic drugs were excluded from the study after taking detailed history and examination. About 5 ml of venous blood were drawn under aseptic precautions, in a sterile bulb from selected subject after a period of overnight fasting; serum was separated by centrifugation and used for analysis. Serum lipid profile which includes triglycerides (TG), total cholesterol (TC), high density cholesterol (HDL-C) were measured by enzymatic method and serum low density cholesterol (LDL-C) and very low density cholesterol (VLDL-C) were calculated by using Friedwald formula ($LDL-C = TC - (HDL-C + TG/2.2)$).¹² In the analysis of serum malondialdehyde (MDA) by thiobarbituric acid method and superoxide dismutase (SOD) by marklund method were used. Lipid profile was analyzed by using ERBA kits in microlab semi analyzer of MERK Company, all the reagents used in the estimation were of analytical grade. Data analysis was done using statistical software SPSS-16 version. Comparison of mean was done using student t-test and comparison of proportion by chi-square test. The levels of

statistical significance were taken as $p < 0.05$. Pearson correlation coefficient used to correlate lipid profile and oxidative stress parameters.

III. RESULT

110 individual were recruited in this study 60 CKD (Male: Female ratio 42(70%): 18(30%) and 50 controls (Male: female ratio 31(62%):19(38%). Chronic glomerulonephritis (50%) was the leading cause of CKD, followed by interstitial nephritis (22%), chronic pyelonephritis (6%) and polycystic kidney disease (2%). Mean age group of patient was 45.6 ± 12.6 (33-65) versus 48.5 ± 11.5 (35-65) in control. Mean hemoglobin in patients versus controls was (9.5 ± 1.45 & 12.5 ± 2.05) respectively. Mean blood urea and serum creatinine was (120 ± 42.2 versus 14.2 ± 3.2) and (7.8 ± 3.4 versus 0.6 ± 0.2) respectively. Mean serum calcium and phosphorus was (8.3 ± 0.50 versus 9.5 ± 0.48 and 5.73 ± 1.8 versus 3.2 ± 0.40). In CKD group mean duration of dialysis was 4.5 ± 2.05 years and frequency of dialysis was three times per week for four hours. (Table-1) Comparative analysis of serum lipid profile between controls and cases shows mean value of TC, TG, LDL-C, VLDL-C, TC/HDL-C and LDL/HDL-C values are increased in cases when compared to controls (p value < 0.001) except HDL-C (p value < 0.05). (Table-2)

Serum MDA level when compared between hemodialysis patients and controls showed significant increased level of MDA ($p < 0.001$) in hemodialysis group. Comparative analysis of serum SOD levels between controls and cases shows mean values of SOD are decreased in hemodialysis patients when compared to controls ($p < 0.001$). (Table-3) There is a statistically significant correlation between lipid profile and oxidative stress as shown in Table-4.

Table -1 Basic Demographic and Clinical Characteristics of the study groups

Demographic and clinical Characteristics	Patient (n=60) (Mean±SD)	controlee (n=50) (Mean±SD)
1. Age (years)	45.6±12.6 (33-65)	48.5±11.5(35-65)
2. Gender		
Male	42 (70%)	31 (62%)
Female	18 (30%)	19 (38%)
3. Hemoglobin (g/dl)	9.5±1.45	12.5±2.05
4. Blood Urea (mg/dl)	120±42.2	14.2±3.2
5. Serum creatinine (mg/dl)	7.8±3.4	0.6±0.2
6. Serum calcium (mg/dl)	8.3±0.50	9.5±0.48
7. Serum phosphorus (mg/dl)	5.73±1.8	3.2±0.40
8. Hemodialysis duration (yrs)	4.5±2.05	0
9. Hemodialysis frequency	3-4 hrs/day 3times in week	0

Table – 2 Comparison of serum lipid profile between controls and cases

	Particulars	TC mg/dl	TG mg/dl	HDL-C mg/dl	LDL/C mg/dl	VLDL-C mg/dl	TC/HDL-C	LDL/HDL-C
Controls n=50	mean ± SN	182.1± 22.3	115.0± 30.2	44.3 ± 5.0	115.4 ± 23.4	23.0 ± 6.1	4.2 ± 0.69	2.64 ± 0.64
Cases n=60	mean ± SN	205.7± 24	219.28± 37.82	36.1±5.3	125.4 ± 20.4	43.8 ± 7.7	5.8 ± 1.0	3.55 ± 0.85
Controls V/S Cases	t values	5.29	15.75	8.27	2.38	15.53	9.88	6.14
	p value	<0.001	<0.001	< 0.001	< 0.05	< 0.001	< 0.001	< 0.001

Table -3: Comparison of serum MDA & SOD between controls and hemodialysis patients

Group	Hemodialysis patients	Controls
Number	60	50
Serum MDA nmol/ml	6.5±1.0	3.0±0.5
Serum SOD U/ml	3.6±1.20	9.5±2.2
p value	<0.05	<0.001

Unpaired t-test; p<0.05 significant, p<0.001-highly significant

Table-4: Correlation between lipid profile and oxidative stress parameters

		TC mg/dl	TG mg/dl	HDL-C mg/dl	HDL-C mg/dl	VLDL-C mg/dl	Serum MDA nmol/ml	Serum SOD U/ml
Serum MDA nmol/ml	r value	0.292	0.336	-0.682	0.216	0.556	1	-0.707
	p value	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Serum SOD U/ml	r value	-0.372	-0.381	0.512	0.185	-0.668	-0.706	1
	p value	<0.001	<0.001	<0.001	<0.05	<0.001	<0.001	

r value; Pearson correlation coefficient
p value; >0.05 significant

IV. DISCUSSION

Our study shows peak incidence of CKD in age group of between the third and fourth decades. In developed countries the prevalence of CKD increases with advancing age and the peak incidence is found in 7th and 8th decades.¹³ The reason for disparity in peak age range among CKD patients from developed countries and our society population may be related to genetic, sociocultural factors, access to diagnostic tools, therapeutic modalities and the pattern of disease causing CKD.^{14,15}

Disorder of lipoprotein metabolism, imbalance between generation of free radicals and antioxidant defense system during uremia and dialysis are important mechanism of atherogenesis in CRF. The mean value of triglyceride is significantly increased in cases when compared to controls. This result is accordance with studies done by SM Alam et al,¹⁶ Bharat Shah et al,¹⁷ P Lee et al,¹⁸ and Z.A. Massy.¹⁹ Hypertriglyceridemia is a common feature of CRF. Presence of insulin resistance in renal failure activate hormone sensitive lipase causing increased free fatty acid which stimulates the production of apoB-100 containing

lipoproteins like VLDL leading to hyper triglyceridemia. Several authors also suggested that hyper triglyceridemia in CRF may be due to defective metabolism of TG rich lipoprotein lipase (LPL) and hepatic lipase.^{20,21,22}

The mean value of total cholesterol is significantly increased in cases when compared to controls. This is in accordance with the study of MM Avram et al,²³ P.O. Attman et al²⁴ and Mayumi Tsumura et al.²⁵ Many studies have reported variable result. A study done by B.S. Das et al²⁶ observed decreased level of total cholesterol in CRF patients. The reason for this decrease may be due to reduced food intake. CRF is associated with hypercholesterolemia which is due to associated proteinuria and renal insufficiency perse. Proteinuria leads to alteration in gene expression for HMG-COA reductase resulting in increased activity of HMG-COA reductase leading to hypercholesterolemia.²⁶

Mean value of HDL-C is significantly decreased in CRF patients when compared to controls. Studies conducted by Z.A Massey et al,¹⁹ B.S. Das et al,²⁶ and Tetsuo Shoji et al,²⁷ have

also observed the same results. The reason for decreased concentration of HDL in CRF is not fully understood. It may be due to decreased activities of LPL, hepatic triglyceride lipase (HTGL), lecithin cholesterol acyltransferase (LCAT) and increased concentration of cholesterol esters transfer protein (CETP) and decreased apo lipoprotein concentration.^{20,21}

MDA is a lipid peroxidation product which is formed during oxidation process of Polyunsaturated Fatty Acid (PUFA) by reactive oxygen species. MDA is the sensitive marker of lipid peroxidation. MDA level is significantly elevated in hemodialysis patients when compared to conservatively managed patients. This is in accordance with study of C.M Loughrey et al²⁸, A. Marjani²⁹ and Talia Weinstein et al³⁰. Although hemodialysis leads to improvement of several biochemical parameters like creatinine, urea levels and plasma lipid patterns, but it can cause harmful atherogenic effects. The increase in lipid peroxidation resulting from hemodialysis could be provoked by bio incompatibility of dialysis membrane. When cells come in contact with the dialyzer membrane leads to sensitization of cell membrane components leading to complement activation which cause formation of other reactive oxygen species which will initiate peroxidation of PUFA.^{31,32}

SOD functions as a scavenger of superoxide radical in the body. Mean value of SOD is significantly decreased in hemodialysis (p value < 0.05) patients when compared to conservatively managed patients. This is in accordance with the study of A. Marjani²⁹, M Sasikala et al³¹ and M. Nouri et al³². Mechanisms involved in decreased serum SOD activity in CRF patients may be due to increased production of ROS such as H₂O₂ which is known to suppress SOD activity. Decreased SOD activity among hemodialyzed patients could be due to decreased levels of Cu⁺⁺ and Zn⁺⁺ as they are cofactors of cytoplasmic SOD. Increased lipid peroxidation causes consumption of antioxidant enzymes, particularly in hemodialysis patients, may be also one of the reasons for decreased SOD levels.³³

V. CONCLUSION

The result of this study indicate that patient undergoing maintenance hemodialysis show important abnormalities of lipid metabolism such as hypertriglyceridemia, elevated level of total cholesterol, low HDL-C and oxidative stress which could contribute to accelerate the atherosclerosis and cardiovascular disease and may increase the morbidity and mortality in this group. As a first step of controlling hyperlipidemia, body weight normalization, dietary modification, regular exercise and education about diet should be applied. It may also be useful to supplement the diet with polyunsaturated fatty acid from fish oil in order to reduce triglycerides. Statin can be used safely in CKD patients with careful monitoring.

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Synthesis and Qsar Studies On 4,5- Diphenyl Imidazolylpyrimidine -5- Carboxylates (DPIP) against Antifungal Activity

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Abstract- A series of substituted ethyl 1,2,3,6-tetrahydro-4-methyl-2-oxo/thioxo-6-phenyl-1-(4,5-diphenyl-1-H-imidazol-2-yl) pyrimidine-5-carboxylates(3a-3g) was subjected for Quantitative structure-activity relationship (QSAR) models. The antifungal activity was co-related with mathematical relationship between physical chemical, biological activities of interest and measurable or computable parameters such as physicochemical constant, topological, reiterations analysis estimated activity and values calculated etc. The newly synthesized substituted diphenyl imidazolylpyrimidines were established by using the molecular descriptors ST, MV, X_{index} , MR, TE, LUMO, Log P, V AR, AECC. The logarithm of zone of inhibition of micro-organisms i.e. *C.albicans* strains are used as key properties to evaluate the QSAR models. The Predictive ability and accuracy of the model is determined by a cross validation method.

Index Terms- imidazolylpyrimidines derivatives, QSAR studies, molecular descriptors, cross validation, antifungal activity.

I. INTRODUCTION

Novel medicines are typically developed using a trial and error approach, which is time consuming and costly. The application of quantitative structure-activity relationship (QSAR) methodologies to this problem has potential to decrease substantially the time and effort required to discover new medicines or to improve current ones in terms of their efficacy. QSAR establishes the mathematical relationship between physical, chemical, biological or environmental activities of interest and measurable or computable parameters such as topological, physicochemical, stereo chemical or electronic indices¹⁻⁴.

Candida albicans is the most prevalent opportunistic fungal pathogen in human that causes various forms of candidiasis ranging from superficial mucosal infection to life threatening systemic diseases in immunocompromised patients⁵. Many azoles inhibiting 14 α -lanosterol demethylase in ergosterol biosynthesis pathway are known to exhibit interesting antibacterial activity and antifungal activities. However, reported drug class having azoles ring system⁶ suffers major shortcomings i.e. a rapid development of resistance against *Candida albicans*. This has highlighted the need to discover new effective

Antibiotic with new modes of action against both bacteria and fungi.

The present study aims at determining the antifungal and antibacterial activities of newly synthesized imidazolylpyrimidine derivatives by means of QSAR approach. During the programmed study on the development of green approach towards the synthesis of new organic molecules, a simple strategy for the synthesis of 4,5-diphenyl imidazolyl pyrimidine derivatives (3a-3g) was designed, in which the two aryl rings were located at C-4 and C-5 on the opposite faces of the newly planar imidazole ring⁷.

C.albicans with Griesofulvin. Since the synthesized compounds showed remarkable antifungal and antibacterial activity, we established QSAR analysis using ST, MV, X_{index} , MR, TE, LUMO, LogP, V AR, and AECC as appropriate molecular descriptors. After selecting these indices adequately, a very specific characterization of each chemical compound in QSAR models (Table 1.1) was obtained.

Descriptors Used: Before the calculation of the descriptors, the structures were fully, optimized using ACD/Chem. Sketch 10.3 software⁸ and Chemdraw 3D Ultra 8.0.⁹ All the descriptors used are calculated from the hydrogen suppressed molecular graphs. These molecular, graphs are obtained by deleting all the carbon - hydrogen as well as heteroatom - hydrogen bonds from the molecular structures of the imidazolepyrimidine derivatives. Dragon 5.4 (2006)¹⁰ software was used for further calculations. The details of the calculations of these descriptors are available in the literature and therefore, they are not mentioned here.

Statistical analysis: The regression analysis is made using, maximum R2 method using MYSTAT 12¹¹ and Origin 5.0¹² software.

II. MATERIALS AND METHODS

Experimental Section

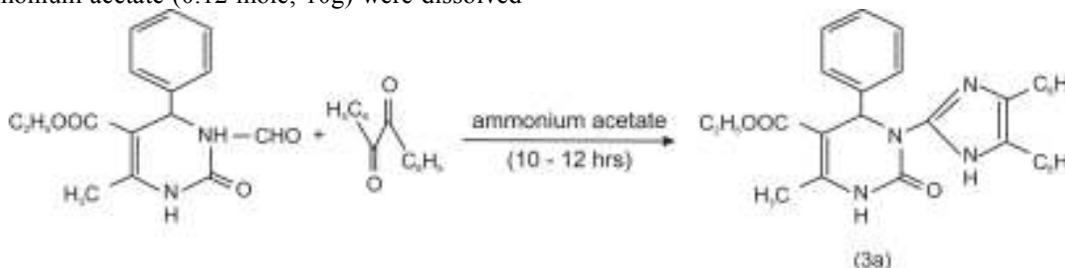
All solvents were distilled prior to use. TLC was performed on silica gel G. Melting points were determined by open capillary method and are not correct. ¹H NMR and ¹³C NMR spectra were recorded from CDCl₃/DMSO-d₆ solution on a Bruker Avance-II 400(400 MHz) NMR Spectrometer. Chemical shifts are reported in ppm using TMS as an internal, standard. IR spectra were obtained on a Shimadzu FTIR spectrophotometer, using KBr discs. Mass spectra were recorded by using Shimadzu gas chromatograph coupled with QP5050 Spectrometer at 1-1.5 eV.

Procedure

Preparation of synthesis of substituted ethyl 1, 2, 3, 6-tetrahydro-4-methyl-2-oxo/thioxo-6-phenyl-1-(4, 5-diphenyl-1-H-imidazol-2-yl) pyrimidine-5-carboxylate (3a-3g)

Benzil (2.5m mole; 5.25g), ethyl-1-formyl-1,,2,3,6-tetrahydro-4-methyl-6-phenyl-2-oxo-pyrimidine-5-carboxylate (2.5m Mole; 11.95g) and ammonium acetate (0.12 mole; 10g) were dissolved

in glacial acetic acid. The reaction mixture was refluxed for 10-12 hours. It was then cooled and poured in cold water then the precipitate was formed, filtered, washed with ammonium hydroxide and dried. The product was recrystallization from ethanol. **Yield : 64% M.P. 160°C**



Scheme 1

III. RESULTS AND DISCUSSIONS

Substituted ethyl 1, 2, 3, 6-tetrahydro-4-methyl-2-oxo/thioxo-6-phenyl-1-(4, 5-diphenyl-1-H-imidazol-2-yl) pyrimidine-5-carboxylates (3a-g) were synthesized by condensing substituted ethyl-1-formyl-1, 2, 3, 6-tetrahydro-4-methyl-6-phenyl-2-

oxo/thioxopyrimidine-5-carboxylates (1a-g) and Benzil with ammonium acetate by using acidic alumina, and four drops of glacial acetic acid under conventional method for 12 hours. (Scheme 1)

Table 1.1 : Physical Characteristic data of the compound synthesized (3a-g)

Compound	X	R ₁	R ₂	Mol.Formula	MP(0C)	Method-A Yield/Time %/hr
3a	O	H	U	C ₂₉ H ₂₆ N ₄ O ₃	160	64/12
3b	O	H	NO ₂	C ₂₉ H ₂₅ N ₅ O ₅ Cl	210	64/12
3c	O	Cl	H	C ₂₉ H ₂₅ N ₄ O ₃ Cl	180	62/12
3d	O	OCH ₃	H	C ₃₀ H ₂₈ N ₄ O ₄	240	65/12
3e	S	U	H	C ₂₉ H ₂₆ N ₄ O ₂ S	190	65/12
3f	S	Cl	H	C ₂₉ H ₂₅ N ₄ O ₂ SCl	195	63/12
3g	S	H	NO ₂	C ₂₉ H ₂₅ N ₅ O ₄ S	220	60/12

The QSAR study of newly synthesized ethyl-1, 2, 3, 6-tetrahydro-4-methyl-2-oxo/thioxo-6-phenyl-1-(4,5-diphenyl-1H-imidazol-2-yl) pyrimidine-5-carboxylate derivatives (3a-g) is not reported in the literature. Hence the synthesized compounds were tested against *C.albicans* in comparison with Griesofulvin.

Antifungal activity

The antifungal activities of compounds (3a-3g) have been assayed in vitro at a concentration 100 μg disc⁻¹ against *C.albicans*. Griesofulvin was used as standard fungicide for the antifungal test. Muller-Hinton agar was used as basal medium for test fungi. Glass Petri dishes were sterilized and 10ml of sterilized melted MH agar medium (45°C) was poured into each Petri dish. After solidification of the medium small portion of mycelium of *C.albicans* was spread carefully over the centre of each MH agar plate with the help of spreader. Thus fungus was

transferred to each plate. The plates were then incubated at (27°C) and after half an hour of incubation they were ready for use. The prepared discs of test sample were placed gently on the solidified agar plate, freshly seeded with the test organisms with sterile forceps. The plates were then incubated at 37.5°C for 24hr. Dimethyl formamide (DMF) was used as a solvent to prepare desired solutions of the compounds initially¹⁷⁻¹⁸.

The antifungal studies revealed that the compounds 3b and 3c having chloro and nitro groups respectively along with oxypyrimidine moiety were found to be most active amongst the entire tested compounds. 3a and 3g exhibited moderate activity in comparison with other compounds. 3f showed less activity where as 3d and 3e were found to be inactive against the *C.albicans* (Table 1.2).

Table 1.2 : Antifungal screening results of compound synthesized

Sr.No.	Compounds	Zone of inhibition in mm for conc. for 100 μg/ml	Logarithm of zone of inhibition in mm
<u><i>C.albicans</i></u>			
1.	3a	9.0	2.197

2.	3b	12.0	2.485
3.	3c	13.0	2.565
4.	3f	6.0	1.791
5.	3g	9.0	2.197

QSAR Study

In the present study authors tried to develop best QSAR model for each microorganisms to explain the correlation between the physicochemical parameters and antifungal activity of diphenyl imidazolyl pyrimidines (DPIP) derivatives against microorganisms. The details of molecular structures of (DPIP)

derivatives used in the present study are illustrated in (Table 1.1). The antifungal activities of above said compounds against *Calbicans* are depicted in (Table 1.2). Here, we have used logarithm of activities to be studied. In order to model and predict the specific activity, 57 physicochemical constants, topological and structural descriptors were considered as possible input candidates to the model¹³.

Table 1.3 : The calculated values of descriptors ST, MV, X_{index}, V_{index}, MR, TE, LUMO, LogP, V AR, and AECC are summarized.

Sr.No.	Compound	VAR	X _{index}	V _{index}	MV	MR	ST	LogP	TE	LUMO	AECC
1	3a	146	0.288	0.191	238.9	135.97	52.3	4.5456	2305.6	-0.502	10.279
2	3b	152	0.29	0.193	372.8	139.98	54.9	4.3552	2882.4	-0.874	10.342
3	3c	146	0.288	0.191	379.3	136.23	52.3	4.7657	2305.04	-0.635	10.278
4	3d	175	0.285	0.188	391.4	138.02	52.0	4.0811	2299.28	-0.554	10.838
5	3e	129	0.291	0.193	351.0	138.9	75.3	5.7991	2310.25	-1.08	9.714
6	3f	146	0.288	0.191	361.8	143.73	76.8	6.3573	2309.97	-1.195	10.278
7	3g	152	0.29	0.193	384.2	146.45	53.2	5.9468	2905.37	-1.009	10.342

A persual of (Table 1.2) showed that 3-a, b, c, f, g; these 5 compounds are effective against *C.albicans* are found to be resistant against 3b and 3d. In obtaining QSAR models, we have used logarithm of zone of inhibition to account for their antifungal activities against the microbes mentioned earlier.

Based on the activity values we observed, we can propose the following order of antifungal activity.

$$\text{Against } \textit{Calbicans} \\ 3c > 3b > 3a = 3g > 3f \quad (1)$$

Table 1.4 : Correlation matrices for the DPIP used

	Activity	VAR	X _{index}	V _{index}	MV	MR	ST	LogP	TE	LUMO	AECC
<u>Calbicans</u>											
n = 5											
Activity	1.000										
VAR	0.282	1.000									
X _{index}	0.282	1.000	1.000								
V _{index}	0.282	1.000	1.000	1.000							
MV	0.512	0.204	0.204	0.204	1.000						
MR	-0.54	0.544	0.544	0.544	-0.26	1.000					
ST	-0.819	-0.33	-0.331	-0.331	-0.90	0.429	1.000				
LogP	-0.797	-0.04	-0.044	-0.044	-0.42	0.812	0.708	1.000			
TE	0.268	1.000	1.000	1.000	0.210	0.56	-0.33	-0.02	1.000		
LUMO	0.619	-0.32	-0.323	-0.323	0.679	-0.88	-0.75	-0.82	-0.33	1.000	
AECC	0.282	1.000	1.000	1.000	0.204	0.544	-0.33	-0.04	1.000	-0.323	1.000

It is interesting to record that compound 3c shows maximum zone of inhibition against *C.albicans* and minimum zone of inhibition against all other strains used. Furthenmore, these sequences (order) do not establish any quantitative structure-activity relationship (QSAR). Therefore, we have made such study using above said descriptors, which encodes the molecular structures of DPIP numerically. Since, different compounds are found effective against five microorganisms used, we have obtained the correlation matrices (Table 1.4) for preliminary investigations of correlation among descriptors against the

antifungal activities. Based on the microorganisms used, our discussion has been divided into five different segments.

Antifungal activity of DPIP against Calbicans.

The data presented in QSAR studies shows that the descriptors used i.e. ST, MV, X_{index}, MR, TE, LUMO, LogP, V AR, and AECC are significantly conelated with the antifungal activity against *C.albicans*, which proves that ST is the best descriptor for QSAR model. The correlation potential of MV, MR and LUMO is significantly lower than the other used descriptors. This shows that we can obtain two mono-parametric models for modeling antifungal activity against *C.albicans* and that mono-parametric

model based on ST will be the best for this purpose. In QSAR studies show that all the 10 descriptors are not linearly correlated and thus any combination of these descriptors in multilinear regression analysis may not result with a model suffering from the defect due to colinearity.

Looking to the sample size and following 'Rule of Thumb' we can at the most carry out bi-parametric regression analysis. The regression parameters and quality of correlations for the different mono-parametric and bi-parametric models are given in (Table 1.5). This shows that among the mono-parametric models, the model based on ST gives better results.

Table 1.5 : Regression analysis and quality of correlations for modeling antifungal activity of DPIP against *C.albicans*.

Models	Descriptors	Se	R	R ²	R ² _A	F	A
1	LogP	0.212	-0.797	0.635	0.513	5.21	3.76
2	ST	0.201	-0.819	0.671	0.561	6.12	4.07
3	LUMO	0.29	-0.563	0.316	0.089	1.39	1.94
4	MR	0.296	-0.539	0.291	0.055	1.23	1.82
5	MV	0.3	0.521	0.272	0.029	1.12	1.74
6	ST,MV	0.11	0.967	0.935	0.869	14.31	8.79
7	LogP, ST	0.208	0.875	0.765	0.531	3.26	4.21
8	ST, MR	0.23	0.845	0.714	0.429	2.5	3.67
9	ST, LUMO	0.247	0.819	0.671	0.342	2.04	3.32

Antifungal activity against *C.albicans* = 122.19 (±26.18) – 28.6(±11.56) ST

$$n = 5 \quad Se = 0.2 \quad R = -0.819 \\ R^2 = 0.67 \quad F = 6.12 \quad Q = 4.07 \quad (2)$$

R Here and thereafter 'n' is the number of compounds, Se - Standard error of estimation, R - Simple correlation coefficient, F - Fisher's statistics and Q - Quality factor, which is defined as the ratio of correlation coefficient to the standard error of estimation, that is $Q = R/Se$.

The coefficient of ST in the mono-parametric model represented by equation (2) is negative indicating that the antifungal activity of DPIP against *C.albicans* is inversely proportional to the magnitude of ST. This index ST precisely accounts for an inverse steric parameter. As compound **3c** has minimum value of ST shows significant antifungal activity against *Candida albicans*. Thus, the overall interpretation of negative R-values is that decrease in the magnitude of ST increases the antifungal activity of DPIP against *C.albicans*.

As stated earlier we have attempted several bi-parametric regressions and the results obtained are presented in Table 1.5. This shows that the bi-parametric model containing ST and MV showed excellent results in accordance with the following expression.

Antifungal activity against *C.albicans* = 20.07 (±5.8) – 0.005(±0.012) ST – 0.039(±0.017)MV

$$n = 5 \quad Se = 0.11 \quad R = 0.967 \\ R^2 = 0.935 \quad F = 14.31 \quad Q = 8.79 \quad (3)$$

The physical significance of the negative coefficient of ST term in the equation is the same as discussed for equation. The negative coefficient of MV indicates that the activity goes on decreasing with the increasing value of MV. This molar volume (MV) is one of the important Polarizability parameter; hence we can safely say that Polarizability plays a negative role in the exhibition of the activity⁷⁵.

Table 1.6 : Found and estimated antifungal activity of DPIP derivatives against *C.albicans* using the best model containing ST and MV descriptors.

Sr.No.	Compound	Exp. Activity	Estimated Activity	Residue	(Residue) ²
1	3a	2.197	2.261	-0.064	0.0041
2	3b	2.565	2.44	0.125	0.0156
3	3c	2.485	2.551	-0.066	0.0044
4	3f	1.792	1.785	0.007	0.00005
5	3g	2.197	2.2	-0.003	0.0000009
					Σ=0.024158

In order to confirm our results we have estimated the antifungal activity of DPIP derivatives against *C.albicans* using model expressed by equation and compared them with the observed values. The data presented in (Table 1.6) shows that the observed and the estimated activities are very close to each other. The predictive power of the models can be judged from quality factor Q. The Q values are recorded in (Table 1.5). The highest Q = 8.79 for the model expressed by equation indicates that it has

highest predictive power (Figure 1.2). Further, calculating predictive correlation coefficient, R₂Pred that is obtained from the correlation between the observed and the estimated activity makes confirmation regarding predictive power. The R₂pred = 0.934 confirms that the predictive power of the proposed model equation is highest.

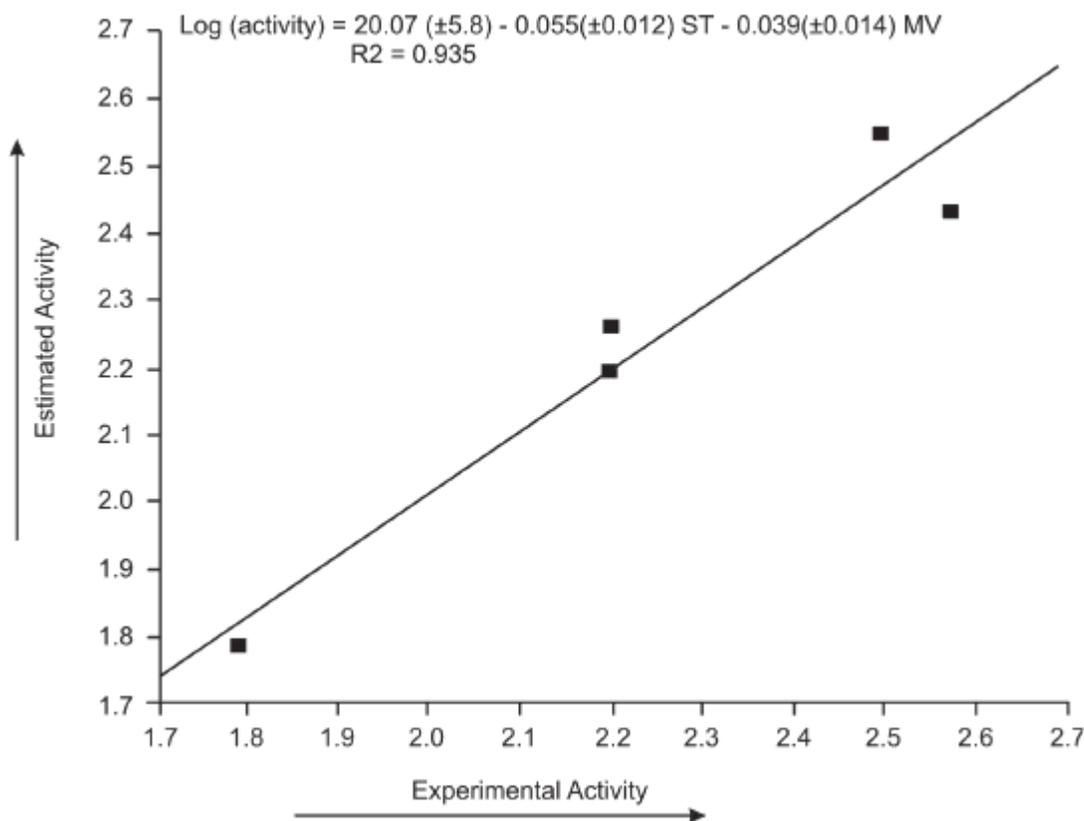


Figure 1.1: Plot of estimated activity values Vs the experimental Log (activity) values for the model expressed by equation.

In support of our results we have also calculated 5 important statistical parameters: Probable error of the coefficient of correlation (PE), least square error (LSE), Friedman's lack of fit measure (LOF), Sum of squares of response values (SSY) and

Uncertainty of prediction (SPRESS). These parameters are calculated from the following equations that are summarized in Table 1.6.

Table 1.7 : PE, LSE, LOF, SSY and S_{PRESS} value calculated for the derived models for modeling antifungal activity of DPIP derivatives against *C.albicans*.

Models	Descriptors	Se	R	R ²	R ² _A	F	A
1	LogP	0.109	0.59	0.0348	0.59	0.3696	0.4435
2	ST	0.098	0.122	0.0148	0.122	0.3696	0.2016
3	LUMO	0.204	0.201	0.0404	0.201	0.3696	0.2586
4	MR	0.212	0.26	0.0676	0.26	0.3696	0.2944
5	MV	0.217	0.268	0.0718	0.268	0.3696	0.2989
6	ST,MV	0.019	0.024	-	0.024	0.3696	0.1107
7	LogP, ST	0.07	0.087	-	0.087	0.3696	0.2085
8	ST, MR	0.085	0.105	-	0.105	0.3696	0.2291
9	ST, LUMO	0.098	0.122	-	0.122	0.3696	0.247

$$PE = 2/3 * 1 - R^2 / \sqrt{n} \quad (4)$$

Where, R – coefficient of correlation and n – number of compounds used.

$$LSE = \sum (Y_{obs.} - Y_{calc.})^2 \quad (5)$$

Where, $Y_{obs.}$ and $Y_{calc.}$ are the observed and calculated activities as in our case antifungal activity of DPIP derivatives against *C.albicans*.

$$LOF = LSE / \{1 - (C + d * p) / n\}^2 \quad (6)$$

Where, LSE – Least square error, C – number of descriptors + 1, p – number of independent parameters, n - number of compound used, d - smoothing parameter which controls the bias in the

scoring factor between equations with different numbers of terms and was kept 1.0.

It is argued that if.

$R < PE$, R is not significant;

$R > PE$, Several times at least three times greater correlations is indicated;

$R > 6PE$, Correlation is definitely good.

$$SSY = \sum (Y_{obs.} - Y_{Mean})^2 \quad (7)$$

Where, $Y_{obs.}$ and Y_{mean} are the observed and mean activities, in our case antifungal activity of DPIP derivatives against *C.albicans*.

$$R^2_{\text{Pred}} = 1 - (\text{PRESS})/\text{SSY} \quad (8)$$

$$S_{\text{PRESS}} = \sqrt{(\text{PRESS}) / (n - k - 1)} \quad (9)$$

Where, n = number of compounds used,

K = number of descriptors used

PRESS = Predicted Residual Error sums of Squares = $\sum (Y_{\text{obs.}} - Y_{\text{Mean}})^2$

The values of PE (Table 1.6) indicate that all the proposed correlations are definitely good and the one expressed in equation (3) is the best. The lowest value of LSE, LOF and SPRESS are also in favour of the proposed model. It is important to mention here that one should use LOF directly rather than LSE, the reason being LOF does not decrease with increase number of descriptors and the lowest value is found for an equation with the optimum number of parameters.

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Prevalence of Diabetic Retinopathy in Diabetic Patients of Vindhya Region

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Abstract- Diabetic retinopathy is most dreaded complication of ocular manifestation of diabetes. The Patients attending the diabetic /eye examination camps from September 2010 to Feb. 2012 were included in this study and an attempt was made to study the prevalence of retinopathy among these patients of Vindhya region (M.P.) India. Ophthalmoscope was used to check the retinopathy of diabetic patients. The blood sugar levels of these patients were measured using biochemical test. A total of 202 patients were examined in these camps. Out of them 104 were males and 98 were females. A total no. of 130 patients was diagnosed as diabetic. Out of them 94 (46.53 %) showed no retinal damage and were kept in background patients, Whereas 25 (12.37%) showed preproliferative changes. proliferative changes in 7 patients (3 %) and 4 patients (2 %) showed complete loss of vision. The prevalence of retinopathy is 17.8 % in diabetic patients examined. and it was more frequent in the patients with diabetes for longer duration.

Index Terms- Diabetes, Diabetic Retinopathy, Community Programme

I. INTRODUCTION

Medical advances in recent decades have paradoxically led to an increase in the incidence and prevalence of diabetes mellitus and its complications. Increased life expectancy in the industrialized world is one reason why diabetes is now more common; another is the increased prevalence of a sedentary life style and changed eating habits, resulting in overweight. The typical ocular complications range from impaired visual acuity due to diabetic retinopathy and premature cataracts all the way to blindness or loss of an eye. Even though diabetic retinopathy can be treated effectively, it nonetheless remains the most common cause of acquired blindness among persons of working age in the industrialized world. Diabetes is a disease of high prevalence; the first complication is damage to the vascular system that increases the mortality and morbidity in diabetic patients. One of these complications is a vascular retinopathy (1-3). The last fifty years reports about diabetic complications specify an increase in prevalence rate of diabetic retinopathy (DR) which is the most serious complication of diabetes and is one of the leading causes of blindness in the world. WHO has estimated that there were 171 million people worldwide with diabetes mellitus in 2000 and predicted that 366 million people will have diabetes mellitus by 2030. The most significant increase of DR is reported in developing countries (1). DR is the major health problem in all countries. The frequency of diabetes in our province is

considerably higher than the rest of the world (17.8 % vs. 2.0-11.7%) (4). Accurate information regarding the incidence of diabetic retinopathy and associated risk factors is important in the prevention of its development and of the visual impairment caused by this complication. This research was conducted to evaluate the prevalence of diabetic retinopathy (DR) in patients who were unaware of their eye condition.

II. MATERIALS AND METHODS

A descriptive cross-sectional study was performed in a 24 month period on patients who visited to M.P.Birla Hospital and Research Centre, Satna and reported in various camps. This survey was conducted from September 2010 to February 2012 . 130 patients with type 2 diabetes mellitus who had no eye complaint were selected. At first visual acuity measurement and slit lamp examination were done. Then pupil dilation was created by Cyclopentolate and fundus examination was performed by indirect ophthalmoscope. In some cases for maculae examination, if needed, trimirror or +78 lens was used. The examination of all patients was performed by an ophthalmologist. With regard to clinical findings, below stated patients were divided into five groups:

1. No retinopathy
2. Background retinopathy
3. Moderate non-proliferative diabetic retinopathy
4. Proliferative diabetic retinopathy

III. RESULTS

A total of 202 patients were examined in these camps. Out of them 104 were males and 98 were females. A total no. of 130 patients was diagnosed as diabetic. Out of them 94 (46.53 %) showed no retinal damage and were kept in background group , Whereas 25 (12.37%) showed preproliferative changes . proliferative changes in 7 patients (3 %) and 4 patients (2 %) showed complete loss of vision. The prevalence of retinopathy is 17.8 % in diabetic patients examined and it was more frequent in the patients with diabetes for longer duration diabetic retinopathy was relatively high. (Picture 1-3 and diagram 1 & 2)



Figure 1: Mild non-proliferative diabetic retinopathy with blot hemorrhages, mainly on the temporal side of the macula, and clinically significant macular edema with hard exudates



Figure2: Severe proliferative diabetic retinopathy with neovascularization on the optic disk and vitreous hemorrhages



Figure 3: Neovascularization on the radial surface extending from the edge of the pupil to the chamber angle

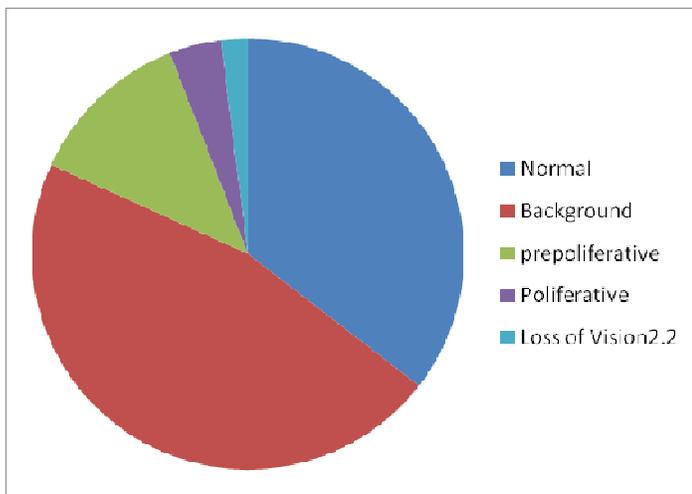


Diagram 1: Shows the % distribution of diabetic patients according to type of retinopathy

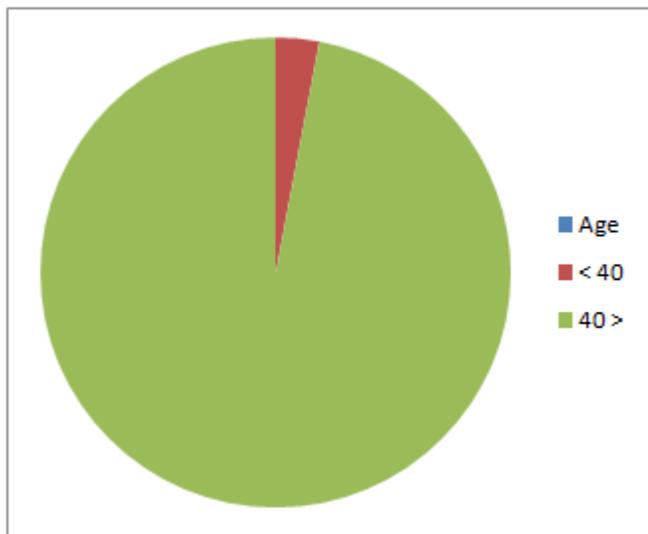


Diagram 2: Shows the Age wise distribution of Diabetic patients

IV. DISCUSSION

A significant percentage of patients with type 2 diabetes have established retinopathy at the time of initial diagnosis (5). There is evidence that DR begins to develop years before the clinical diagnosis of type 2 diabetes (6). Lack of symptoms and the insidious onset of type 2 diabetes may result in development of DR at an early stage (7). In a study in Tehran, diabetic retinopathy was found to be common in patients with newly diagnosed diabetes mellitus. The overall prevalence of diabetic retinopathy was 13.8% (8). Two other studies performed in Australia showed the prevalence of diabetic retinopathy in newly diagnosed type 2 non-treated diabetic patients to be 14%- 20% (9,10). Although our patient number was relatively small, the results can be compared with other studies. Despite the absence of ocular symptoms in our patients, prevalence of most patients did not have adequate eye care. In other studies conducted in Iran, high prevalence of DR and inadequate eye care were reported (8,11). Screening strategies depend on the rate of appearance and progression of diabetic retinopathy and on the risk factors that alter these rates (12).

V. CONCLUSION

Diabetic retinopathy is a well-recognized complication of diabetes mellitus. Visual disability from diabetic retinopathy is a significant public health problem. However, this morbidity is largely preventable and treatable. Due to diabetic patients unawareness and lack of eye complaints in many cases, screening programs for detecting diabetic retinopathy and early identification of disease could significantly decrease the complications of DR. If this disease is managed with timely intervention; the quality of life can be preserved. By a good planning, such as periodic eye examinations and adequate treatment, blindness due to diabetic retinopathy can be significantly reduced.

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Impact of Food Intake on Bone Mineral Density and Uric Acid Level of Patients Suffering from Arthritis

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Abstract- Arthritis is a chronic disease that can affect people at any stage of life. Osteoarthritis (OA) is known as degenerative joint disease. It is the most common form of arthritis. Women usually develop osteoarthritis after age 40. To study the impact of food intake on Bone mineral density and uric acid level of patients suffering from arthritis 60 female patients suffering from osteoarthritis in the age group of 40-60 years were selected from two hospitals of Ludhiana city. The subjects were divided into two groups viz. experimental (E) and control (C) group. General information, family history and dietary pattern of the subjects was recorded by interview schedule. In group E, nutrition counseling was imparted for a period of three months at 15 days interval by individual and group contacts. After nutrition counseling significant improvement was seen in food habits and dietary pattern of the subjects in group E. The mean daily intake of cereals (66.70 to 75%), other vegetables (31.33 to 47.66%), fruits (53.33 to 118.88%) and milk and milk product (90 to 161.3%) was significantly increased and mean daily intake of pulses (74.16 to 69.88%), green leafy vegetable (25.28 to 20.38%) and roots and tubers (55 to 23%) was significantly decreased in the subjects of group E. It was found that improvement in bone mineral density and significant improvement in uric acid level in the subjects of group E. The percentage of subject having T-score between -1.0 and -2.5 decreased from 70 to 53.3 percent and subjects having T-scores more than -1.0 increased from 20 to 36.7 percent where as subjects having T-score less than -2.5 did not show any improvement in group E. Significant decrease in the percentage (63 to 36.7%) decreased of subjects having more than 6 mg/dl uric acid level was observed in group E after nutrition counseling. Therefore, it can be reported from the results that nutrition counseling significantly improved the food intake, bone mineral density and uric acid level of the patients suffering from osteoarthritis.

Index Terms- Bone mineral density, food intake, nutritional counseling, Osteoarthritis, uric acid

I. INTRODUCTION

Arthritis is a term that includes a group of disorders that affect the joints and muscles. Its symptoms include joint pain, inflammation and limited movement of joints. When a joint is inflamed it may be swollen, tender, warm to the touch or red. Surrounding each joint is a protective capsule holding a lubricating fluid to aid in motion. Cartilage, a slippery smooth substance, covers most joints to assure an even fluid motion of

the joint. With arthritis, the cartilage may be damaged, narrowed and lost by a degenerative process or by inflammation making movement painful (Mahan and Stump 2000).

Osteoarthritis (OA) is more common in older people, younger people can develop it - usually as the result of a joint injury, a joint malformation, or a genetic defect in joint cartilage. Both men and women are equally prone before the age of 45, more men than women has osteoarthritis; after the age of 45, it is more common in women. Osteoarthritis is a truly universal disorder. Everyone will get it somewhere if they live long enough. Though others may show minor changes; a common variant is the generalized osteoarthritis of postmenopausal women affecting the terminal joints of the fingers as well as the knees.

In late life, i.e. after the menopause in women and a decade or so later in men, imbalances in the remodeling of the skeleton results in more rapid bone losses, so that reduction in bone mineral content (BMC) and bone mineral density (BMD) occur. The first 5-10 years following the menopause, e.g., from 50-60 years of age, women undergo a high rate of bone loss, i.e., approximately 2% per year. The loss of estrogens is so powerful that adding extra quantities of nutrients, such as calcium and vitamin D supplements, to the diet has little effect on the retention of calcium, as indicated by measurements of bone mass or density (Zacas and Wolinsky 2003).

Keeping in view importance of nutrition counseling in the management of arthritis the present study was designed to study the impact of nutrition counseling on Bone Mineral Density and Uric acid level of patients suffering from arthritis.

II. MATERIALS AND METHODS

A. Selection of the subjects

A statistically adequate sample of 60 females suffering from arthritis in the age group of 40-60 years were selected and divided into two groups viz. Experimental (E) and Control (C). Nutrition counseling was imparted to group E, while group C was not given any nutrition counseling.

B. Collection of data

Data pertaining general information, anthropometric parameters, and dietary survey was carried out to collect the information regarding dietary pattern and dietary intake for 3 consecutive days by using "24 hour recall cum weighment method.

C. Dietary survey

Information pertaining to food preferences, food avoidances was recorded. Dietary intake of subjects was recorded for three consecutive days by using "24 hour recall method" using standardized containers before and after nutrition counseling. The average daily nutrient intake was calculated using Michigan State University (MSU) Nutriguide Computer Programme (Song et al (1992). The average raw amounts in grams of each and every item of food consumed for three consecutive days for each subjects was fed in the software and nutritive value of the diets was recorded. The food intake was compared with RDA by ICMR (2003) and percent adequacy of the various foods was calculated before and after nutrition counseling.

D. Bone mineral density (BMD)

BMD is determined by using DEXA. Principle: Dual-energy X-ray absorptiometry (DEXA) is a method developed originally for the measurement of bone density and mass. The method is based on the attenuation characteristics of tissues exposed to X-rays at two peak energies. A typically whole body scan takes approximately 30 minutes and exposes the subject to ~1 mrem radiation. The method provides the first accurate and practical means of measuring bone mineral mass and offers a new opportunity to study appendicular muscle mass.

E. Uric acid level

Reagents: 0.66N H₂SO₄, 10% sodium tungstate, Uric acid reagent, 14% Na₂CO₃, Stock standard solution, working standard. The uric acid level was determined by using method of Folin (1934).

Procedure: To 1ml of urine add 8ml distilled water and add 0.5ml of 0.66N H₂SO₄, and 0.5ml of 10% sod. tungstate to deproteinise it.

Allow to stand for flocculation of proteins, centrifuge and take 4ml of supernatant in a test tube for uric acid determination. Add 1ml of sodium carbonate and 1ml uric acid reagent and mix well. Read the colour after 15min at 680nm.

Prepare standard curve using 4-20 ug uric acid and calculate the concentration of the unknown using standard curve.

F. Nutrition counseling

Nutrition counseling was imparted to the selected subjects for the period of 3 months at 15 days interval regarding arthritis, its types and dietary management. In dietary management knowledge regarding foods to be taken and avoided for the management of arthritis. Counseling was carried out through lectures and demonstrations. A booklet containing all the information regarding arthritis and its dietary management and a sample menu of 7 days were distributed to the subjects.

G. Statistical analysis

The data on food and nutrient intake, anthropometric measurements, bone mineral density and uric acid level was analyzed statistically. The mean, standard-error, percentages, paired t-test and their statistical significance was ascertained using a computer programme package (Cheema and Sidhu 2007).

III. RESULTS AND DISCUSSION

The study was conducted on 60 females aged between 40-60 years suffering from osteoarthritis were selected randomly and divided equally into two groups viz. experimental (E) and control (C). It was observed that 26.7 & 40 percent of the subjects were in the age group of 40-50 years, while 73.3 & 60 percent of the subjects were in the age group of 50-60 years in group E and C respectively, majority of subjects belonged to Sikh. Percentage of subjects who belonged to joint families was 46.6 and 16.7 percent in group E and C respectively. It was observed that majority of the subjects i.e. 43.4 and 53.4 percent had per capita income more than ₹ 3500, 23.3 and 13.3 percent of the subjects had per capita income of ₹1500 - 2500 and 33.3 and 33.3 percent had per capita income of ₹2500-3500 in group E and C respectively (Table 1). It was reported that per capita income of Indians grew by 17.3 per cent to ₹ 54,527 in 2010-11 from ₹ 46,492 in the 2009-10, as per the revised data released by the Government of India. However, the increase in per capita income would be only 6.7 per cent in 2010-11 (Anonymous 2011a). However, the per capita income of Punjab is estimated to ₹ 70072 in 2010-11 showing an increase of 12.74% (Anonymous 2011b).

Food intake of the subjects

The data revealed that the mean daily cereal intake of the subjects was increased from 66.70 to 69 percent in the subjects of group E could be due to effect of nutrition counseling about the ill effects consumptions of refined cereals. Most commonly consumed pulses were green gram, Bengal gram, lentil and black gram dal. The mean daily consumption of pulses was 74.16 & 75.83 and 69.88 & 75 percent before and after nutrition counseling in group E & C respectively. The most common green leafy vegetables consumed by the subjects were mustard, fenugreek, spinach, asparagus and coriander leaves as they increase uric acid level. The percent adequacy of intake of green leafy vegetables in group E and C was only 25.8 & 24.45 and 20.38 & 22.03 percent before and after nutrition counseling. The data depicted that there was non significant decrease in the intake of green leafy vegetables by the subjects in group E and C after nutrition counseling was observed. Krishnaswami et al (1997) reported inadequate intake of green leafy vegetable among adult women. Sodhi (2000) and Goyal (2003) also reported lesser intake of green leafy and other vegetables by Punjabi women. The consumption of roots and tubers was 55.16 and 23.40 percent before and after nutrition counseling in group E; it could be due to decreased consumption of potato, carrot, radish and other tubers because higher intake of potatoes decreased bone mineralization, whereas no change was found in group C. Onions were taken as salad and vegetables. The percent adequacy of intake of other vegetables in group E and C was 31.33 & 30.77 and 47.66 & 29.60 percent before and after nutrition counseling in both the groups respectively. During nutrition counseling sessions the subjects were advised to increased the intake of other vegetables like pumpkin, turnip, and beans etc which are high in fiber and provide more satiety. Agrahar and Pal (2004) also reported inadequate consumption of other vegetables among the subjects. The fruits commonly consumed by the subjects were apple, banana, orange, papaya, and tomato etc. The daily intake of fruits by the subjects was 53.33 & 54.94 and 118.88 &

57.83 percent before and after nutrition counseling in group E & C respectively. Madhura (2009) also recommended fresh fruits and vegetables for pain relief of patients suffering from arthritis. The consumption of milk & milk products by the subjects was in the form of curd, tea and cheese. The mean daily intake of milk & milk products was 90 & 93 per cent and 161.3 & 93.6 per cent by the subjects in group E & C before and after nutrition counseling respectively. Zacas and Wolinsky (2003) suggested that calcium, vitamin D and other bone related nutrients need to be consumed in sufficient amounts, as recommended. An important role for additional calcium, as a supplement, is that the

serum calcium has an inhibitory effect on the secretion of parathyroid hormone by the parathyroid gland. Fats & oils were consumed by the subjects in the form of vanaspati, refined oil, butter & butter oil. It was observed that the percent adequacy of fats & oils was 88.5 & 90 and 60 & 95 percent before and after nutrition counseling by the subjects in group E & C respectively. The intake of fats and oils in group E was significantly decreased after nutrition counseling as the subjects were taught to reduce fat intake because high fat diet have been linked to arthritis.

Table 1: General information of the subjects

Parameters	Group E (n=30)	Group C (n=30)
Age		
40-50	8 (26.7)	12(40)
50-60	22 (73.3)	18 (60)
Mean ±S.E	53.37±6.38	50.90±7.40
Religion		
Hindu	13 (43)	15 (50)
Sikh	17 (57)	15 (50)
Family type		
Nuclear	16 (53.4)	25 (83.3)
Joint	14 (46.6)	5 (16.7)
Family size		
2-4	12 (40)	17 (56.6)
4-8	14 (46.7)	11 (36.7)
>8	4 (13.3)	2 (6.7)
Family income		
Per month (₹)		
<10,000	6(20.0)	6 (20)
10,000-20,000	8(26.7)	8(26.7)
20,000-30,000	12(40.0)	9(30)
>30,000	6(20.0)	7 (23.3)
Mean ±S.E	18033±10502.82	14250±6268.07
Per capita income		
Per month (₹)		
1500-2500	7(23.3)	4 (13.3)
2500-3500	10(33.3)	10 (33.3)
>3500	13(43.4)	16 (53.4)
Mean ±S.E	3869±2307.49	2710±1027.12

Figures in parenthesis indicate percentages
n = number of subjects in each group

Table 2: Mean daily food intake of the subjects before and after nutrition counseling (Mean ±SE)

Food group	Group E (n=30)			Group C (n=30)			Suggested intake (g) #
	Before	After	Paired t- value	Before	After	Paired t-value	
Cereals (g)	200.83±10.67	225±10.67	2.89*	207.66±12.78	205.30±12.43	-	300
Pulses (g)	44.50±7.77	41.93±6.77	1.71**	45.50±10.31	45.00±10.19	0.67 ^{NS}	60
GLV 's (g)	25.28±8.13	20.38±7.35	1.69 ^{NS}	24.45±7.62	22.03±9.83	1.30 ^{NS}	100
Roots and tubers (g)	55.16±3.59	23.40±12.28	4.66*	54.83±5.71	54.94±6.57	-	100
Other vegetables (g)	31.33±10.33	47.66±6.12	2.21**	30.77±10.97	29.60±7.65	0.11 ^{NS}	100
Fruits (g)	53.33±13.43	118.88±12.44	5.45*	54.94±17.21	57.83±16.86	0.72 ^{NS}	100
Milk and milk products (ml)	270.57±24.36	484.69±27.44	5.62*	279.38±25.69	281.72±20.38	0.31 ^{NS}	300
Fats and oils (g)	17.72±3.75	12.02±2.01	6.56*	18.00±4.86	19.08±5.27	0.45 ^{NS}	20
Sugar and jaggery (g)	23.66±3.69	12.37±2.01	7.26*	22.55±3.90	22.83±3.86	-	20

#: ICMR (2003)

*: Significant at 1%

NS: Non significant

** : Significant at 5%

Smith (2008) reported that high cholesterol and high fat diets have been shown to increase the chances of developing arthritis and for patients suffering from arthritis, they can have a devastating effect on their level of pain and suffering. The sugar was mainly consumed in the form of biscuits, sweets and by addition in milk, tea, coffee etc. Statistically significant decrease in the consumption of sugar & jaggery was observed in the group E whereas a non significant decrease was reported in the group C. Skupeika (2007) reported that people who have arthritis, it is better to avoided sugar, as sugar does not absorb nutrients and calcium.

In the frequency of food consumption pattern of the subjects, it was seen that majority of the subjects in group E and C consumed cereals i.e. 70 and 63.3 percent at least thrice a day, 30 and 36.7 percent at least twice a day. After nutrition counseling the consumption of cereals increased significantly (P≤0.01) by the subjects in group E. The percentage of subjects consuming of pulses/legumes twice a day was 20 and 26.6 percent, once a day was 80 and 86.6 percent respectively before nutrition counseling in group E and C respectively. After nutrition counseling the corresponding figures were 6.7 percent twice a day and 93.3 percent once a day in group E. Similarly it was seen that there was a significant decreased in the consumption frequency of green leafy vegetables and roots & tubers by the subjects of

group E. After nutrition counseling the consumption frequency of fruits and milk & milk products were significantly increased by the subjects in group E i.e. 93.3 and 100 percent.

Bone mineral density

The results of the present study revealed that 10 & 3.3 and 10 & 10 percent of the subjects were having T-score less than -2.5, 70 & 80 and 53.3 & 70 percent of the subjects were having T-score in the range of -1.0 to -2.5 whereas 20 & 16.7 and 36.7 & 20 percent of the subjects fall in the range of more than -1.0 before and after nutrition counseling in group E and C respectively. There was non-significant reduction was observed in group E after nutrition counseling. Zhang et al (2000) reported relations of bone mineral density and change in BMD to risk of incident and progressive radiographic knee osteoarthritis.

Uric acid level

Uric acid levels of the subjects were recorded before and after nutrition counseling. Table 4.2 depicted that 6.7 & 10 and 3.3 & 6.7 percent of the subjects having uric acid level less than 1.5 mg/dl, 13.3 & 10 and 26.6 & 16.70 percent of the subjects having uric acid level 1-3 mg/dl, 16.70 & 10 per cent and 33.3 & 13.3 percent of the subjects having uric acid level 3-6 mg/dl whereas 63.3 & 70 and 36.7 & 63.3 percent of the subjects were having uric acid level more than 6.0 before and after nutrition counseling in group E and C respectively . A significant (P≤0.05)

reduction in the uric acid level of the subjects was found after nutrition counseling in group E while non-significant reduction in group C respectively.

Table 3: BMD of the subjects before and after nutrition counseling

BMD(T-score)	Group E (n=30)			Group C (n=30)		
	Before	After	Paired t-value	Before	After	Paired t-value
< -2.5	3(10)	3(10)	1.55 ^{NS}	1(3.3)	3(10)	0.38 ^{NS}
-1.0 - -2.5	21(70)	16(53.3)		24(80)	21(70)	
> -1.0	6(20)	11(36.7)		5(16.7)	6(20)	

Figures in parenthesis indicate percentages *: Significant at 1% **: Significant at 5% ^{NS}: Non significant

Table 4: Uric acid level of the subjects before and after nutrition counseling

Uric acid (mg/dl)	Group E (n=30)			Group C (n=30)		
	Before	After	Paired t-test	Before	After	Paired t-test
<1.5	2(6.7)	1(3.3)	1.72**	3(10)	2(6.7)	1.05 ^{NS}
1-3	4(13.3)	8(26.6)		3(10)	5(16.70)	
3-6	5(16.70)	10(33.3)		3(10)	4(13.3)	
>6.0	19(63.3)	11(36.7)		21(70)	19(63.3)	

Figures in parenthesis indicate percentages *: Significant at 1% **: Significant at 5%
NS: Non significant

IV. CONCLUSION

The investigations of present study revealed that average intake of cereals of the subjects was less before nutritional counseling and it was increased after nutritional counseling whereas in case of pulses and green leafy vegetables it got decreased after nutritional counseling, but still it was less than RDA'S and intake of fruits and milk & milk products by the subjects was increased. It showed a positive effect on the Bone Mineral Density level of the subjects. There was a significant decrease in the uric acid level of the subjects after nutrition counseling.

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Education- A tool of Women Empowerment: Historical study based on Kerala society

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Abstract- India is famous as a great country of many cultures, traditions, religions and geographical characteristics. However, at the same time, India is also known by the sobriquet 'male chauvinistic nation'. The male chauvinist half of the nation tends to forget that India is referred to as 'Bharat Mata' the mother to every Indian, as well. Traditionally, women have been compelled to play the second fiddle in every sphere, be it in family or public life. Such in order of things in India in spite of the fact that women nowadays, are no less proficient than men in any field. In the case Kerala women, the same as the above. But today, women are not what they used to be some years ago; they have now made their presence felt in every sphere of life. Women have ultimately discarded their homely image and are now making meaningful contribution to the progress of the nation but, are the progress made by women in all encompassing phenomenon, or is it confined to some specific cases only? Have all women been empowered? If not what is the story of the women who are not empowered? Has the common woman have vested with powers to drive the nation? It is precisely these questions that this essay will attempt to throw some light upon. Here the researcher analyzing the concept, women empowerment by incorporating all divergent views with sufficient logical reasoning. It also explains the problems faced and the possibilities ahead in achieving women empowerment through education.

Index Terms- women empowerment, globalization, tarawads, devadasi, syrian girls.

I. INTRODUCTION

Globalization has presented new challenges in the realization of the goal of empowering women and now women empowerment has become the slogan and motto of many social reformers, governmental agencies and voluntary organizations. There is a long cherished wish among all the women to have better avenues in life in order to lead the life in a more fruitful way. However the concept women empowerment is a matter of controversy even now. Empowerment is a process of acquiring knowledge and awareness which enable them to move towards life with greater dignity and self assurance. In fact an empowered woman is a nation's strength. The United Nations Organization had declared the year 1975 as women's year and the decade 1975-1985 as women's decade on an international level (2005, p.37). If enabled economists and social scientists to unveil many issues related to women. So various studies were conducted and made a consensus that so long as women remain depressed and exploited, no nation can enjoy freedom and justice. It is found

that when half of the population is denied the opportunities for utilizing their full potential, the economic parameter like growth, development and welfare remain undefined. So various steps were taken to define the concept of women empowerment and to find out ways through which women can be empowered.

II. CONCEPTIONAL APPROACH

The word 'empowerment' is one, which is widely used but seldom defined. It is an active, multi dimensional process which encompasses several multi reinforcing components that begin with and supported by economic independence. Power is the key word of the term empowerment. According to the International Encyclopedia (1999 p.33). Power means having the capacity and the means to direct one's life towards desired, social, political and economic goals or status. Power means control over material assets, intellectual resources and ideology. Webster's New World Dictionary (1982) says the prefix 'em' which attached to the noun 'power' is generally used to form verbs meaning to make, make in to etc. So the word 'empower' means to make or cause power.

III. THEORETICAL FRAMEWORK

Empowerment literally means becoming powerful. In that perspective the empowerment of women and the improvement of their status, particularly in respect of education, health and economic opportunities is highly important. Women need to be empowered in order to become strong and ready to take up new challenges for the building up of the family, society and the nation. Infact women empowerment is human empowerment itself. According to Sushama Shay (1998, p.56.) Women Empowerment is a process which helps women to change other women's consciousness through creating awareness.

A. Importance of women empowerment

Human development encompasses elements that contribute critical issues of gender and development. The dignity and culture of a society can be detected from the status of women in that society. According to Rameshwari Pandya (2008) Empowerment has become the key solution to many social problems. Empowerment of women is empowerment of family/household and in turn development of a nation of a country. Empowerment of women leads to benefit not only to the individual woman and to women groups, but also to the families and community as a whole through collective action for development. (2008, p.5).

B. Purpose of Women empowerment

Women must define their own needs and goals as well as strategies. A pre- requisite for women's participation in

development process is their empowerment. Women must exercise full participation in decision making process in all walks of life and fully participate with men in finding equitable and practical solution to issues both in the family and society. It also declared that human rights of women and girl child are inalienable, integral and invisible parts of universal human Rights. In her message to mark the First day of the 'year of Empowerment of women', the national commission for women chairperson Vibha Partha Sarathi said, 'the year to come must see women in apex decision making bodies, enter profession denied to them so far, recognize their contribution on important and legitimate and help them to fight against disease and deprivation, indignity and inequity.

IV. EDUCATION AND WOMEN EMPOWERMENT

Various writers highlight the role of education for the empowerment of women According to the International Encyclopedia on women (1999) in the programme of action of the International Conference on population and Development education is considered as one of the most important means to empower women with the knowledge skill and self confidence necessary to participate fully in development process. The National Policy on Education (1986) emphasized the promotion of women's education in all areas of learning to eliminate any sex based stereo typing with the guarantee of equality before the law and the emphasize on girl's education. Since employment plays a vital role in improving women's status in a society education of women is of prime importance in any women empowerment programme.

V. WOMEN EDUCATION IN KERALA IN THE 18TH CENTURY

The education of women was not in a process of development at the dawn of 19th century. The society had general prejudice against female education. The prohibition against women learning to read was probably due to various causes. It was believed that education was considered rather profane and immoral by aristocratic ladies. There was a very strong social prejudice against the education of women. But there was a small section of women who ad received education. They were devadasis, the daughters of Nair Tarawads and the Syrian girls .Courtesans whose business in life is to dance in the temples and public ceremonies and prostitutes are the only women who are allowed to learn to read, sing or dance. The next group of the girls who received education was the girl children in Nair and Syrian families .In these girls were admitted along with boys in the indigenous institution called 'Ezhuthupallies'. Logan (1951, p.107) pointed out the indigenous schools were freely attended by girls. The aim of girl's education in these institutions was to give training in elementary, moral instruction and some basic lessons in music.

Period of learning was from five to seven years of age and some girls of this age group attended school. Formal higher education as denied to them. The main defect of this indigenous system of elementary schools was the exclusion of girl's except some Nair and Syrian children. Another defect was that the children of both sexes of the low castes who formed the vast majority of population were denied admission in these schools.

Therefore, in the beginning of the 19th century there existed a kind of village education which was exclusively meant for high caste boys and a very small section of the middle class girls including devadasis. So it may be concluded that expect an extremely small number of women who received some rudimentary education either at home or in schools, general or special, almost the whole of the female population of the country was deprived of formal education. It was against this back ground that the missionaries and government agencies launched a new venture of providing education irrespective of caste or sex. (1995, p.55)

VI. WOMEN EMPOWERMENT AND GOVERNMENT SECTOR

According to Kerala government survey report, (2001, p. 149) The objective of the Women's Empowerment Year is to create large scale awareness with the active participation of women themselves .In Kerala the relevance of empowering women is all the more important since half of the population is women. So any development programme should not neglect this better half of the population. In this respect it follows the guidelines of UNO and government of India. Followed by the directions and steps taken on a national level for empowering women, the government of Kerala too is entrusted with task of uplifting women and trying to bring them to the forefront of the society. The achievements of Kerala have been well acclaimed by many and Kerala is projected as 'the model state of development. The human development report of 1996 by the UNDP discussed Gender development Index (GDI) For 16 Indian states and Kerala is placed at the top of the list in terms of basic female capabilities India's female literacy rate is 39.29 % and Kerala's female literacy rate is 87.86%.In Kerala a major programme launched during the 2nd plan was the setting up of social welfare Extension centers. Its projects help to promote social welfare schemes for women subsequent plans increased the number of projects. Major achievement assignments in Kerala are explained under different heads.

Kerala women's commission is a statutory organization under the state government and was constituted under the section 5 of the Kerala women's commission Act 1990 to improve the status of women in Kerala.

Kerala state women's Development Corporation (KSWDC) was registered on 22- 2- 1988 by the company Act 1956. It works for women employment income and to enable them to earn a better living.

Empowerment and Kudumbasree mission: The Kerala government has initiated a special project exclusively for women namely Kudumbasree on 17th May 1998. Its motto is -" Reaching out the families through women and reaching out to the community through families" The aim of the project is to eradicate the absolute poverty within a period of ten years. This is achieved through concerted community action under the leadership of local self governments.

VII. ROLE OF CHRISTIAN MISSIONARIES

Along with the government, various Christian missionaries like LMS, CMS and BEMS- the pioneers of women's development made continues efforts to popularize women's education and empowerment. This type of voluntary

organizations is set up an organizational entity by a group of persons on their own initiative or partly by an outside motivation which maybe religious or human, to help the people of a locality by undertaking activities in a self reliant manner It is controlled and administrated by an association of ,rather than by the government and is primarily financed by contribution from the members of the community from any other outside donor agency.

LMS missionaries were the first protestant missionary society which sent missionaries to Kerala. Johanna Mead was the pioneer missionary in the field of women's education in Kerala .She began her work for women by starting a school in Nagarcoil. This was the first girl's school in Kerala.

Aims – The missionaries had definite aims in starting girl's school when the Christian missionaries began their work in India they realized that no stable and certainly no Christian community could be built up under conditions where women were incompetent to teach the young The main aim in starting these schools in Travancore was to bring girls more completely under Christian influence in the hope that, if thus educated they could become converts and be fitted for the work of extending knowledge of truth among their country men. The missionaries also found that education was one of the means to raise women folk from their low Board of Directors of the LMS as well as the missionaries regarded female education as very important. Therefore, when Johanna Mead started the first girl's school, her primary object was to impart a plain education, united with religious instruction. So the aims of girl's education of the missionaries can be summarized as humanitarian and religious concerns.

Church missionary society (CMS) was the child of Evangelical Anglicanism. Like other missionary societies Evangelization was the main aim of the CMS Missionaries. To attain that object they wanted to educate the people. The missionaries thought that while the women who determine the atmosphere of the home remain ignorant and superstitious, is to say the least of it , a wasteful method Therefore the missionaries imparted education to boys and girls.

Aims of female education was to provide suitable wives for pastors, catechists , school masters and other mission agents The missionary register gives a clear picture of the aim of women's education. According to it, all Christians who really aim at the advancement of the kingdom of Christ in India admit that in pursuance of that object female education is one of the chief things which ought to be promoted It continued: But whatever we may do, and whatever we may say, the church of Christ will never appear in its great beauty, unless the foundations of Christian Education be laid in the minds of its members by the hands of a Christian Mother. Amelia Baker was the pioneer of girl's education in North Travancore. She started a school for girls in Kottayam in 1820.

Basel Evangelical Missionary Society (BEMS) .Hermann Gundert was the founder of the Malabar Mission of the Basel Evangelical Missionary Society. In 1839 the first centre was opened at Nettur in Tellicherry in British Malabar. Along with evangelical work the missionaries concentrated on educational activities also.

Aims – Like the other missionaries it also had some specific aims. Evangelization was its main objective .According to 5th

Report; preaching in Bazaars and fairs itinerant preaching work among the women evangelization by schools and by the medical mission had been vigorously carried on by the society to attain that object. The aim of education according to Rehm, one of the missionaries was to implant religion in the hearts of the pupils. They also wanted the girls to become fit helpmates to their husbands and mothers, able to bring up their children.

VIII. CONCLUSION AND RECOMMENDATIONS

Women empowerment is an essential element in national development. Since women constitute half of the population there can be no development unless the needs and interests of women are fully taken into account. In fact, empowered women are a nation's strength. Since development means improvement in the living conditions of the society, as a whole, it is logical to expect that this also mean improved status for women. The effective management and development of women's resources, their capabilities, interests, skills and potentialities are of paramount importance for the mobilization of human resources. In the Indian social, cultural and economic context, no one can achieve the whole purpose of women's empowerment and emancipation within a short span of time. However the women have utilized the chances given to them and made considerable progress. As formal agency, the government of India wanted to improve the living conditions of women at different times. Here education played an important role for women empowerment. The activities of the missionary societies in the field of women's education have brought about tremendous changes in the society of Kerala.

- Attitude towards girl's education: The activities of the missionaries helped to change the attitude of the people towards girl's education.
- Literacy rate: As a result of the activities of the missionaries there was rapid spread of education among the people of Kerala especially among women. In 1947, the percentage of literacy of males was 58.1 and that of females 36.0.
- Development of social awareness: members of each caste became aware of their rights in the society and tried to improve their conditions
- Abolition of social evils: Certain social evils such as sati, smartha, devadasi system, pula Pedi etc. Disappeared from the society of Kerala.
- Introduction of western culture: The missionaries introduced western education and culture in Kerala.

Therefore, when one compares the education and status of women in Kerala of the 18th and the first half of the 20th century it can be seen that the condition of women in the 18th century was very miserable. But the educational activities of the missionaries helped to eradicate many evil customs and practices in the society, to develop a favorable attitude towards girl's education among women. These facilities tremendously enhanced the educational and social status of women in the society of Kerala in the first half of the 20th century. In the light of the present study the investigator made certain recommendations for further development.

Change in the attitude of men in the society: Both men and women should aware of about the concept of women

empowerment. From the very onset an attitudinal change in the society is necessary towards the concept.

Change in the attitude of women in the society. Women's own perception of themselves and on their empowerment should be changed. They should strive to change their image as weak, dependent, passive and docile persons to independent, active, strong and determined human beings.

In the academic level: It is important to create awareness about it among the younger generation especially among the students and the youth.

In the political level : One of the ways by which women empowerment can become a reality is through proper policies and legislations that are women friendly in nature.

In the administrative level: empowerment of women is a necessity for the sustainable development of a nation. So policy of the government should be women friendly in its various schemes. This can be possible through various ways that are listed below.

- Awareness campaign, Workshops and seminars should be arranged at the village
- Literature and publications are a major area through which the whole notion of women empowerment can be inculcated to the society.
- Arranging programmes for interaction with other empowered women in the society is another important way of motivating women.
- The institutions that are engaged in various fields of social work can start short term diploma or certificate courses in areas of rural development with special emphasis on projects for women's development.
- Government should make sure that each official body has sufficient number of women members.

There should be an official body consisting of representatives of the government and voluntary association, which can function as a coordinating agency.

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Comparing Adhesion Attributes of two Isolates of *Lactobacillus Acidophilus* for Assessment of Prebiotics, Honey and Inulin

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Abstract- Adhesion attributes of *Lactobacillus acidophilus* were studied for adhesion to hydrocarbons, aggregation abilities and autolysis to evaluate different prebiotics. Autoaggregation correlates with adhesion, which is a prerequisite for colonization and infection of the gastrointestinal tract by many pathogens and coaggregation has been related to the ability to interact closely with pathogens where autolysis decreases the adhesiveness. Hydrophobicity affects adhesion to intestinal surfaces. The strains *L. acidophilus* NCDC 13 and *L. acidophilus* NCDC 291 showed changes in aggregation abilities and adhesion properties in the presence of prebiotics, honey and inulin. The results for both strains indicate that the ability to autoaggregate and cell surface hydrophobicity, increased in the presence of inulin. While the ability to coaggregate increased in presence of honey and autolytic activity reduced highly in presence of inulin. This study suggest the importance to identify the useful prebiotic so as to enhance the effect of probiotic properties of lactobacillus strain, and also the relevance to future synbiotic food development from the strain studied.

Abbreviations Used: CFU, colony forming units; BHI, brain heart infusion; MRS, de man rogosa sharpe; PBS, phosphate buffered saline; PUM, phosphate urea magnesium sulphate.

Index Terms- adhesion, autoaggregation, autolysis, coaggregation, prebiotics probiotics

I. INTRODUCTION

In the last 19 century microbiologists describe microflora in the gastrointestinal tract (GIT) of healthy individuals that different from those found in diseased individual. These beneficial microflora found in the GIT termed probiotic. Promising probiotic strains include members of the genera *Lactobacillus*, *Bifidobacterium* and *Enterococcus*. *L. acidophilus* is one of the most extensively studied probiotic. Lactic Acid Bacteria (LAB) are thought to be safe bacteria that have been ingested from foods without any problems for many years and are known as GRAS (Generally Recognized As Safe). Research on mass screening of probiotics for use in yoghurt has been performed from selecting points such as resistance to lysozyme in mouth, acidic conditions in stomach, and bile acids in intestine (Kurien and Singh, 2005). In addition to the selecting points, the adhesion of LAB to human intestine is thought to be one of the most

important characteristics of probiotics preventing their immediate elimination by peristalsis and providing a competitive advantage in this ecosystem (Alander *et al.* 1997). Adherence of bacterial cells is related to cell surface characteristics (Bibiloni *et al.* 2001, Canzi *et al.* 2005 and Rahman *et al.* 2008). A number of reports have described the composition, structure, and forces of interaction related to bacterial adhesion (Del Re *et al.* 2000; Tuomola *et al.* 2000 & Collado *et al.* 2005, Collado *et al.* 2007a,b,c). The mechanism, by which *L. acidophilus* group adheres to the human gastrointestinal tract, has been partially elucidated (Saito *et al.* 2004 and Buck *et al.* 2005). Autoaggregation of probiotic strains appeared to be necessary for adhesion to intestinal epithelial cells, coaggregation abilities may form a barrier that prevents colonization by pathogenic microorganisms (Del Re *et al.* 2000, Schachtsiek *et al.* 2004 and Schellenberg *et al.* 2006) and autolysis reduces the number of probiotic bacteria (Kang *et al.* 1998 and Koch *et al.* 2007). Physicochemical characteristics of the cell surface such as hydrophobicity may affect autoaggregation and adhesion of bacteria to different surfaces (Del Re *et al.* 2000) but also conflicting results have been reported (Vinderola *et al.* 2004). When present in sufficient numbers, the lactobacilli are believed to be able to create a healthy equilibrium between beneficial and potentially harmful microflora in the gut (Tannock 1999 and S'us'kovic' *et al.* 2001). Prebiotics are non-digestible food ingredients that stimulate the growth and /or activity of bacteria in the digestive system which are beneficial to the health of the body. Traditional dietary sources of prebiotics include soybeans, inulin sources (such as Jerusalem artichoke, jicama, and chicory root), raw oats, unrefined wheat, unrefined barley, honey, almonds and yacon. Prebiotics improve the number and/or activity of probiotic bacteria (Conway *et al.* 2001, Gibson *et al.* 2004, Salminen *et al.* 2004 & Macfarlane *et al.* 2008). Hence the aim of this study was to investigate various adhesion attributes; aggregation abilities, cell surface hydrophobicity property and autolytic activity of *L. acidophilus* NCDC 13 and *L. acidophilus* NCDC 291 to comparatively evaluate prebiotics honey and inulin.

II. MATERIALS AND METHODS

A. Bacterial strains and growth conditions

Lactobacillus acidophilus NCDC 13, *Lactobacillus acidophilus* NCDC 291 and *Escherichia coli* NCDC 135 (EC-

135) were obtained from the National Collection of Dairy Cultures (NCDC), Dairy Microbiology Division, National Dairy Research Institute (NDRI), Karnal, India. Freeze dried lactic culture was activated in chalk litmus milk at 37°C for 24 hr and *E. coli* was activated in Brain Heart Infusion (BHI) medium (Himedia, Mumbai, India) and sub-cultured monthly. Before use, the lactic culture was sub-cultured twice in de Man Rogosa Sharpe (MRS) broth (Himedia, Mumbai, India) and *E. coli* in BHI broth at 37°C for 24 hr. Four types of medium were used to evaluate the prebiotics, which were G (glucose source) = MRS medium, H = (MRS – Dextrose) + Honey, I = (MRS – Dextrose) + inulin, M (minimal) = (MRS – Dextrose).

B. Autoaggregation assays

Auto aggregation assays were performed according to Del Re *et al.*, (2000) with certain modifications. Fresh lactic cultures were inoculated in all the four media (G, M, H, I) for 16-18 hr. Cells were harvested by centrifuging at 10,000 rpm for 15 min at 4°C. Cells were washed twice in Phosphate Buffered Saline (PBS) having viable counts of 10^8 CFU ml⁻¹. Cell suspensions (10 ml) were mixed by vortexing for 10 sec in acid washed tubes and left undisturbed. Upper layer was removed after 3 and 5 hr and absorbance (A) was measured at 610 nm. The autoaggregation percentage is calculated by the formula:

$$\text{Autoaggregation \%} = 1 - (A_t / A_0) \times 100$$

Where A_t represents the absorbance at time $t = 3$ or 5 hr and A_0 the absorbance at $t = 0$.

C. Coaggregation assays

Coaggregation assays was also performed according to Del Re *et al.*, (2000) with certain modifications. Fresh cultures of *L. acidophilus* NCDC 13 and *L. acidophilus* NCDC 291 were inoculated in all the four media (G, M, H, I) and *E. coli* in BHI broth for 16-18 hr. Cells were harvested by centrifuging at 10,000 rpm for 15 at 4°C. Cells were washed twice with PBS having viable counts of 10^8 CFU ml⁻¹. Equal volume (5+5 ml) of each cell suspensions were mixed together by vortexing for 10 sec. Control tubes were set up at the same time, containing 10 ml of each bacterial suspension on its own. The absorbance (A) at 610 nm of the single and mixed suspensions were measured after 3 and 5 hr of incubation at room temperature. Samples were taken in the same way as in the auto aggregation assay. The percentage of coaggregation was calculated using the equation (Handley *et al.* 1987):

$$\text{Coaggregation \%} = \frac{[(A_x + A_y) / 2 - A(x + y)]}{A_x + A_y / 2} \times 100$$

Where x and y represent each of the two strains in the control tubes, and $(x + y)$ the mixture.

D. Autolytic assay

The method for preparing the cell suspensions for autolysis was the same as that for auto aggregation assays. The samples for checking absorbance was taken after mixing the cell suspensions after 3 and 5 hr. The percentage of autolytic activity was calculated by the following formula:

$$\text{Autolytic activity \%} = 1 - (A_t / A_0) \times 100$$

Where A_t represents the absorbance after mixing at time $t = 3$ or 5 hr and A_0 the absorbance after mixing at $t = 0$.

E. Cell surface hydrophobicity

Cell surface hydrophobicity was measured according to the method of Rosenberg *et al.* (1980) with some modifications (Crow and Gopal, 1995 and Bellon-Fontaine *et al.* 1996). Fresh lactic cultures were inoculated in all the four media (G, M, H, I) for 16-18 hr. Cells were harvested by centrifuging at 10,000 rpm for 15 min at 4°C. Cells were washed twice with Phosphate Urea Magnesium sulphate (PUM) buffer having viable counts of 10^8 CFU ml⁻¹. The absorbance of the cell suspension (10 ml) was measured at 600 nm (A_0). Distributed 4.2 ml of cell suspension in acid washed tubes and added 0.8 ml of solvent n-hexadecane and incubated for 15 min at 37°C. The two phase system was mixed well by vortexing for 2 min. The aqueous phase was removed after 1 hr of incubation at room temperature and its absorbance at 600 nm (A_t) was measured. The percentage of bacterial adhesion to solvent was calculated as:

$$\text{Cell surface hydrophobicity \%} = 1 - (A_t / A_0) \times 100$$

Where A_t represents the absorbance at time $t = 1$ hr and A_0 the absorbance at $t = 0$.

III. RESULTS

A. Autoaggregation assay

The sedimentation rate of *L. acidophilus* NCDC 13 and *L. acidophilus* NCDC 291 was measured over a period of 3 and 5 hr in four different media (G, H, I, M). Results showed that autoaggregation of both the *lactobacilli* strains is raised upto 35.23-38.19% after 3 hr incubation and 40-43.24% after incubation of 5 hr in the case of inulin than honey (Fig.1 & 2). However the rise is more in case *L. acidophilus* NCDC 13.

B. Coaggregation assay

The coaggregation abilities of probiotic strains might enable it to form a barrier that prevents colonization by pathogenic bacteria. Coaggregation of *L. acidophilus* NCDC 13 and *L. acidophilus* NCDC 291 with enteropathogen *E. coli* was measured over a period of 3 and 5 hr in four different media (G, H, I, M). Results are expressed as percentage reduction after 3 and 5 hr in the absorbance of a mixed suspension compared with the individual suspension. *L. acidophilus* NCDC 291 showed more percentage reduction in absorbance (upto 18.97%) in honey (Fig. 3) while *L. acidophilus* NCDC 13 showed more reduction in percentage in absorbance (upto 19.95%) in inulin (Fig. 4).

C. Autolytic assay

Autolysis is the spontaneous disintegration of the bacterial cell as a result of age or unfavourable physiological conditions, which activate autolysins, the enzymes found in the cell that are capable of hydrolyzing the cell wall peptidoglycan. The autolytic process proceeds by endogenous autolysin that hydrolyzes the covalent bonds of peptidoglycan, the main cell wall component in LAB. Autolytic activity of *L. acidophilus* NCDC 13 and *L. acidophilus* NCDC 291 was measured over a period of 3 and 5 hr

in four different media (G, H, I, M). The extent of autolysis is highest in MRS and reduced in all the other media. This shows that there is reduction in autolysis in the presence of prebiotics (Fig. 5 & 6), and the effect is reduced more in the presence of inulin (upto 5.6-6.09%).

D. Cell surface hydrophobicity

The measurement of cell surface hydrophobicity can be considered as an indicator of the ability of cells to adhere to the intestinal epithelial cells. The adherence of probiotics to the intestinal epithelial tissues is an important prerequisite, which depends on the hydrophobicity of the bacterial cell surface (Jacobsen *et al.*, 1999, Tuomola *et al.*, 2001). It is the interaction of the bacterial cell with the organic compounds. Adhesion to hydrocarbon like n-hexadecane is considered as a biochemical marker for adherence to the epithelial cell in gut. Hence the cell surface hydrophobicity of *L. acidophilus* NCDC 13 and *L. acidophilus* NCDC 291 was measured with organic solvent n-hexadecane after 1 hr. The interaction got drastically increased in the presence of inulin (upto 47.22-48.12%) as compared to honey (Fig. 7).

IV. DISCUSSION

Cell adhesion is a multistep process involving contact of the bacterial cell membrane and interacting surfaces. The ability of probiotic bacteria to form cellular aggregates is considered a desirable characteristic, as they can potentially inhibit adherence of pathogenic bacteria to intestinal mucosa either by forming a barrier via self-aggregation or coaggregation with commensal organisms on the intestinal mucosa or by direct coaggregation with the pathogens to facilitate clearance (Bujnakova *et al.*, 2002, Schachsteik *et al.*, 2004). In addition, studies have suggested aggregation as an important mechanism for genetic exchange, adhesion, and colonization in the host environments, as well as Immunomodulation of colonic mucosa (Cesena *et al.*, 2001, Voltan *et al.*, 2007).

It was reported by Kos *et al.*, (2003) that the cell surface proteins (S-layer proteins) influenced autoaggregation property and adhesiveness of *L. acidophilus* M92. Tomas *et al.*, (2007) analyzed that autoaggregation increases with the concentration of glucose in the growth medium. Collado and Salminen (2007) reported that dadih lactic acid bacteria strains presented higher autoaggregation abilities than the pathogens after incubation of 24 hr. Goh and Klaenhammer, (2010) analyzed that the aggregation promoting factors increases self-aggregation with incubation. So our results confirmed the results of Tomas *et al.*, (2007), Collado and Salminen (2007) and Goh and Klaenhammer, (2010). As the autoaggregation increases with incubation time and also got improved with the glucose concentration.

Ehrmann *et al.*, (2002) studied the co-aggregation properties of nine *Lactobacillus* strains with three different indicator strains, *E. coli*, *S. enteritidis* and *S. typhimurium*. All strains showed maximum coaggregation with *S. enteritidis*. Kos *et al.*, (2003) reported maximum coaggregation ability of *L. acidophilus* M92 with *Enterococcus faecium* L3 rather than *E. coli*; *Salmonella serotype Typhimurium* and *Lactobacillus plantarum* L4. Schachtsiek, *et al.*, (2004) analyzed that *Lactobacillus coryniformis* coaggregated with *Escherichia coli* K88, *Campylobacter coli* and *Campylobacter jejuni* but not with other

human pathogens. Collado and Salminen, (2007) analyzed the dadih lactic acid bacteria strains and pathogens *B. vulgatus*, *C. histolyticum* and *difficile*, *St. aureus*, *Enterobacter sakazakii*, and *E. coli* for coaggregation abilities. The results of coaggregation were dependent on dadih strain, pathogen strain and time. Ekmekci *et al.*, (2009) studied the coaggregation ability of 19 vaginal *Lactobacilli*. Coaggregation ability of all *lactobacilli* with *Escherichia coli* ATCC 11229 was positive under both aerobic (71%) and anaerobic conditions (62%). So our results are in confirmation with Schachtsiek, *et al.*, (2004) and Ekmekci *et al.*, (2009) and are similar to that they have reported about coaggregation ability of *Lactobacillus* strains with *Escherichia coli*.

Riepe *et al.*, (1997) analyzed that the two highly autolytic *Lactococcus lactis* subsp. *cremoris* strains (CO and 2250) showed maximum lysis when grown in M17 broth containing a limiting concentration of glucose (0.4 to 0.5%) as the carbohydrate source. Lysis was reduced when strains were grown on lactose or galactose. Whereas Kang *et al.*, (1997) showed that rate and extent of autolysis of *Lb. bulgaricus* and *Lb. casei* was dependent upon temperature, pH, NaCl concentration, growth phase and strain. Masuda *et al.*, (2005) evaluated 7 strains of *L. gasseri* and 5 strains of *L. acidophilus* for the autolytic activity. *L. gasseri* strains showed more prominent results in dispersed solutions than *L. acidophilus* strains. So our results in confirmation with Riepe *et al.*, (1997) when inulin and honey were used as carbohydrate source which have limiting concentration of glucose.

Kushal (2001) reported a higher cell surface hydrophobicity of *L. acidophilus* NCDC 13 in presence of inulin. Pascual *et al.*, (2008) reported the rise in cell surface hydrophobicity percentage was upto 36.12 when *Lactobacillus* strains were grown in MRS broth for 3 hr. Kos *et al.*, (2003) recorded maximum cell surface hydrophobicity in chloroform when the strains *L. acidophilus* M92, *Lactobacillus plantarum* L4 and *Enterococcus faecium* L3 were tested against xylene, chloroform and ethyl acetate. So our results are in confirmation with Kushal (2001) and Pascual *et al.*, (2008).

V. CONCLUSION

Two prebiotics viz., honey and inulin were evaluated for the probiotic and functional attributes of the two strains of *Lactobacillus acidophilus* (*Lactobacillus acidophilus* NCDC 13 and *Lactobacillus acidophilus* NCDC 291) to assess them comparatively. Various adhesion attributes checked were the autoaggregation, coaggregation with *E. coli*, autolysis and cell surface hydrophobicity. *Lactobacillus acidophilus* NCDC 13 showed remarkable autoaggregation efficiency in inulin than *Lactobacillus acidophilus* NCDC 291. While the strain *Lactobacillus acidophilus* NCDC 291 showed more coaggregation in presence of honey than *Lactobacillus acidophilus* NCDC 13. Autolytic activity gets remarkably decreased in presence of prebiotics and the decrease is more in inulin than honey. The property of cell surface hydrophobicity of both the strains was much increased in inulin than honey. In conclusion it can be said that both the strains *Lactobacillus acidophilus* NCDC 13 and *Lactobacillus acidophilus* NCDC 291 showed better attributes in prebiotics inulin than honey.

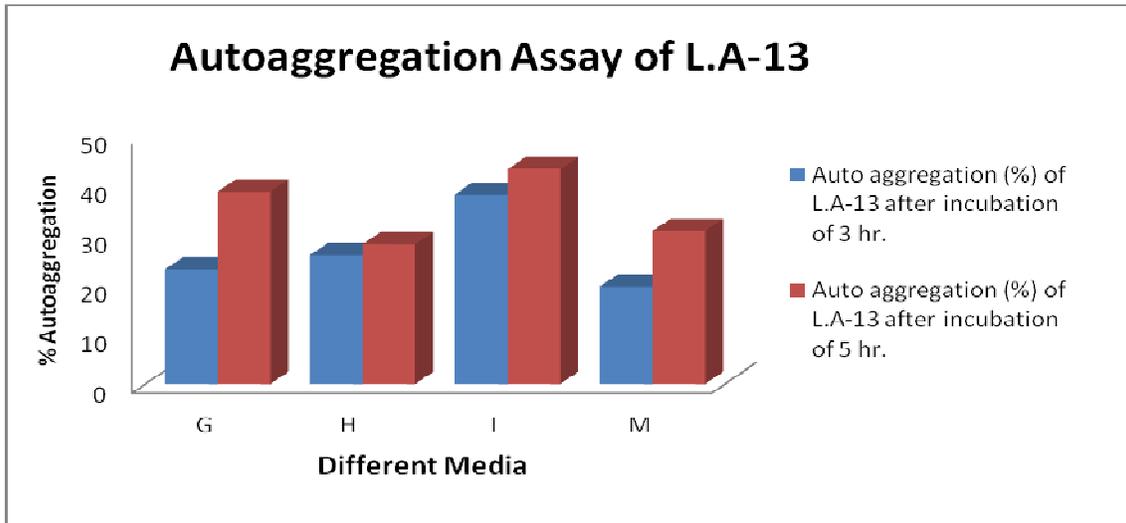


Figure 1: Autoaggregation assay of *Lactobacillus acidophilus* NCDC 13 after incubation of 3 and 5 hr in different media G, H, I and M.

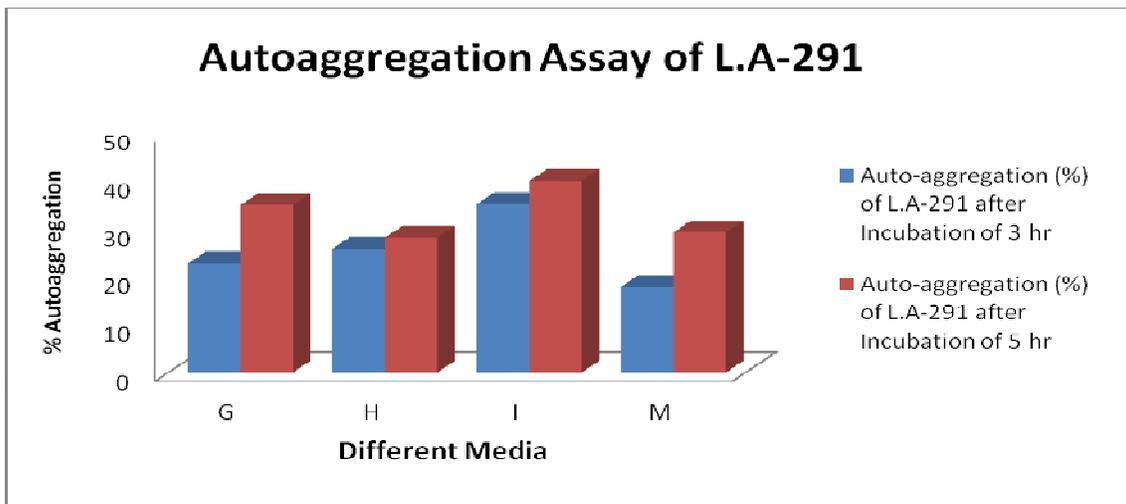


Figure 2: Autoaggregation assay of *Lactobacillus acidophilus* NCDC 291 after incubation of 3 and 5 hr in different media G, H, I and M.

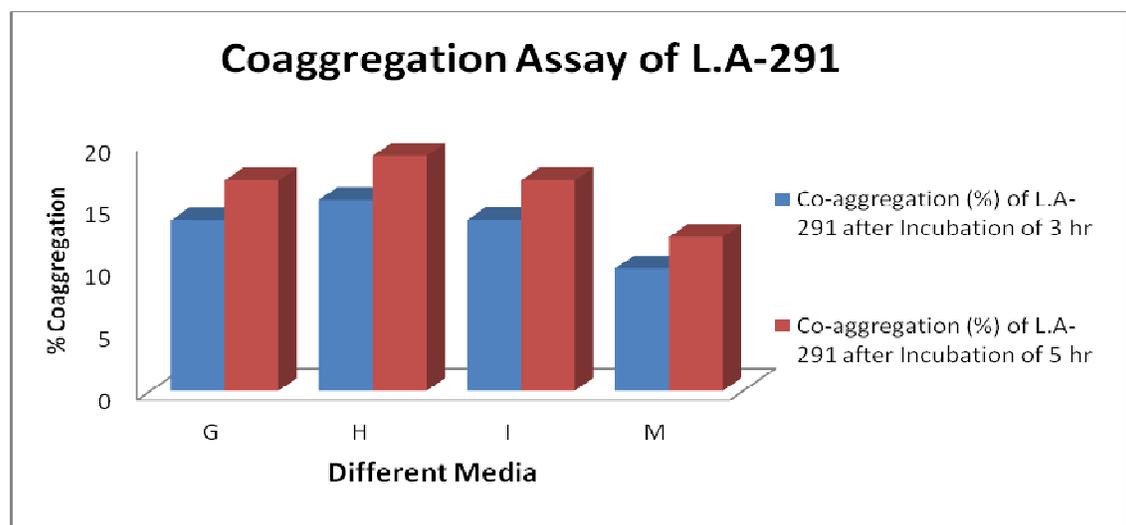


Figure 3: Coaggregation assay of *Lactobacillus acidophilus* NCDC 291 after incubation of 3 and 5 hr in different media G, H, I and M.

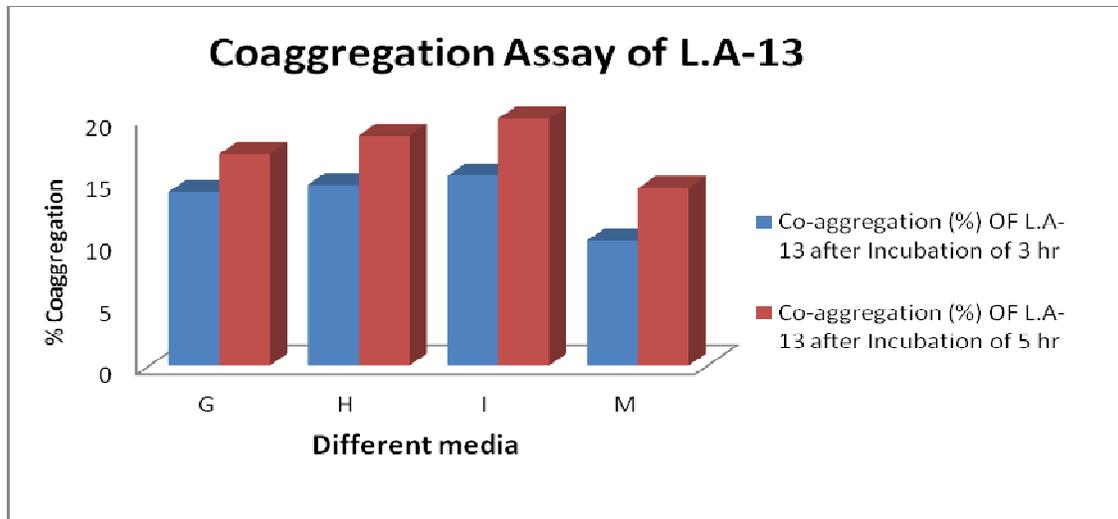


Figure 4: Coaggregation assay of *Lactobacillus acidophilus* NCDC 13 after incubation of 3 and 5 hr in different media G, H, I and M.

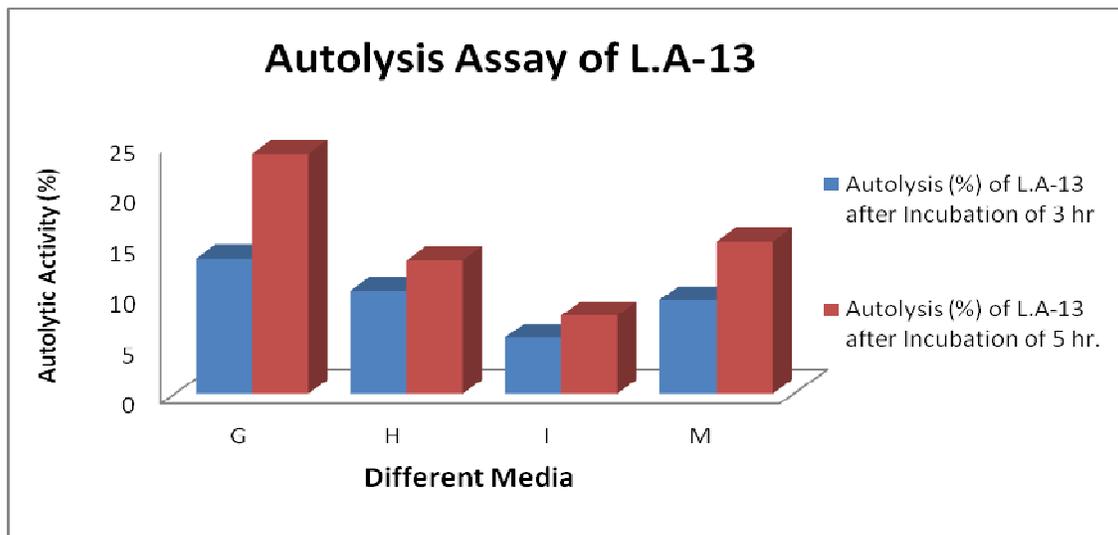


Figure 5: Autolysis assay of *Lactobacillus acidophilus* NCDC 13 after incubation of 3 and 5 hr in different media G, H, I and M.

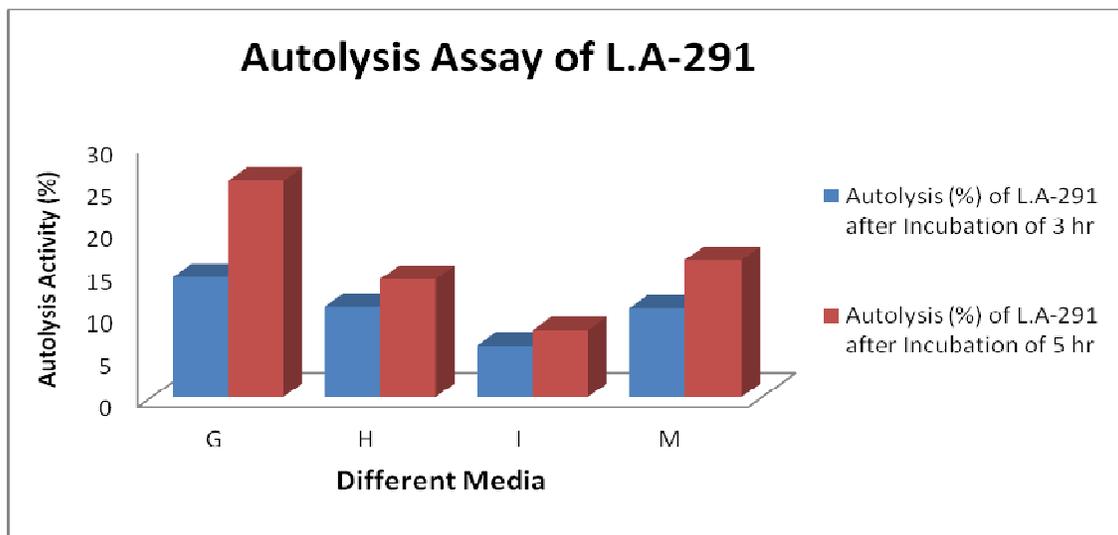


Figure 6: Autolysis assay of *Lactobacillus acidophilus* NCDC 291 after incubation of 3 and 5 hr in different media G, H, I and M.

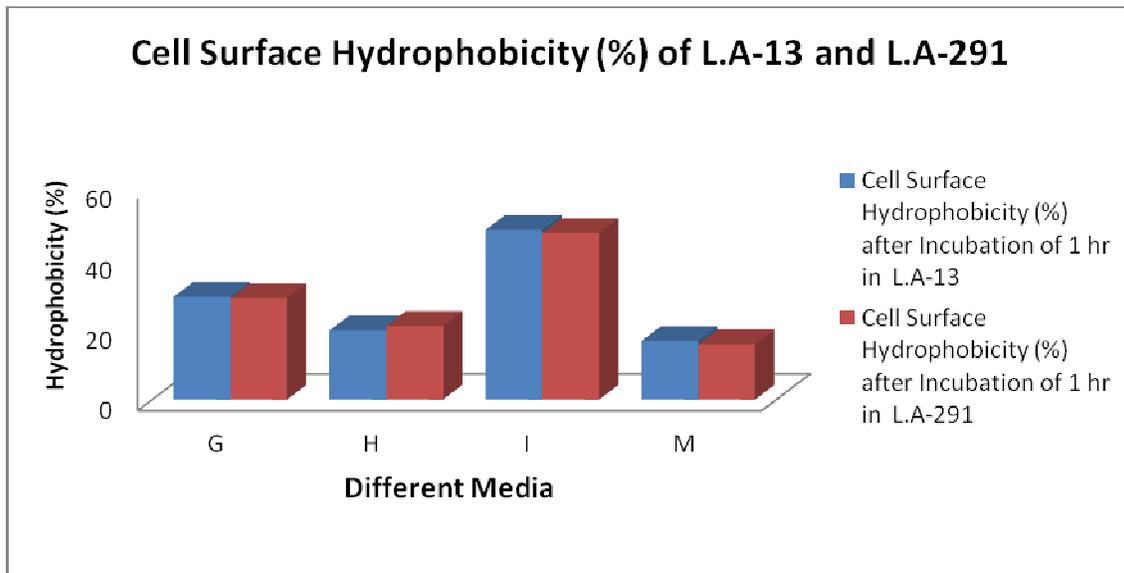


Figure 7: Cell surface hydrophobicity assay of *Lactobacillus acidophilus* NCDC 13 and *Lactobacillus acidophilus* NCDC 291 after incubation of 1 hr in different media G, H, I and M.

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Isolation and Screening of Antibiotic producing Halophiles from Ratnagiri coastal area, State of Maharashtra

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Abstract- The prime purpose of this study is to isolate and screen out antibiotic producing halophilic bacteria and to determine their activity against different pathogenic strains by agar cup method viz., *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus subtilis* and fungi like *Aspergillus niger*, *Penicillium sp.* *Candida albicans* etc. The isolates were obtained from marine environments by crowded plate technique and were subjected to primary screening.

Enrichment of these organisms were carried out in Balanced Salt Medium broth and finally dialyzed so as to purify the proteins then it was characterized by SDS-PAGE electrophoresis. The purified crude extract was prepared. This is the first time we report at our coastal area, the presence of halophiles having antibacterial activity against various pathogenic microorganisms.

Index Terms- halophiles, marine environment, antibacterial activity, zone of inhibition, SDS-PAGE, protein purification.

I. INTRODUCTION

Halophiles are extremophile organisms that thrive in environments with very high concentrations of salt and inhabit hypersaline environments all over the world. There are currently 15 recognized genera in the family (Gutierrez, 2002) Halophilic microorganisms are found in all three domains like *Archaea*, *Bacteria* and *Eukaryotes*. Moderate halophiles are those organisms growing optimally between 0.5-2.5 M salt (Kushner, 1927) Halophiles are categorized slight, moderate or extreme, by the extent of their halo tolerance. Halophiles can be found anywhere with a concentration of salt five times greater than the salt concentration. The metabolism of halophiles includes oxygenic and anoxygenic phototrophs, aerobic heterotrophs, fermenters, denitrifiers and sulphate reducers. Halobacterium glycoprotein requires high NaCl concentration for structural stability. When suspended in low salt concentration, the wall protein denatures and this leads to lysis and cell death (Soo-Hoo, 1967) The emergence of antibiotic resistance is an evolutionary process that is based on selection for organisms that have enhanced ability to survive doses of antibiotics that would have previously been lethal (Cowen, 2008). Different antibiotics like penicillin, erythromycin and gentamycin which used to be one of the important cures are now less effective because bacteria have become more resistant (Pearson, 2008). The requirement of high salt concentration for the structural stability of the protein be

attributed to the low content of hydrophobic residues and accordingly weak hydrophobic interactions within the protein molecules. This advantage of halophiles has showed many medical applications (Lowe, 1993). Analysis of most of the halophiles strain E-367 harbors three different plasmids (pVC1, pVC2 & pVC3) as well as megaplasmids. Other plasmids that have been isolated and detected are pH11 from *Chromobacter israelensis* (48 kb), pH51 from *Halomonas subglaciescola*, about 70kb (Vergas C, 1995). *Halomonas elongata* containing a plasmid named pH1, shown to have resistance against kanamycin, tetracycline and neomycin (Fernandez Crastillo R, 1992). A comparatively wide range of taxa have been isolated from saltern crystalliser ponds, including members of the following genera: *Haloferax*, *Halogeometricum*, *Halococcus*, *Haloterrigena*, *Halorubrum*, *Haloarcula* and *Halobacterium* families (Oren, 2002). Thus the presence of plasmids might be responsible for the antibacterial activity.

II. MATERIALS AND METHODS

The study was carried out at Department of Microbiology and Department of Biotechnology, at Gogate-Jogalekar College, Ratnagiri during November 2011 to February 2012.

C. Isolation of Halophiles from Marine environments

The organisms (halophiles) used in this study were isolated from the Ratnagiri coastal area, Maharashtra, India. The water sample was collected from the Mandvi beach (Arabic ocean) during December 2011 and was brought to the Microbiology laboratory in highly aseptic conditions. Halophiles from the sample had been isolated by pour plate, streak plate technique on Balanced Salt Medium agar and incubated at room temperature at 48 hours. For enrichment the broth inoculated with 1ml of sample was kept on rotary shaker at room temperature at 150rpm for 48 hours.

D. Screening of Halophiles for Antimicrobial activity

The primary and secondary screening was done. In primary screening the antimicrobial activity of crude culture filtrate were used to determine the effect of isolate by agar well diffusion method on Muller-Hilton agar per National Committee for Clinical Laboratory Standards (NCCLS, 1999). The medium is modified with addition of certain essential amino acids except tryptophan so as to enhance growth of halophiles. Secondary screening was carried out with purified protein extract by ammonium sulphate precipitation and dialysis. The pathogenic strains used were *Staphylococcus aureus*, *Klebsiella pneumoniae*,

Escherichia coli, *Pseudomonas aeruginosa*, *Bacillus subtilis* and fungi like *Aspergillus niger*, *Penicillium* spp. *Candida albicans* etc. obtained from NCIM Department National Chemical Laboratory, Pune.

E. Characterization of Halophiles from Secondary screening

The active isolates obtained from secondary screening were characterized by morphological method described by Nakazawa *et al*, (2006). Morphological method consists of Microscopic methods. The microscopic characterization was done with Trinocular Research Microscope (Carl Zeiss) Germany. Gram staining and motility was done so as to determine their Gram nature.

F. Enrichment

Enrichment step was carried out in 500ml of flask containing 100ml of BSM broth inoculated with 1 ml of sample and kept on rotary shaker for 48hours at 150rpm.

G. Protein Purification

The crude culture filtrate was mixed with saturated ammonium sulphate and kept overnight at 10°C and then centrifuged. The precipitate was dialyzed in phosphate buffer having pH 7.5 so as to purify the protein. The sample is allowed to run on SDS-PAGE electrophoresis.

H. Isolation of Antibacterial components

The components needed for antibacterial activity was obtained from the crude filtrate by solvent extraction method. Ethyl acetate was added to the filtrate in the ratio of 1:1(v/v) and shaken vigorously for 1hour for complete extraction. The Ethyl phase that contains antibiotic was separated from aqueous phase, then it was evaporated in water bath at 60°C and the residue obtained was used for further analysis.

I. Determination of Antibacterial activity

The same residue was taken so as to determine the antibacterial activity by agar cup method (Zamanian *et al*, 2005). The partially purified extract obtained by the evaporation of the ethyl acetate extract was dissolved in 1ml 0.2M phosphate buffer (pH 7). Then 0.1ml of sample was added into well bored against test organisms and plates were kept for incubation for 37°C for 24hours and observed. The diameter of zone of inhibition was measured with the help of Kirby-Bauer's chart.

III. RESULTS

Thus, the halophiles were isolated from marine environments having antibacterial activity and they found to be gram negative non-motile organisms. The halophiles which inhibits the growth of test organisms were *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus subtilis* and fungi like *Aspergillus niger*, *Penicillium* sp. *Candida albicans* and shows significant zone of inhibition against them.

Table 1 shows the antibacterial activity of halophiles (protein crude extract) against test organisms. The inhibition was found to be maximum against *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus subtilis* followed by *Klebsiella pneumonia*.

Table 2 shows the antifungal activity of halophiles (protein crude extract) against test fungus and inhibition was found to be maximum against *Candida albicans* followed by *Aspergillus niger*, *Penicillium* spp.

Table 1: In vitro antibacterial activity of halophiles (protein crude extract)

Organisms	Zone of Inhibition in (mm) Isolate I
<i>Escherichia coli</i> ,	8.4
<i>Pseudomonas aeruginosa</i> ,	5.4
<i>Bacillus subtilis</i>	5.2
<i>Klebsiella pneumonia</i>	4.2

Values are mean of three replicates

Table 2: In vitro antifungal activity of halophiles (protein crude extract)

Organisms	Zone of Inhibition in (mm) Isolate I
<i>Candida albicans</i>	8.4
<i>Aspergillus niger</i>	6.2
<i>Penicillium</i> sp.	6.4

Values are mean of three replicates

The result of SDS-PAGE shows the presence of potent proteins in the crude residues, responsible for the antibacterial and antifungal activity. The molecular weight of the isolate I was found to be 66 kDa.

IV. DISCUSSION

The antibacterial and antifungal assays of halophiles (protein crude extract) have shown that, the marine environments represent a potential source of new antimicrobial and antifungal agents. The marine environments and mangrove rhizosphere has enormous diversity of all aerobic as well as facultative anaerobic bacteria (Todkar *et al*, 2011). The protein crude purified extract showed greater activity than the crude culture filtrate. The antibacterial and antifungal profile of this (Isolates I) halophiles gives the findings that these strains may contain multiple plasmids as seen in other plasmid containing strains (Ghosh *et al*, 2009). *Halobacterium* is a group of Archaea that have a high tolerance for elevated levels of salinity. Some species of halobacteria have acidic proteins that resist activity of most of other organisms. It has been studied that, Ratnagiri coastal area shows tremendous diversity of various microorganisms (Todkar *et al*, 2011). In this study the maximum activity was observed against *Escherichia coli*, *Pseudomonas aeruginosa*, *Bacillus subtilis* followed by *Klebsiella pneumonia*. Further analysis of these (isolates I) would be possible by 16S-rRNA sequencing method so as reveal the genus and species level.

V. CONCLUSION

This study reveals the importance of halophiles present in marine environments and that may useful in control in diseases caused by bacterial and fungal pathogenic species. This halophile protein purified extract would have an increased importance in medicine and in health care industry again further research on the above aspects may be undertaken. Thus these protein purified extracts obtained from halophiles seems to be a potential source of arresting the growth and metabolite activities of various

pathogenic microorganisms. Thus it supports previous findings based on presence of *Bacillus spp.* in marine environments.

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Design of $\mu\text{C}/\text{OS II}$ RTOS Based Scalable Cost Effective Monitoring System Using Arm Powered Microcontroller

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Abstract- This paper describes an embedded monitoring system based on $\mu\text{C}/\text{OS II}$ operating system using ARM7. It deals with the porting of Micro C/OS-II kernel in ARM powered microcontroller for the implementation of multitasking and time scheduling. Here a real time kernel is the software that manages the time of a micro controller to ensure that all time critical events are processed as efficiently as possible. Different interface modules of ARM7 microcontroller like UART, ADC, LCD are used and data acquired from these interfaces is tested using $\mu\text{C}/\text{OS-II}$ based real time operating system. It mainly emphasizes on the porting of $\mu\text{C}/\text{OS-II}$.

Index Terms- embedded system, $\mu\text{C}/\text{OS-II}$, arm 7, RTOS

I. INTRODUCTION

In high end applications, sometimes devices may malfunction or totally fail due to long duration of usage or any technical problem which give fatal results. An embedded monitoring system is necessary for continuously collecting data from onsite and later analyzing that and eventually taking proper measures to solve the problem. The systems that are in use today use non real time operating systems based on mono-task mechanism that hardly satisfies the current requirements. This paper will focus on porting of $\mu\text{C}/\text{OS II}$ in ARM7 controller that performs multitasking and time scheduling. The $\mu\text{C}/\text{OS II}$ features and its porting to ARM7 are discussed. Finally it provides an overview for design of embedded monitoring system using $\mu\text{C}/\text{OS II}$ as application software that helps in building the total application.

II. MICRO C/OS II

$\mu\text{C}/\text{OS II}$ (pronounced "Micro C O S 2") stands for Micro-Controller Operating System Version 2 and can be termed as $\mu\text{C}/\text{OS-II}$ or $\text{uC}/\text{OS-II}$). It is a very small real-time kernel with memory footprint is about 20KB for a fully functional kernel and source code is about 5,500 lines, mostly in ANSI C. It's source is open but not free for commercial usages. $\mu\text{C}/\text{OS-II}$ is upward compatible with $\mu\text{C}/\text{OS V1.11}$ but provides many improvements, such as the addition of a fixed-sized memory manager; user-definable callouts on task creation, task deletion, task switch, and system tick; TCB extensions support; stack checking; and much more.

J. $\mu\text{C}/\text{OS II}$ using ARM

$\mu\text{C}/\text{OS-II}$, The Real-Time Kernel is a highly portable, ROMable, scalable, preemptive real-time, multitasking kernel (RTOS) for microprocessors and microcontrollers. $\mu\text{C}/\text{OS-II}$ can manage up to 250 application tasks. $\mu\text{C}/\text{OS-II}$ runs on a large number of processor architectures and ports. The vast number of

ports should convince that $\mu\text{C}/\text{OS-II}$ is truly very portable and thus will most likely be ported to new processors as they become available. $\mu\text{C}/\text{OS-II}$ can be scaled to only contain the features you need for your application and thus provide a small footprint. Depending on the processor, on an ARM (Thumb mode) $\mu\text{C}/\text{OS-II}$ can be reduced to as little as 6K bytes of code space and 500 bytes of data space (excluding stacks). The execution time for most of the services provided by $\mu\text{C}/\text{OS-II}$ is both constant and deterministic. This means that the execution times do not depend on the number of tasks running in the application.

K. Choosing $\mu\text{C}/\text{OS II}$

$\mu\text{C}/\text{OS II}$ is chosen for the following features.

1. Portable

Most of $\mu\text{C}/\text{OS-II}$ is written in highly portable ANSI C, with target microprocessor specific code written in assembly language. Assembly language is kept to a minimum to take $\mu\text{C}/\text{OS-II}$ easy to port to other processors. Like Micro C/OS, $\mu\text{C}/\text{OS-II}$ can be ported to a large number of microprocessors as long as the microprocessors provides a stack pointer and the CPU register can be pushed onto and popped from the stack. Also, the C compiler should provide either in-line assembly or language extension that allows you to enable and disable interrupt from C. $\mu\text{C}/\text{OS-II}$ can run on most 8-, 16-, 32 or even 64-bit microprocessors or microcontrollers and DSPs.

2. ROMable

$\mu\text{C}/\text{OS-II}$ was designed for embedded application. This means that if you have the proper tool chain (i.e. C compiler, assembler and linker/loader), you can embed Micro C/OS-II as part of a product.

3. Scalable

$\mu\text{C}/\text{OS-II}$ is designed such a way so that only the services needed in the application can be used. This means that a product can use just a few $\mu\text{C}/\text{OS-II}$ services. Another product may require the full set of features. This allows to reduce the amount of memory (both RAM and ROM) needed by $\mu\text{C}/\text{OS-II}$ on a per product basis. Scalability is accomplished with the use of conditional compilation.

4. Preemptive

$\mu\text{C}/\text{OS-II}$ is a fully preemptive real time kernel. This means that Micro C/OS-II always runs the highest priority task that is ready.

5. Multitasking

Multitasking is the process of scheduling and switching the CPU between several tasks. $\mu\text{C}/\text{OS-II}$ can manage up to 64 tasks. Each task has a unique priority assigned to it, which mean that $\mu\text{C}/\text{OS-II}$ cannot do round robin. There are thus 64 priority levels.

6. Deterministic

Execution time of all $\mu\text{C}/\text{OS-II}$ functions and services are deterministic. This means that one can always know how much time $\mu\text{C}/\text{OS-II}$ will take to execute a function or a service. Furthermore except for one service, execution time all $\text{C}/\text{OS-II}$ services do not depend on the number of tasks running in the application.

7. Robust and Reliable

$\mu\text{C}/\text{OS-II}$ is based on $\mu\text{C}/\text{OS}$ which has been used in hundreds of commercial applications. $\mu\text{C}/\text{OS-II}$ uses the same core and most of the same functions as $\mu\text{C}/\text{OS}$ yet offers more features.

L. Starting $\mu\text{C}/\text{OS-II}$

In any application $\mu\text{C}/\text{OS-II}$ is started as shown in the figure 1. Initially the hardware and software are initialized. The hardware is the ARM core and software is the $\mu\text{C}/\text{OS-II}$. The resources are allocated for the tasks defined in the application.

The scheduler is started then. It schedules the tasks in preemptive manner. All these are carried out using specified functions defined in $\mu\text{C}/\text{OS-II}$.

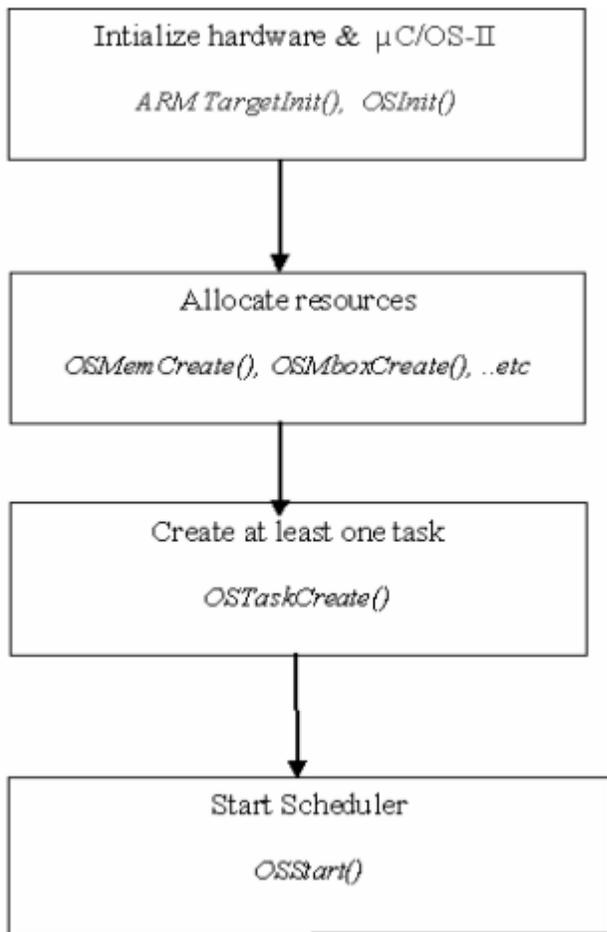


Figure 1: Starting $\mu\text{C}/\text{OS-II}$

M. Initializing $\mu\text{C}/\text{OS-II}$

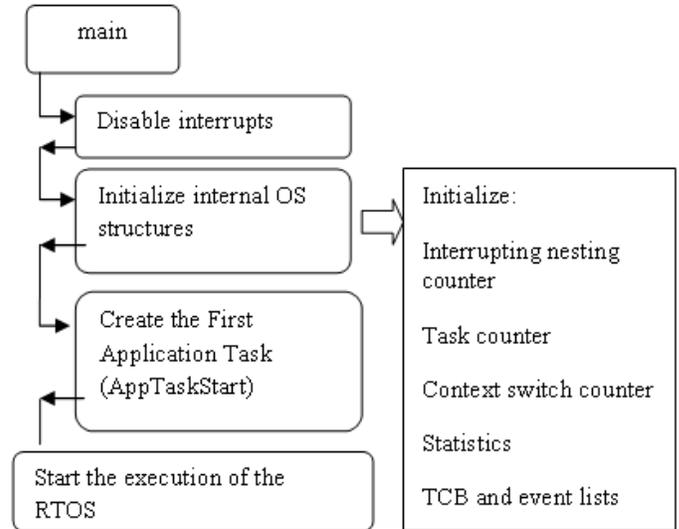


Figure 2: Initializing $\mu\text{C}/\text{OS-II}$

$\mu\text{C}/\text{OS-II}$ can be initialized as shown in the figure 2. The detailed steps are shown in the figure. Below shows the sample program for the steps shown in the figure.

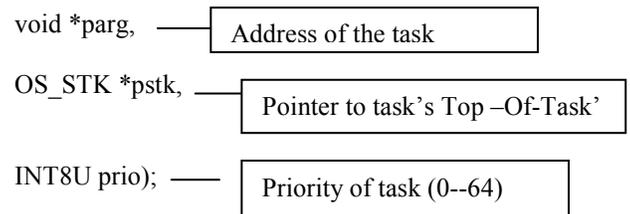
```

void main (main)
{
    /* user initialization */
    OSInit(); /* kernel initialization */
    /* Install interrupt vectors */
    /* Create at least 1 task (start task) */
    /* Additional User code */
    OSStart(); /* start multitasking */
}
    
```

N. Task Creation

To make it ready for multitasking, the kernel needs to have information about the task: its starting address, top-of-stack (TOS), priority, arguments passed to the task, other information about the task.

You create a task by calling a service provider by $\mu\text{C}/\text{OS-II}$:
 OSTaskCreate(void (*task) (void *parg),



You can create task:
 before you start multitasking (at initialization time)
 (or) during run time.

O. Implementation through $\mu\text{C}/\text{OS-II}$

In embedded systems, a board support package (BSP) is implementation specific support code for a given (device motherboard) board that conforms to a given operating system. It is commonly built with a boot loader that contains the minimal device support to load the operating system and device drivers for all the devices on the board. Some suppliers also provide a root file system, a tool chain for making programs to run on the embedded system (which would be part of the architecture support package), and configurations for the devices (while running). A board support package

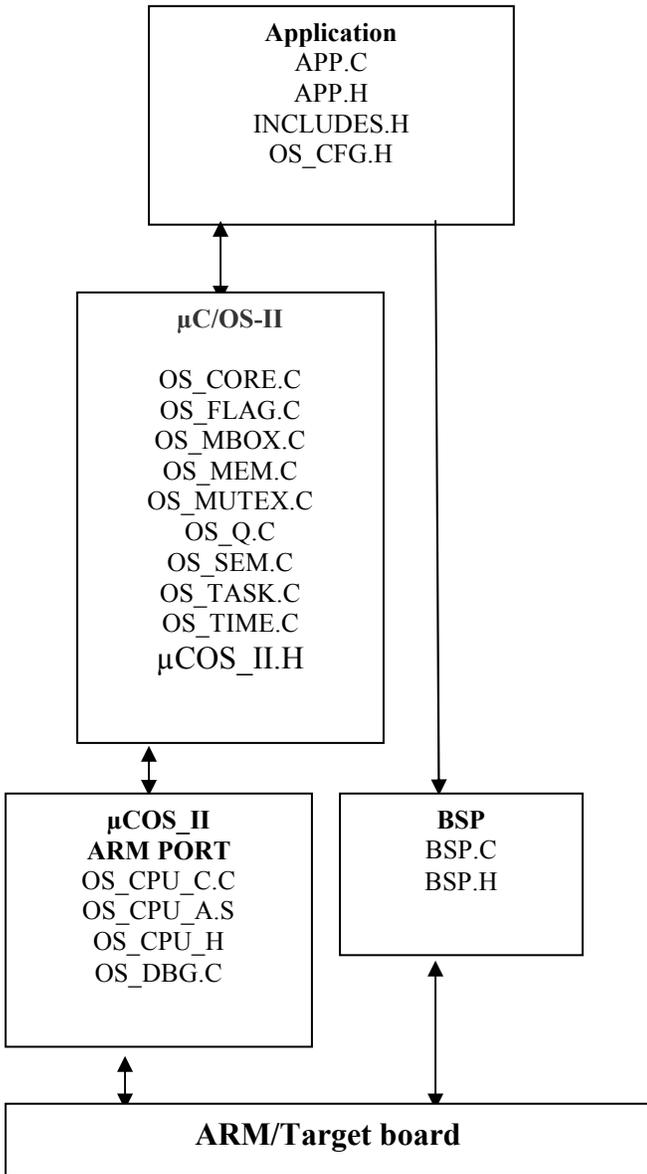


Figure 3: The architecture of hardware and software when using μ COS_II

III. SYSTEM ARCHITECTURE

The heart of the system is a real-time kernel that uses preemptive scheduling to achieve multitasking on hardware platform. The previous sections dealt with μ COS_II porting to

the application desired. This section deals with the implementation of hardware and software.

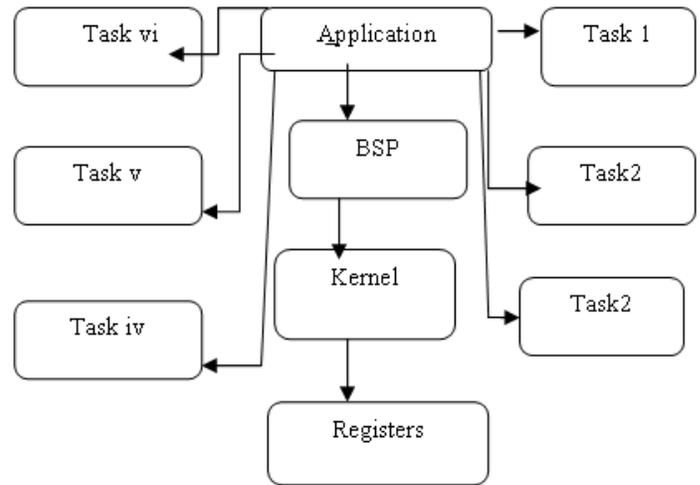


Figure 4: Block diagram

In Micro C/OS-II maximum number of tasks is 64. In the figure shown above the application has six tasks. Depending on the required application the number of tasks may vary. To perform a sample experiment to understand the porting of μ C/OS-II we can perform simple tasks like Temperature sensor (i.e., ADC), Graphical LCD (i.e., degree to graphical Fahrenheit), UART (i.e., digital data displaying), LED toggle (ie., 8-bit data flow control) Buzzer (i.e., alarm device). The ARM runs the Real time operating system to collect information from the external world. Here RTOS is used to achieve real time data acquisitions. Micro C/OS-II kernel is ported in ARM powered microcontroller for the implementation of multitasking and time scheduling as shown in previous sections.

Keil IDE is used for implementation. Keil IDE is a windows operating system software program that runs on a PC to develop applications for ARM microcontroller and digital signal controller. It is also called Integrated Development Environment or IDE because it provides a single integrated environment to develop code for embedded microcontroller.

IV. CONCLUSION

In this paper the porting of μ C/OS-II in ARM 7 is presented. It mainly focus on designing an embedded monitoring system using ARM 7 and μ C/OS-II. The steps involved in porting the RTOS and final implementation details are provided. This paper provides an detailed overview for developing a embedded monitoring system using ARM and μ C/OS-II.

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Prevalence and Disease Burden of Common Alpha Thalassaemia Deletions in Malaysian Blood Donors: A multi ethnic population

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Abstract- Alpha thalassaemia is common in Malaysia which comprises of Malays, Chinese, Indians and other ethnics. Therefore it is important to determine the prevalence of common alpha thalassaemia deletions that are --^{SEA}, --^{THAI}, --^{FIL}, - $\alpha^{3.7}$ and - $\alpha^{4.2}$, and to estimate the number of pregnancies each year in which the fetus would be at risk and contribute for deletional Hb Barts hydrops foetalis syndrome and deletional HbH disease in Malaysia. In this study, a cross-sectional study of 94 Malays, 129 Chinese and 7 others from Health Awareness Campaign was carried out using standard haematological analysis, multiplex PCRs and statistical analysis. Red Cell Mean Corpuscular Volume (MCV) < 80 fL was identified in 38 (16.5%) with exclusion of Indians. 17 (7.4%) of blood donors showed alpha thalassaemia deletions. 3.5% were with double gene deletion and 3.9% with single gene deletions. --^{SEA} was seen in 7(5.4%) Chinese and 1(1.1%) Malay. - $\alpha^{3.7}$ was seen in 7 (3.0%) of 4 (4.3%) Malays, 2 (1.6%) Chinese and 1 other ethnic. - $\alpha^{4.2}$ was seen in 2 Chinese (0.9%). The projected number of pregnancies at risk and contribute for deletional Hb Barts hydrops foetalis syndrome and deletional HbH disease each year in Malaysia is 30 and 120 in the Malays, 250 and 150 in the Chinese, 640 in combination and on average is 600 and 669 respectively. The current prevalence and projected number of pregnancies at risk of deletional Hb Barts hydrops foetalis syndrome and deletional HbH disease will help to achieve a better disease management in order to lessen present alpha thalassaemia burden and to prevent much higher alpha thalassaemia birth in Malaysia.

Index Terms- alpha thalassaemia deletions, prevalence, disease burden, blood donor, multiplex PCR

I. INTRODUCTION

Alpha thalassaemias are described as genetic disorders of hemoglobin synthesis characterized by a reduction in the synthesis of alpha globin chains and affecting 5% of world's population. The alpha globin cluster consists of 5'- ζ 2- ψ ζ 1- ψ α 2- ψ α 1- α 2- α 1- θ 1-3' on chromosome 16p13.3 giving ($\alpha\alpha/\alpha\alpha$) in a wild type. Absence of one alpha gene ($\alpha\alpha/\alpha-$) is known as a silent carrier, absence of two ($\alpha\alpha/--$), ($-\alpha/\alpha$) known as alpha thalassaemia trait, absence of three ($--/\alpha$) known as HbH disease with inclusions in the red cells stained with Brilliant Cresyl Blue are usually observed, and complete deletion of alpha genes ($--/--$)

known as Hb Barts hydrops foetalis is incompatible with life predominantly seen in Southeast Asia[1-7]. The incidence in a population reflects the balance between the premature death of homozygotes and the increased fitness in heterozygotes[8]. The most common alpha thalassaemia deletions are the Southeast Asia (--^{SEA}), Philippines (--^{FIL}) and Thailand (--^{THAI}) in the Southeast Asia, the 3.7 kb (- $\alpha^{3.7}$) and the 4.2 kb (- $\alpha^{4.2}$) in the world[10-12]. Over 5% of the Filipinos are carriers for --^{SEA} or -^{FIL} and 14% of Northern Thailand people are carriers of --^{SEA}[12]. In Singapore, about 6.4% Chinese (3.9% α^0 only in the Chinese, 2.5% α^+), 4.8% Malays, and 5.2% Indians are α -thalassaemia carriers[13].

Malaysia constitutes of Malay, Chinese, Indians and other ethnics[14, 15]. The Malay is the main ethnic group and originates mainly from Malay-Polynesians (Austronesia) as Indonesia and the Philippines, and the Mon-Khmer (central Asia)[16]. Hydrops foetalis due to alpha thalassaemia was first seen in 1961 of Chinese origin and has been reported in Chinese-Indonesian, Thais and Philipino[17-20]. A survey of cord blood on healthy newborns in Kuala Lumpur showed Hb Barts in both Malays (3.2%) and Chinese (5.1%)[21]. Hb Barts was more common in Chinese than Malays and was used as surrogate marker for alpha thalassaemia[18-19, 22-23]. Currently precise diagnosis of alpha thalassaemia is carried out using DNA studies[24-28]. Hb Barts hydrops foetalis occurs in Chinese-Malaysian with 0.3:1000 births[25] and 4.5% of Chinese-Malaysian are carriers of α^0 . HbH disease was similarly seen in the Malays and Chinese. In contrast, antenatal diagnosis for α thalassaemia reported Hb Barts hydrops foetalis mostly in the Chinese and all Chinese couples were carriers of --^{SEA}[29-30]. Thalassaemia studies among blood donors of 91.3% (73/80) Malays found out that 30% were anaemic and all had a negative H-inclusion[31]. Deletional alpha thalassaemia burden has not been reported in Malaysia. In order to know the current carrier prevalence in our multiethnic population, carrier detection was carried out by screening blood donors. This enabled estimation of disease burden, continuous monitoring of deletional alpha thalassaemia in the country and identified carriers can be informed their risk and options regarding marriage and child-bearing[32].

II. MATERIALS AND METHODS

In conjunction with blood donation by the National Blood Service Centre in September 2004, 106 males and 132 females undergraduates came to donate blood and consent was taken for thalassaemia DNA studies. Full Blood Count was determined by ABX MICROS 60-OT18 (ABX Diagnostics, France) within 6 hours of venesection. Cell morphology assessment and Hemoglobin H inclusion test were carried out according to standard methods[33, 34]. Hb A₂ and F were quantified by Variant™ β-thalassaemia Short Program (BIO-RAD Laboratories, USA). Hb A₂ > 4.0% was the cut-off value of classical β⁰ thalassaemia trait in Malaysia[35]. Eight samples (3%) diagnosed as β-thalassaemia trait, Hb E/AE trait, Hb S trait and suspected Hb Q were excluded from this study as coinheritor of alpha and beta thalassaemia was not included in the study. A cut-off value of MCV < 80 fL was used[2, 10, 36- 37] and 16.5% (20 males and 18 females) were subjected to DNA analysis. DNA was extracted using QIAamp® DNA Blood Midi Kit (QIAGEN, Germany). Purity and concentration were estimated using Ultrospec 3000pro (Pharmacia Biotech, USA). Polymerase Chain Reaction (PCR) was carried out using 13 primers or 8 pairs to detect --^{SEA}, --^{FIL}, --^{THAI}, -α^{3.7} or -α^{4.2}[38] and consisted of 100ng DNA, 0.2μM each primer and QIAGEN® Multiplex PCR Kit (QIAGEN, Germany). The program was 15 minutes Hot Start at 98°C, 30 cycles of 45 seconds denaturation at 98°C, 3

minutes annealing at 64°C and 150 seconds extension for 72°C followed by 15 minutes final extension at 72°C. PCR products were electrophoresed in 2% agarose gel and ethidium bromide stained. Statistical analysis was carried out using SPSS 11.5.

III. RESULTS

In the 230, 94 (41%) were Malays, 129 (56%) Chinese and 7 (3%) of other ethnics and none from Indians. These were 19-24 years old from all 14 states in peninsular and east Malaysia. MCV and MCH of Malay (40 male and 54 female) and Chinese (58 male and 71 female) were normally distributed (p>0.05) with mean 83 fL and 28 pg, and well demonstrated in MCV of Malay male and Chinese female [39-40]. A bimodal (65 and 85 fL) MCV distribution was demonstrated in Chinese males[10]. --^{SEA} (3.5% with 95% CI, 3.4% to 3.8%) detected were with MCV ≤ 68 fL and MCH < 22 pg and -α⁺ (3.9% with 95% CI, 3.8% to 4.2%) with MCV ≥ 73 fL and MCH > 25.2 pg (Table 1). Total alpha thalassaemia deletions present was 17 from 5 (2.2%) Malays, 11 (4.8%) Chinese and 1 (0.4%) of other ethnics giving 7.4% (95% CI, 7.1 % to 8.3%) and were equally distributed among Malay and Chinese (Yates' corrected chi-squared, P<0.05). In the Malays, the prevalence was 5.3% (95% CI, 5.2 % to 5.9%) with 4.3% -α^{3.7} (95% CI, 4.2% to 4.7%) and 1.1% --^{SEA} (95% CI, 1.1% to 1.2%). In the Chinese, was 8.5% (95% CI, 8.1% to 9.7%) with 5.4% --^{SEA} (95% CI, 5.3% to 6.0%), 1.6% -α^{3.7} (95% CI, 1.6% to 1.7%) and -α^{4.2} each.

Table 1: Allele frequency of alpha thalassaemia deletions detected.

Allele	MCV fL	MCH pg	Malay (n = 94)	Chinese (n = 129)	Others (n=7)	Total (n=230)
(-- ^{SEA})	60-68	19.2-21.8	1♀ (1.1%)	7♂ (5.4%)	0	8(3.5%)
(-α ^{3.7})	73-77	25.2-26.8	3♀ (3.2%)	1♀ (0.8%)	0	7(3.0%)
	79	26.7, 26.6	1♂ (1.1%)	1♂ (0.8%)	1♂	
(-α ^{4.2})	76	25.5	0	1♂ (0.8%)	0	2(0.9%)
	78	26.3	0	1♀ (0.8%)	0	
Total			5 (5.3%)	11 (8.5%)	1	17(7.4%)

Malaysia population is about 28 million[41] and comprises of 58% Malays, 25% Chinese, 7% Indian and 10% of other ethnics[14-15] giving 16 million Malays and 7 million Chinese. With Malaysia's crude birth rate of 17.5 per 1000 population[15], births/year is 0.49 million with 0.3 million Malays and 0.1 million Chinese. In the Malays, the prevalence for --^{SEA} was 1/94 meanwhile the prevalence for single α gene deletion was 4/94. In the Chinese, the prevalence for --^{SEA} was 7/129 meanwhile the prevalence for single α gene deletion was 4/129. In both, the prevalence for --^{SEA} was 8/223 meanwhile the prevalence for single α gene deletion was 8/223. On average, the prevalence for --^{SEA} was 8/230 meanwhile the prevalence for single α gene deletion was 9/230. Thus the projected number of pregnancies each year in Malaysia at risk of deletional HbH disease and Hb Barts hydrops foetalis syndrome is 120 (95% CI, 116 to 125) and 30 (95% CI, 29.8 to 30.4) in the Malays, 150 (95% CI, 131 to 175) and 250 (95% CI, 195 to 319) in the Chinese, increased to 640 (95% CI, 545 to 749) in both and, 669 (95% CI, 586 to 765) and 600 (95% CI, 533 to 678) on average respectively (Table 2) [9-10, 36, 42].

Table 2: Projected number of pregnancies at risk of deletional Hb H disease and Hb Barts hydrops foetalis syndrome.

Ethnic	Hb H disease	Hb Barts hydrops foetalis syndrome
Malays	120	30
Chinese	150	250
Malay and Chinese	640	640
Average	669	600

* The projected numbers were calculated from the values in Table 1, as follows: for Malays, 300 000 births per year X (1 ÷ 94) (4 ÷ 94) for deletional HbH disease and 300 000 births per year X (1 ÷ 94)² for deletional Hb Barts hydrops foetalis syndrome; for average, 490 000 births per year X (0.035) (0.039) for deletional HbH disease and 490 000 births per year X (0.035)² for deletional Hb Barts hydrops foetalis syndrome.

IV. DISCUSSION

In this study the $--\alpha^{SEA}$, $-\alpha^{3.7}$ and $-\alpha^{4.2}$ were detected with different frequencies in Malays and Chinese-Malaysian. The most common deletion in the Malays was $-\alpha^{3.7}$ and $--\alpha^{SEA}$ in the Chinese-Malaysian. In the Malays, higher frequency of $-\alpha^{3.7}$ (4.3%) was observed than $--\alpha^{SEA}$ (1.1%). This is similar to local study of 10.7% to 2.5% respectively in pregnant mothers[30]. The lower $--\alpha^{SEA}$ (1/94) is similar to 0.6% (9/1567) of Malay blood donors[43]. Conversely in the Chinese-Malaysian, the $--\alpha^{SEA}$ of 5.4% (7/129) is higher than $-\alpha^{3.7}$ (1.6%). This is consistent with 4.14% (232/5605) to 3.10% (174/5605) in Southern China newborns[9], 4.5% (81/1800) to 0.3% (6/1800) in Hong Kong high school students[12] and 15% to 10% (10/100) in Chinese-Malaysian pregnant mothers[30]. Lower $--\alpha^{SEA}$ prevalence observed in China could be due to one child per family law practiced. In local studies, the $--\alpha^{SEA}$ of 8.5% (22/259) was observed in the Chinese-Malaysian from β -thalassaemia patients with Hb A2 >3%[44] and 5.1% (6/118) in classical β -thalassaemia carriers with Hb A2 <4%[45]. Coinheritance of beta thalassaemia was excluded in our study. Therefore the 5.4% $--\alpha^{SEA}$ in Chinese-Malaysian obtained is consistent with studies carried out in local and in countries in the region. Lowest $-\alpha^{4.2}$ frequency was observed. The $-\alpha^{4.2}$ was not detected in Malays (0/94) and consistent with also not detected (0/1567) in Malay blood donors and 1% (4/402) in Malays pregnant mothers[30]. This is consistent with study in Hong Kong high school students[36] of 0.2% (3/1800) and 0.95% (53/5605) in Southern China newborns[9]. In Chinese-Malaysian, the $-\alpha^{4.2}$ is similar to $-\alpha^{3.7}$ of 1.6% (2/129).

Alpha thalassaemia deletions frequency was lower in the Malays (5.3%) than the Chinese-Malaysian (8.5%). Single α -globin gene deletions are common and homozygous single α -globin gene deletion will give similar haematologic profiles and are not at risk of conceiving hydrops foetalis babies, however, at risk of conceiving HbH disease babies[46]. In the Malays, the higher frequency of $-\alpha^{3.7}$ is consistent with the presence of HbH disease despite the lower frequency of $--\alpha^{SEA}$ and very rare $-\alpha^{4.2}$. HbH samples encountered were also with genotype ($\alpha^{SEA}/-\alpha^{3.7}$). The low $--\alpha^{SEA}$ frequency could explain the rare incidence of Hb Barts hydrops foetalis in the Malays even though similar incidence of HbH disease as in the Chinese-Malaysian was observed. In the Chinese-Malaysian, the $--\alpha^{SEA}$ frequency was higher and consistent with Hb Barts hydrops foetalis syndrome present in the society. The 5.4% of $--\alpha^{SEA}$ in the Chinese-Malaysian was in accordance to 4.3% in Thailand, 4.5% in Hong Kong Chinese[36], 4.14% in Guangdong Province in Southern China[9] and 6.1% in Taiwanese Chinese[36] in which all are in the thalassaemic belt.

$--\alpha^{SEA}/--\alpha^{SEA}$ fetuses were with 10-20% Hb Portland 1 ($\zeta_2\gamma_2$) and the most is Hb Bart's (γ_4) which is a useless haemoglobin. Much lesser of Hb Portland 2 ($\zeta_2\beta_2$) was also observed and the foetus usually survive into third trimester of gestation. The foetus succumbs to hypoxia and heart failure either in utero or shortly after birth. Serious maternal complications in pregnancies are also reported and without medical care, half were estimated to die[46]. From our estimation, the number of pregnancies each year at risk of deletional Hb Barts hydrops

foetalis is 30 in the Malays, 250 in the Chinese-Malaysian, 640 of both and reduces to 600 on average. This number was not seen as cases may not get reported due to misdiagnosis as iso-immunization or heart failure or reported as foetal ascites[20, 22, 24-25, 46]. Hydrops foetalis without α thalassaemia is a common non-specific finding in a wide variety of foetal and maternal disorders[4]. Compared to the Chinese-Malaysian, the number of Malays and births/year is 2.3 (16 to 7 million) and 3 times more (0.3 to 0.1 million) respectively but the $--\alpha^{SEA}$ prevalence is 5 times lower (1.1% to 5.4%) thus justified the 8 times lesser (30 to 250) projected number of pregnancies at risk of deletional Hb Barts hydrops foetalis. The single deletion prevalence in the Malays is similar to the Chinese (4.3% to 3.2%) thus the projected number of pregnancies at risk of deletional HbH disease is similar (120 to 150) and these were consistent with present status. Mix marriages of both will increase the number of birth per year (0.4 million) and even out both prevalence (3.6%) thus the number of pregnancies at risk of deletional Hb Barts hydrops foetalis and HbH disease (640) is similar and increases. On average, the population is 28 million and the number of births/year increases to 0.49 million thus increases (669) the number of pregnancies at risk of deletional HbH disease as α^+ thalassaemia was detected in other ethnics but reduces (600) the number of pregnancies at risk of deletional Hb Barts hydrops foetalis as double deletion is ethnic specific.

In conclusion, several approaches are initiated to reduce new cases of pregnancies with Hb Barts hydrops foetalis syndrome and HbH disease. These included continuous screening at antenatal clinics and at risk population as in undergraduates as carried out. Any substantial increase in our population will be detected and the affected families and α^0 carriers known will be recorded. This enables high risk individuals in these families are informed of genetic counselling and diagnostic services to be provided when the need arises. This will further help to control and lower the present morbidity and mortality and consequently lessen health burden. Thus an economical, comprehensive and effective management of this problem in our country will be better achieved[47-48].

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Fault Tolerant Resource Management with Mutual Exclusion Algorithm for Mobile Adhoc Networks

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Abstract- In this paper we propose permission based Resource Management with Mutual Exclusion Algorithm for mobile ad-hoc networks (MANET). To reduce the message cost, the algorithm uses the DAG (Directed Acyclic Graph) technique, which enforces MUTEX only among the hosts currently competing for the critical section. We propose mechanisms to handle doze and disconnections of mobile hosts. The algorithm can also tolerate link or host failure we would like to propose an algorithm which is completely fault tolerant (covers temporary and permanent faults).It also has the mutual exclusion property for critical resource management to solve permission based algorithm. At the end we have proved the algorithm mobility is high and load level is low.

Index Terms- MANET, fault tolerant, DAG, safety, liveness, critical section, MUTEX

I. INTRODUCTION

In a mobile environment especially a MANET (mobile ad hoc networks), link failure (eg: single shielded) and host failure (eg: battery exhausted) occur frequently. Link failure may lead to message loss while host failure may result in accidental disconnections. Such failures are to be handled by mutual exclusion algorithm .Mutual exclusion provides access to shared critical resources (resource which may be accessible by a single process at a time). I would like to propose permission based solutions, with token based solutions, there exist a unique token in the system and only the node holding the token may access the critical section. To access the critical section using permission based solution[1] a process P_i is require to receive permission from a set of nodes $S=\{S_1, S_2, \dots, S_n\}$ [2]. Every node may communicate directly with its neighbors by exchanging messages and keep information about its neighbors. The communication delay is assumed to be finite but not bounded. In mobile adhoc network the topology of the network is arbitrary the topology may change with respect to the time. Any mutual exclusion algorithm have to ensure two properties: Safety[2] and Liveness[2].The *safety* property ensures that at most one process is executed in critical section at any time, while the *liveness* property ensures that requesting node will succeed to enter its critical section in finite time. Performance of mutual exclusion algorithm is to be evaluated by the number of messages generated per critical section entry, synchronization delay, and size of information control.

A solution to the MUTEX problem must satisfy the following three correctness properties

Mutual exclusion (safety): At most one host is allowed to enter the CS at any movement

Deadlock free (liveness): If any host is waiting for the CS, then in a finite time some host enters the CS

Starvation free (Fairness): If a host is waiting for the CS, then in a finite time the host enters the CS

II. BACKGROUND

The hosts are intermittently requesting to enter the critical section(CS) to gain exclusive access to shared resources. So many MUTEX algorithms for MANETs have been proposed in literature. logical ring [3] and considers the delay and distance between the nodes, to place them on different clusters It reduces the intra-cluster message and gives higher priority to local nodes in a cluster message and gives a higher priority to local nodes in a cluster, for entering the critical section [2]

This algorithm applies three extensions to Naimi-Trehel's algorithm[5], based on idea of limiting the propagation of requests between nodes of different clusters. Two different types of permissions have been used in existing permission-based algorithms [10]. The Ricart–Agrawala type permission, which is adopted in our proposed algorithm, is proposed by Ricart and Agrawala [21]. A host that wants to enter the CS, sends request messages to all other hosts. Requests for CS are assigned globally unique priorities, e.g.Lamport-like timestamps [10]. If the receiver of a request is not requesting the CS or its priority is lower, it grants permission to the requester immediately by sending a reply. Otherwise, it grants the permission after its own execution of the CS. The semantics of such permission is “as far as I am concerned, it is OK for you to enter the CS” [21]. A variation of the Ricart–Agrawala algorithm is proposed in [7], by remembering the recent history of the CS execution so as to reduce message cost. Singhal proposed a dynamic Rciart–Agrawala type algorithm [20], by dynamically changing the set of the hosts to which a requesting host needs to send request messages.

The algorithm proposed in, based on which our new algorithm is designed, is also Reicart–Agrawala type algorithm. It made a modification to the Ricart–Agrawala algorithm [10] so that, instead of involving all the hosts in the system, MUTEX is enforced only among the hosts which are currently competing for CS. On each host S_i , there are two sets. The Info_set_i includes the IDs of those hosts which S_i needs to inform when it requests to enter CS, and the Status_set_i includes the IDs of the hosts

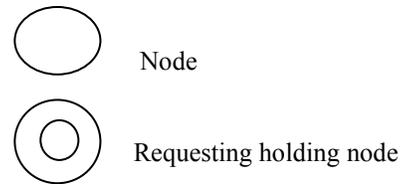
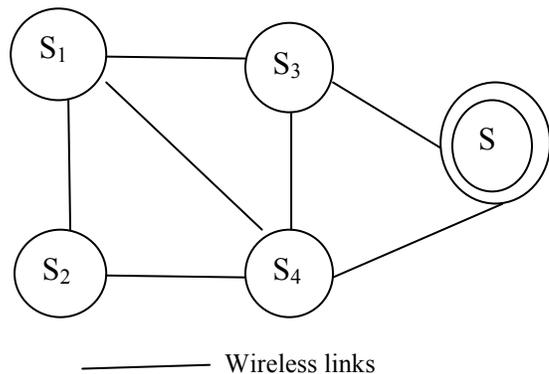
which would inform S_i when they request to enter CS. If a host wants to enter CS, it just sends request to the hosts in its Info set. When a host wants to disconnect from the network, it offloads the current values of its data structures to its serving MSS which would then act on behalf of the host in the execution of the algorithm.

III. PROPOSED ALGORITHM

We define the algorithm as a structure mapped on real topology of network which is represented by a Direct Acyclic Graph (DAG) of permission based pointers, maintaining the multiple paths leading to the node holding the permission. The algorithm is well suited to the resource management mutual exclusion because it requires nodes to keep information only about their immediate neighbors. Each node keeps information which is used to update the Direct Acyclic Graph structure in case of link failure in order to have always the permission holder node always the root of this tree. It is assumed that the permission cannot be lost and communicational links are bi directional. The nodes move with a limited speed so it cannot disconnect from the network during activation of the algorithm and during message transmission.

The algorithm starts by constructing a permission-based connected by the Directed Acyclic Graph [2], maintained by the permissions distributed over the nodes and directed to the permission holder. The permissions are REQUEST, REPLY and data structures. These permission are defined by the relative elevation of a node in relation to its neighboring nodes. The elevation of node i has the form (α, β, i) [5] and increase according to its distance from permission holder. The neighbors of each node are divided into two sets: a set of nodes connected to incoming links and a set of nodes is connected to outgoing links in order to maintain many routes to the nodes holding permission. When it receives the first request from one of its neighbors it maintains the request queue to store and order requests and also for backword path to reach the requesting node. Upon receiving permissions, the nodes which detect its own id is in the top of requesting queue becomes a "sink" by modifying its elevation to be lower than its neighbors and finally enters the CS. The request holder will always be the lowest in the DAG. So, the partial rearrangement of DAG is necessary.

During the execution of algorithm, some links may fail and/or may be created. In figure 1, part (a) depicts a simple mobile ad hoc network



a) Example of mobile ad hoc network

Incom_Lset_i: The array of the IDs of the hosts to which S_i needs to send request messages when it wants to enter CS.

Outgoing_Lset_j: The array of the IDs of the hosts which, upon requesting to access CS, would send the request messages to S_i . To ensure the correctness of the algorithm, the following conditions must be satisfied:

- (1) $\forall S_i :: \text{Incom_Lset}_i \cup \text{Outgoing_Lset}_j = S_i$;
 $\forall S_i :: \text{Incom_Lset}_i \cap \text{Outgoing_Lset}_j = \emptyset$;
- (2) $\forall S_i \forall S_j :: S_i \in \text{Incom_Lset}_i \Rightarrow S_j \in \text{Outgoing_Lset}_j$;

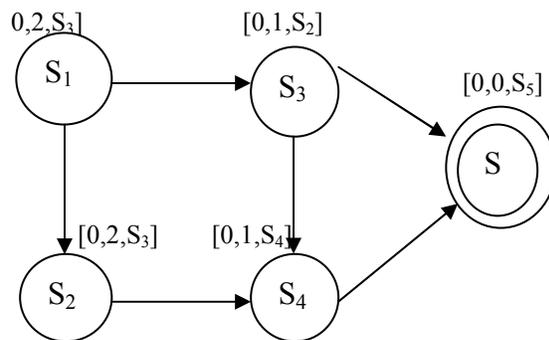
Obviously, condition

- (1) The host is guaranteed that host S_i knows the request status of all the other hosts and there is no redundancy information. Condition
- (2) The host is guaranteed the consistency among the sets of all MHs

REQUEST: the message sent from a host requesting CS to other hosts for getting their Permissions. The message contains the priority of the request (e.g. unique timestamp).

REPLY: the message sent by a receiver of a REQUEST to grant the permission of accessing CS

Initialization of the algorithm is



b) Initialization and request for node S_5

Vertex	Adjacency List
S_1	S_2, S_3
S_2	S_1, S_4, S_5
S_3	S_1, S_4
S_4	S_3, S_2, S_5
S_5	S_2, S_4

Observe that each host Graph G is represented an an adjacency structure Figure (b) shows the state of the network with logical links after initialization of the algorithm. Node S₅ is holding the request(has no out going links) and all other nodes point to host S₅. Along the paths to request holder node, the elevation decrease. Node S₁ issue a request for the over path_A which is enquired on S₄ request queue, and forwards the request to node S₂ which enquires the S₄ request. And finally S₃ S₃ enquires S₂ request

Linked representation of graph G, which maintains G in memory by using its adjacency lists, will normally contain two files (or set of records), one called the host file and other called Edge File, as follows

- a) **Host File:** Host file will contain the list of vertices of the graph G usually maintained by an array or by a linked list. Each record of the host file will have the form

HOST	NEXT-HOST	PTR	[REDACTED]
------	-----------	-----	------------

Here host will be the name of the host , NEXT-HOST points to the next host in the list of host in the host file when the host are maintained by a linked list. and PTR will point to the first element in the adjacency list of the host appearing in the Edge file. The shaded area indicates that there may be other information in the record corresponding to the host

- b) **Edge file:** The edge file contains the edges of the graph G. Specifically the edge file will contain all the adjacency lists of G where each list is maintained in memory by a linked list .Each record of the host file will correspond to a host in an adjacency list and hence, indirectly to an edge of G. The record is usually of the form

EDGE	ADJ	NEXT	[REDACTED]
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Here:

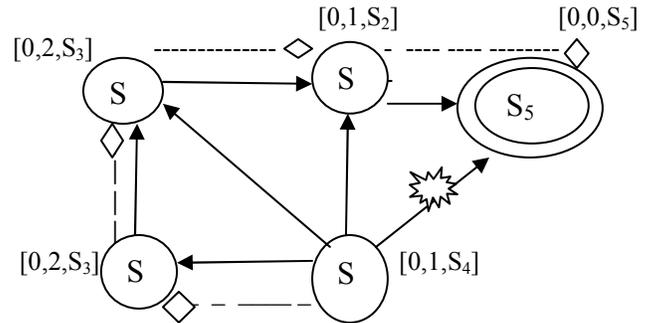
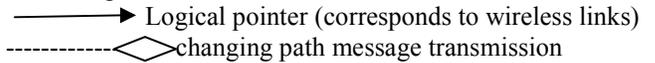
1. EDGE will be the name of the edge host (if it has one)
2. ADJ points location of the host in the host file
3. NEXT points to he location of the next host in the adjacency List

Figure c shows how the graph G in fig(c) may appear in memory. Here the hosts of G are maintained in memory by a linked using the variable START to point to the first host. (Alternatively, one could a linear array for list of hosts, and then Next-Host would not required.) Note that the field EDGE is not needed here since the edge have no name. Figure(c) also shows the adjacency list (S₅, S₄, S₁) of the host S₂.

The algorithm mutual exclusion is

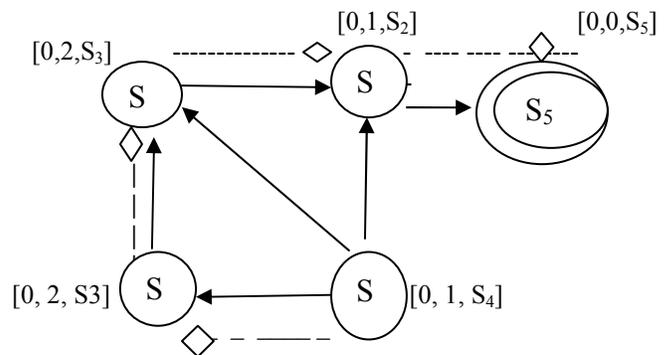
- Step 1: the all hosts are randomly allocated to the host file
- Step 2: any one of the host will become the start pointer
- Step 3: the next host will be allocated through the host file
- Step5: Based on the pointer the adjacency will be executed from

the left to right



d) Handling of link failure by the algorithm

When a node detects a failure of its last existing out going link, this results that there is no path to the request holder. Then, it invokes a partial rearrangement of the DAG using the method described in [3] which avoids formation of a cycle. Generally, the failure may happen at any time, the algorithm provides the mechanisms to ensure its normal functioning. In the example given in figure (c), the link S₄ –S₅ has failed due to an increase distance between hosts S₄ and S₅. The failed link is the last out going S₄ which does not hold the request .So , S₄ rearranges its links, changes its elevation that causes host S₂ to have no out going links. Also, after this, S₃ has any out going links. Consequently, the tree is partially rearranged.



c) Handling the messages

Figure (d) shows the result of permission grant from host S₅ to S₁ causing the elevation changes of the hosts S₂, S₁ and S₃ . These changes ensure that all logical links point from hosts with higher elevation towards hosts with lower elevation

When a new link is detected , the two adjacent nodes of this new link exchange messages to achieve the necessary modifications of outgoing and incoming links.The algorithm guarantee the safety and liveness property[6].

When a host wants to enter the CS, it first sets TS_{req} to the current time and sends the REQUEST message to all the hosts its Incoming_Lset. To tolerate link and host failures, a timeout is set in TO_{req} for each request message sent. The host then waits for a REPLY message a corresponding to each REQUEST message sent out. If the Incoming_Lset_i is empty. It enters CS immediately

When a host S_i receives a REQUEST message from another host S_j , it moves S_j to Incoming_Lset_i and records the request in Qreq. If S_i itself is not requesting for CS or its priority is lower, it sends a REPLY message to S_j and removes the record for S_j in Qreq. If S_j is in Outgoing_Lset_j before S_i receives the REQUEST from S_j and S_i is requesting for CS with a lower priority, S_i sends a REQUEST to S_j .

Upon receiving of a REPLY message from host S_j , S_i removes the timeout (in TReq) associated with S_j . If S_i finds no request from S_j in its Qreq, S_j is moved to Outgoing_Lset_i.

When the timeout for a REQUEST message expires, the requesting host sends a REQUEST again. When all the replies for REQUEST messages have been received, the requesting host enters CS. On exiting CS, a host sends REPLY messages to all hosts in its Incoming_Lset_i.

It is worth notice that when two hosts compete for the CS simultaneously, if we do not recorder the REQUEST separately in Qreq, it is possible that the host with the lower priority never gets a REPLY from the other host. This is caused by the non-FIFO property of communication channels.

Here any host failure the resource management algorithm is to first created the adjacency list the host file it allocates the all hosts randomly and then pointer will be generated any host having the malicious, it change the path the pointer points the new path again it construct the new DAG technique we follow The packet transmission path will be reconstructed fig(d) may appear in memory. Here the hosts of G are maintained in memory by a linked using the variable START to point to the first host. (Alternatively, one could a linear array for list of hosts, and then Next-Host would not required.) Note that the field Adjacency is not needed here since the edge have no name. Figure (d) also shows the adjacency list (S_5, S_4, S_1) of the host S_2 after the fault tolerance

IV. PERFORMANCE ANALYSIS

Number of messages per CS entry (MPCS):

The algorithm says that the average number of messages to enter into the CS is incoming link set and outgoing link set are equal. So the number of messages exchanged among the hosts for each execution of the CS.

Therefore the MPCS under low load condition is ;

$$MPCS_{low} = (n + n) / 2 = n$$

Under the high load condition $n/2$ hosts issues current request messages. Each request message the reply message must be send so half of these hosts are in outgoing link list is $n/4$. Therefore the MPCS under the high load condition is:

$$MPCS_{high} = (n/2 + n/4) = 3 * n/4$$

Table1: The table shows #MPCS the high and low load

No. Of Hosts	#MPCS-LOW	#MPCS-HIGH
0	0	0
20	20	7.5
40	40	15
60	60	22.5
80	80	37.5

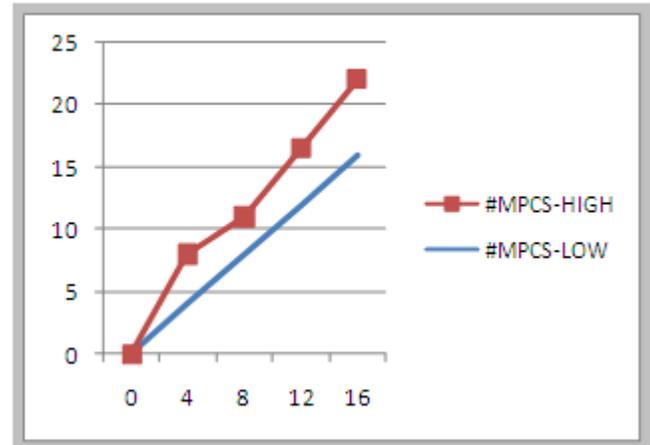


Fig. 1: The graph shows the #MPCS at high and low load

Table 2: The table shows #MPCS the high and low load

No. Of Hosts	#MPCS-LOW	#MPCS-HIGH
0	0	0
4	4	4
8	8	3
12	12	3.5
16	16	6

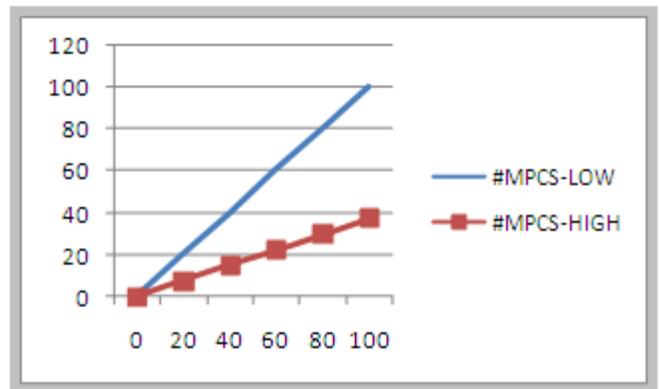


Fig. 2: The graph shows the #MPCS at high and low load

Synchronization delay (SD): The number of sequential messages exchanged after a host leaves the CS and before the next host enters the CS. Under low load conditions the synchronization delay is meaningless, because it measures the interval between the arrival of two requests. Under the high load conditions, when host S_i exits the CS, it will send REPLY messages to all the hosts in its Incoming_Lset, i.e. that is the host that have pending requests at the earliest time will enter the critical section immediately after it receives the REPLY from S_i . Therefore, the Synchronization delay under the high load condition is

$$SD_{high} = 1, \text{ i.e. one message transferring time.}$$

Response time: The time interval that a host waits to enter the CS after its request for CS arrives. Under low-load conditions,

most of the time, no more than one host competes for the CS. When a host wants to enter CS, it sends REQUEST messages to the hosts in its Incoming_Lset and then all these hosts send REPLY immediately after they receive the REQUEST. Therefore the response time under the low-load level is:

$RT_{low} = 2$, i.e. twice of the time of transferring one message.

Under high-load conditions, there is always a pending request at each host. The hosts are in the waiting chain with respect to the timestamps of their requests, i.e. the time when they issue requests for CS. A host in the chain can enter CS after its predecessor exits, so each host needs to wait for the hosts whose requests are earlier. On average, each host has to wait for $n/2$ such hosts. Assuming the average time of an execution of CS is A, the response time under high-load conditions is

$$RT_{high} = (A + SD_{high}) * n/2 = (A+1) * n/2$$

Table 3: shows RT_{high} at different average time and different no of hosts

Average time	No. of host	RT_{high}
A		
2	5	7.5
3	10	20
4	15	37.5
5	20	60

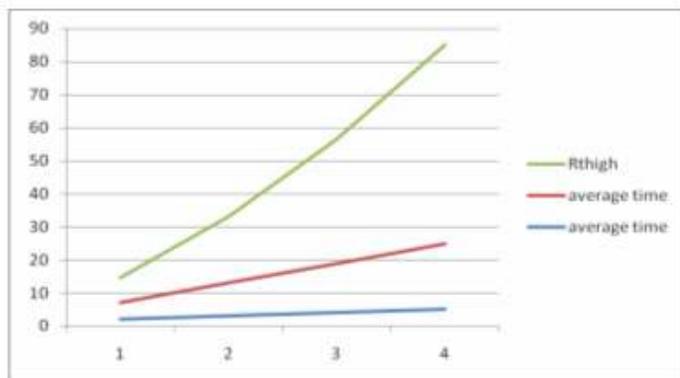


Fig. 4: The graph shows the RT_{high} at different average time and different no of hosts

V. CONCLUSION

In mobile ad hoc network we follow with explanation of fault tolerant happening in Mutual Exclusion algorithm with specific logical topology is DAG[9] for reduce the number of message are exchanged .I designed a mechanism using timeout to tolerate intermittent and recoverable link/host failure which offer occur in MANETs. The algorithm can also handle dozes and disconnections of hosts .The performance analysis show that the algorithm performs better low load level and high mobility level. The algorithm can save much more communication cost. The DAG technique will follow the fault tolerant technique.

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A Study on Consumer Perception about their Exiting Mobile-Connections

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Abstract- The purpose of this study was to determine the consumer perception about their exiting mobile connections. For survey, consumers of **Jhajjar city** of Haryana State are taken and measure the effects on consumers' purchasing behaviour of different services and schemes on mobile connections. The aim of this research is to determine and evaluate consumer satisfaction and the impact of consumer satisfaction on the buyer behaviour of consumers. A purely technical segmentation of the mobile phone market is no longer appropriate. Today, usage benefits are more important than technological performance and the generalization of mobile phones has complicated the market typology. Consumer behaviour is becoming more relevant than technology when it comes to understanding future evolution in the mobile phone market. Consumer's satisfaction of his/her mobile connections plays an important role for a service provider for making appropriate strategies to increase satisfaction level of consumers. A face-to-face interview survey is conducted on 100 consumers of Jhajjar city of Haryana state and who are selected with random sampling. Data are analyzed by using Fisher's Exact Test SPSS 19.0 for window is employed for the scale measurement.

Index Terms- consumer perception, technical segmentation, market typology, fisher's exact test, consumer's satisfaction

I. INTRODUCTION

Exchange of information becomes the necessity of life to a common man. In the modern world an individual tends to communicate anything to everything right from the place where he/she stands. Even while riding vehicle he / she wants to communicate within a fraction of second at quick speed with clear voice, without any disturbance. Like line crossing, out of order, etc. most of which lack in the connection given by the department of telecommunication. Though Telecommunication industry has its origin in the recent past and the growth has been excellent. Consumer feedback is providing the market reflections to the marketer. This enables them to gain awareness about their market performance, consumer preference and their satisfaction level towards the services offered by them. The study at hand will throw light on the customer satisfaction status on various service offerings offered by different mobile connections service providers.

• Consumer Preferences

Consumer preferences is used primarily to mean to select an option that has the greatest anticipated value among a number of

options by the consumer in order to satisfy his/her needs or desires. Preferences indicate choices among neutral or more valued options available. The preference of the consumer is the result of their behaviour they show during searching, purchasing and disposing the products.

• Consumer Satisfaction

Every human being is a consumer of different products. If there is no consumer, there is no business. Therefore, consumer satisfaction is very important to every business person. The consumer satisfaction after purchase depends on the product performance in relation to his/her expectations. Philip Kotler (2008) observed that satisfaction is a person's feelings of pressure or disappointment resulting from product's perceived performance (outcome) in relation to his or her expectations. Consumer satisfaction is the level of a person's felt state resulting from comparing a product's perceived performance (outcome) in relation to the person's expectations. This satisfaction level is a function of difference between perceived performance and expectations. If the product's performance exceeds expectation, the customer is highly satisfied or delighted. If the performance matches the expectations, the customer is satisfied. If the product's performance falls short of expectations, the customer is dissatisfied.

Consumer satisfaction or dissatisfaction is the feeling derived by the consumer when he compares the service's actual performance with the performance that he expects out of it. Consumers make their expectations from the service quality, service, delivery, communications, past experiences and references. These all are to be judged correctly by the management so that their perceptions match with consumer expectations. If any of these factors are wrongly interpreted then the expected level of consumer satisfaction cannot be reached.

II. OBJECTIVES OF THE STUDY

The objectives for the research problem in hand are as follows:

1. To know about the awareness level of consumers regarding their mobile connections service provider.
2. To ascertain the services that consumer prefers in selecting a particular mobile connections service provider.
3. To study the consumers' satisfaction level towards various services offered by mobile connections service providers.
4. To assess the problems faced by the mobile phone users regarding their respective mobile connections service providers.

5. To understand and offer valuable suggestions to improve the services of mobile connections service providers.

III. DEMOGRAPHIC PROFILE

Table 1-Composition of Respondents on the Basis of Gender

Sr. No.	Gender	No. of Respondents	% of Respondents
1.	Male	79	79
2.	Female	21	21
Total		100	100

Table 2- Composition of Respondents on the Basis of Marital Status

Sr. No.	Marital Status	No. of Respondents	% of Respondents
1.	Unmarried	34	34
2.	Married	66	66
Total		100	100

Table 3 - Composition of Respondents on the Basis of Age Group

Sr. No.	Age Group	No. of Respondents	% of Respondents
1.	Below-25	37	37
2.	25-35	34	34
3.	36-55	26	26
4.	Above-55	3	3
Total		100	100

Table 4- Composition of Respondents on the Basis of Income Group

Sr. No.	Income Group	No. of Respondents	% of Respondents
1.	Below-10,000	52	52
2.	10,000-25,000	11	11
3.	25,001-40,000	11	11
4.	Over 40,000	26	26
Total		100	100

Table 5 -Composition of Respondents on the Basis of Qualification

Sr. No.	Qualification	No. of Respondents	% of Respondents
1.	Under Graduation	58	58
2.	Graduation	28	28
3.	Post-Graduation	14	14
4.	Professional Degree	-	0
Total		100	100

IV. RESEARCH METHODOOGY

Primary Data Collected**Table 6 -Consumer Prefrence Towards Cell Phone Service Provider**

Sr. No.	Name of cellular service provider	No. of Respondents	% of Respondents
1.	AIRTEL	13	13%
2.	TATA DOCOMO	4	4%
3.	IDEA	27	27%
4.	BSNL	14	14%
5.	TATA INDICOM	4	4%
6.	VODAFONE	38	38%
TOTAL		100	100%

Table 7-Showing Various Factors Inducing to Purchase the Mobile

Sr. No.	Influencing Factor	No. of Respondents	% of Respondents
1.	Family Members	42	42%
2.	Neighbours	6	6%
3.	Relatives	7	7%
4.	Friends	30	30%
5.	Advertisement	5	5%
6.	Dealer	3	3%
7.	Others	7	7%
Total		100	100%

Table 8 - Composition of Respondents on the Basis of Purpose of Purchase of the Cell Connections

Sr. No.	Influencing Factor	No. of Respondents	% of Respondents
1.	Business	18	18%
2.	Personal	82	82%
Total		100	100%

Table 9 -Consumer preferences towards Cell Phone Service Provider on the Basis of Scheme

Sr. No.	Service Provider	Prepaid Scheme		Post paid Scheme		Total	
		Total No.	%	Total No.	%	Total No.	%
1.	Airtel	11	12.36	2	18.18	13	13
2.	Tata Docomo	4	4.4	0	0	4	4
3.	Idea	26	29.21	1	9.1	27	27
4.	BSNL	11	12.37	3	27.27	14	14
5.	Tata Indicom	4	4.4	0	0	4	4
6.	Vodafone	33	37.1	5	45.5	38	38
Total		89		11	100	100	

Table 10 -Influencing Factors to Purchase the Cell Phone Service

Sr. No.	Influencing Factors	No. of Respondents	% of Respondents
1.	Brand Image	27	27%
2.	Availability	30	30%
3.	Customer care Service	11	11%
4.	Service charges	13	13%
5.	Price	19	19%
Total		100	100%

Table 11 – Consumers Attitude towards the Importance of Having a Mobile Phone Connection

Sr. No.	Attributes	No. of Respondents	% of Respondents
1.	Necessity	68	68%
2.	Status	10	10%
3.	Luxury	10	10%
4.	Compulsion	12	12%
Total		100	100%

Table 12 -Composition of Respondents on the Basis of Usage Purpose

Sr. No.	Usage Purpose	No. of Respondents	% of Respondents
1.	Incoming	12	12
2.	Outgoing	10	10
3.	Both	71	71
4.	Messaging	7	7
Total		100	100

Table 13 -Consumer satisfaction Level on the Basis of Price

Sr. no.	Service provider	Highly Satisfied		Satisfied		Not Satisfied		Total	
		Total No.	%	Total No.	%	Total No.	%	Total No.	%
1.	AIRTEL	6	13.3	7	13.5	-	0	13	13
2.	DOCOMO	2	4.4	2	3.85	-	0	4	4
3.	IDEA	12	26.7	14	27	1		27	27
4.	BSNL	6	13.3	8	15.4	-	0	14	14
5.	INDICOM	1	2.23	3	5.8	-	0	4	4
6.	VODAFONE	18	40	18	34.5	2		38	38
TOTAL		45		52		3		100	

Table 14 -Consumer Satisfaction Level on the Basis of Performance of Service Provider

Sr. no.	Service Provider	Highly Satisfied		Satisfied		Not Satisfied		Total	
		Total No.	%	Total No.	%	Total No.	%	Total No.	%
1.	AIRTEL	3	8.33	10	16.4	-	0	13	13
2.	DOCOMO	-	0	4	6.56	-	0	4	4
3.	IDEA	11	30.6	16	26.2	-	0	27	27
4.	BSNL	3	8.33	9	14.8	2	66.7	14	14
5.	INDICOM	2	5.6	2	3.3	-	0	4	4
6.	VODAFONE	17	47.2	20	32.8	1	33.3	38	38
TOTAL		36		61		3		100	

Table 15 -Consumer Satisfaction Level on the Basis of Performance of Schemes

Sr. no.	Service Provider	Highly Satisfied		Satisfied		Not Satisfied		Total	
		Total No.	%	Total No.	%	Total No.	%	Total No.	%
1.	AIRTEL	3	10	8	13.6	2	18.2	13	13
2.	DOCOMO	2	6.67	2	3.4	-	0	4	4
3.	IDEA	8	26.7	15	25.4	4	36.4	27	27
4.	BSNL	3	10	8	13.6	3	27.3	14	14
5.	INDICOM	1	3.33	2	3.4	1	3.4	4	4
6.	VODAFONE	13	43.3	24	40.7	1	3.4	38	38
TOTAL		30		59		11		100	

Table 16 -Consumer Satisfaction Level on the Basis of Periodical Offers

Sr. no.	Service Provider	Highly Satisfied		Satisfied		Not Satisfied		Total	
		Total No.	%	Total No.	%	Total No.	%	Total No.	%
1.	AIRTEL	7	26	5	10.6	1	3.9	13	13
2.	DOCOMO	1	3.7	3	6.4	-	0	4	4
3.	IDEA	6	22.2	15	31.9	6	23.1	27	27
4.	BSNL	3	11.1	6	12.8	5	19.2	14	14
5.	INDICOM	1	3.7	2	4.3	1	3.9	4	4
6.	VODAFONE	9	33.3	16	34.1	13	50	38	38
TOTAL		27	100	47	100	26	100	100	

Table 17 -Consumer Satisfaction Level on the Basis of Outgoing Call Charges

Sr. no.	Service Provider	Highly Satisfied		Satisfied		Not Satisfied		Total	
		Total No.	%	Total No.	%	Total No.	%	Total No.	%
1.	AIRTEL	9	24.3	4	7.1	-	0	13	13
2.	DOCOMO	2	5.5	2	3.2	-	0	4	4
3.	IDEA	7	19	19	34	1	14.3	27	27

4.	BSNL	7	19	6	10.7	1	14.3	14	14
5.	INDICOM	1	2.7	3	5.4	-	0	4	4
6.	VODAFONE	11	29.7	22	39.3	5	71.4	38	38
TOTAL		37		56		7		100	100

V. DEVELOPMENT OF HYPOTHESIS

The study attempts to compare and analyse the satisfaction factors of exiting mobile connection of consumers. Following Hypothesis are tested:

- H₁:** The association between the gender of the respondents and their level of satisfaction towards their exiting mobile connection is not significant. .
- H₂:** The association between the age group of the respondents and their level of satisfaction towards their exiting mobile connection is not significant. .
- H₃:** The association between the experience of the respondents and their level of satisfaction towards their exiting mobile connection is not significant.
- H₄:** The association between the monthly income of the respondents and their level of satisfaction towards their exiting mobile connection is not significant.

- H₅:** The association between the qualification of the respondents and their level of satisfaction towards their exiting mobile connection is not significant.

VI. DATA ANALYSIS & INTERPRETATION

Fisher's Exact Test Analysis

• Gender of the Respondents and the Level of Satisfaction Towards their exiting mobile connection

The gender-wise classification of the sample respondents and their level of satisfaction towards their exiting mobile connection are given in Table18. In order to find out the association between the gender of the respondents and their level of satisfaction towards their exiting mobile connection, the fisher's exact test is applied

Table18.-Gender and the Level of Satisfaction

Gender	Totally Dissatisfied	Somewhat Dissatisfied	Somewhat Satisfied	Totally Satisfied	Total
Male	3(4.6)	5(5.4)	26(26.2)	43(40.8)	77
Female	3(1.4)	2(1.6)	8(7.8)	10(12.2)	23
Total	6	7	34	53	100

Source: Survey data

Figures given in the brackets represent the Expected Frequency)

Table 19 - Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.109 ^a	3	.375	.377		
Likelihood Ratio	2.725	3	.436	.534		
Fisher's Exact Test	3.289			.317		
Linear-by-Linear Association	2.614 ^b	1	.106	.126	.074	.030
N of Valid Cases	100					

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 1.38.

b. The standardized statistic is -1.617.

Null hypothesis: The association between the gender of the respondents and their level of satisfaction towards their exiting mobile connection is not significant.

As the calculated Chi-square value (**3.289**) is less than the table value (**7.815**) at 5% level of significance for 3 degrees of freedom, the null hypothesis is accepted and it could be concluded that the association between the gender of the respondents and their level of satisfaction towards their exiting mobile connection is not significant.

- Marital Status of the Respondents and the Level of Satisfaction Towards their mobile connection**

The marital status of the sample respondents and their level of satisfaction towards their exiting mobile connection are given in Table20. In order to find out the association between the marital status of the respondents and their level of satisfaction towards the mobile connection, the fisher's exact test is applied.

Null hypothesis: The association between the marital status of the respondents and their level of satisfaction towards their exiting mobile connection is not significant.

As the calculated Chi-square value (**7.899**) is greater than the table value (**7.815**) at 5% level of significance for 3 degrees of freedom, the null hypothesis is rejected and it could be concluded that the association between the marital status of the respondents and their level of satisfaction towards their exiting mobile connection is significant.

Table 20 -Marital Status and the Level of Satisfaction

Marital Status	Totally Dissatisfied	Somewhat Dissatisfied	Somewhat Satisfied	Totally Satisfied	Total
Married	0(2.0)	5(4.6)	28(23.8)	33(35.6)	66
Unmarried	3(1.0)	2(2.4)	8(12.2)	21(18.4)	34
Total	3	7	36	54	100

Source: Survey data

Figures given in the brackets represent the Expected Frequency)

Table 21 -Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	8.716 ^a	3	.033	.027		
Likelihood Ratio	9.522	3	.023	.029		
Fisher's Exact Test	7.899			.033		
Linear-by-Linear Association	.069 ^b	1	.792	.890	.446	.106
N of Valid Cases	100					

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is 1.02.

b. The standardized statistic is -.263.

- **Age Group of the Respondents and the Level of Satisfaction Towards their exiting mobile connections**

The age-wise classification of the sample respondents and their level of satisfaction towards their exiting mobile connection are given in Table22. In order to find out the association between the gender of the respondents and their level of satisfaction towards their exiting mobile connections, the Chi-square test is applied.

Null hypothesis: The association between the age group of the respondents and their level of satisfaction towards their exiting mobile connection is not significant. As the calculated Chi-square value (**7.899**) is less than the table value (**13.512**) at 5% level of significance for 9 degrees of freedom, the null hypothesis is accepted and it could be concluded that the association between the age group of the respondents and their level of satisfaction towards their exiting mobile connection is not significant.

Table 22 -Age Group and the Level of Satisfaction

Age Group	Totally Dissatisfied	Somewhat Dissatisfied	Somewhat Satisfied	Totally Satisfied	Total
Below-25	3(1.1)	1(2.6)	13(13.3)	20(20.0)	37
25-35	0(1.0)	5(2.4)	11(12.2)	18(18.4)	34
36-55	0(.8)	0(1.8)	12(9.4)	14(14.0)	26
Above-55	0(.1)	1(.2)	0(1.1)	2(1.6)	3
Total	3	7	36	54	100

Source: Survey data

Figures given in the brackets represent the Expected Frequency)

Table 23 -Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	15.815 ^a	9	.071	.089		
Likelihood Ratio	17.678	9	.039	.041		
Fisher's Exact Test	13.512			.086		
Linear-by-Linear Association	.601 ^b	1	.438	.448	.245	.046
N of Valid Cases	100					

a. 10 cells (62.5%) have expected count less than 5. The minimum expected count is .09

b. The standardized statistic is .775.

- **According to the Income level of the Respondents and the Level of Satisfaction Towards their exiting mobile connections**

The Income -wise classification of the sample respondents and their level of satisfaction towards their exiting mobile connection are given in Table24. In order to find out the association between the Income of the respondents and their level of satisfaction towards their exiting mobile connections, the Chi-square test is applied.

Null hypothesis: The association between the Income of the respondents and their level of satisfaction towards their exiting mobile connection is not significant. As the calculated Chi-square value (**7.899**) is greater than the table value (**7.292**) at 5% level of significance for 9 degrees of freedom, the null

hypothesis is rejected and it could be concluded that the association between the income of the respondents and their level of satisfaction towards their exiting mobile connection is significant.

Table 24 -Age Group and the Level of Satisfaction

Income Level	Totally Dissatisfied	Somewhat Dissatisfied	Somewhat Satisfied	Totally Satisfied	Total
Below-10,000	2(1.5)	3(3.6)	21(18.4)	25(27.5)	51
10,000-25,000	0(.3)	2(.8)	1(4.0)	8(5.9)	11
25,001-40,000	0(.3)	1(.8)	4(4.0)	6(5.9)	11
Over 40,000	1(.8)	1(1.9)	10(9.7)	15(14.6)	27
Total	3	7	36	54	100

Source: Survey data

(Figures given in the brackets represent the Expected Frequency)

Table 25 – Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	6.955 ^a	9	.642	.648		
Likelihood Ratio	7.954	9	.539	.657		.036
Fisher's Exact Test	7.292			.547		
Linear-by-Linear Association	.290 ^b	1	.590	.613	.318	
N of Valid Cases	100					

a. 10 cells (62.5%) have expected count less than 5. The minimum expected count is .33.

b. The standardized statistic is .539.

Qualification of the Respondents and the Level of Satisfaction Towards their exiting mobile connections

The Qualification-wise classification of the sample respondents and their level of satisfaction towards their exiting mobile connection are given in Table26. In order to find out the association between the qualification of the respondents and their

level of satisfaction towards their exiting mobile connections, the Chi-square test is applied.

Null hypothesis: The association between the qualification of the respondents and their level of satisfaction towards their exiting mobile connection is not significant. As the calculated Chi-square value (**7.899**) is less than the table value (**13.512**) at 5% level of significance for 9 degrees of freedom, the null hypothesis is accepted and it could be concluded that the association between the qualification of the respondents and their level of satisfaction towards their exiting mobile connection is not significant.

Table 26 -Qualification and the Level of Satisfaction

Qualification	Totally Dissatisfied	Somewhat Dissatisfied	Somewhat Satisfied	Totally Satisfied	Total
Undergraduate	3(1.7)	4(4.1)	20(20.9)	31(31.3)	58
Graduate	0(.8)	2(1.9)	11(9.7)	14(14.6)	27
Post Graduate	0(.4)	1(1.0)	5(5.0)	8(7.6)	14
Professional Degree	0(.0)	0(.1)	0(.4)	1(.5)	1
Total	3	7	36	54	100

Source: Survey data

(Figures given in the brackets represent the Expected Frequency)

Table 27 -Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	3.260 ^a	9	.953	.949		
Likelihood Ratio	4.700	9	.860	.895		

Fisher's Exact Test	5.408			.983		
Linear-by-Linear Association	.823 ^b	1	.364	.390	.210	.048
N of Valid Cases	100					

a. 10 cells (62.5%) have expected count less than 5. The minimum expected count is .03.

b. The standardized statistic is .907.

VII. CONCLUSION

1. The association between the gender of the respondents and their level of satisfaction towards their exiting mobile connection is not significant. .
2. The association between the age group of the respondents and their level of satisfaction towards their exiting mobile connection is not significant. .
3. The association between the experience of the respondents and their level of satisfaction towards their exiting mobile connection is not significant.
4. The association between the monthly income of the respondents and their level of satisfaction towards their exiting mobile connection is significant.
5. The association between the qualification of the respondents and their level of satisfaction towards their exiting mobile connection is not significant.

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Green Routing for Wireless Sensor and Actor Networks

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Abstract- In Wireless Sensor & Actor Network (WSAN), sensors are used to sense data from environment and send this to the actor for taking appropriate action. In semi automated architecture data is forwarded to the actor and then to Sink. So the position of actor from sink is important also how many actors to be in active mode is considerable factor in minimizing energy consumption. There are many protocols and algorithm which are trying to minimize energy consumption. But our proposed algorithm OPT is efficient than existing one. Researchers have proposed to use WSAN for road surveillance which is called as Road Sensor and Actor Network (RSAN). This OPT algorithm specifically designed for RSAN. In RSAN to choose set of working actor is a one of parameter to minimize energy consumption. This is proved with simulation result.

Index Terms- wireless sensor and actor network, LEACH, PEGASIS, TREEPSI

I. INTRODUCTION

Nowadays wireless communications is becoming a measure of the fastest growing segment of the communications industry. It attracts the attention of the media and the public. Also wireless local area networks currently supplement or replace wired networks in many homes, businesses, and campuses and applications. Many new things including wireless sensor networks, automated highways and factories, smart homes and appliances, and remote telemedicine are emerging from research ideas to concrete systems [12].

The sensor network has a long history and many kind of sensor devices are used in various real life applications. Wireless sensor network has different application like collection of data of forest temperature, bioinformatics, water contamination, traffic control, telecommunication etc. Sensor network basically consist of large amount of sensor nodes which are low battery power and having less processing capability are deployed to large physical area to monitor and detect the real time environmental activities. But due to limitation of sensor node there exist new kind of network which is called as Wireless Sensor and Actor Network .As its name suggest there exists sensor node along with actor node which is more powerful in processing and long range communication. In such type of network, actor takes intelligent decision from data which has been gathered from sensor nodes. It is used in application like habitat monitoring, health monitoring, traffic, weather, pollution etc. In all such real life application sensor nodes generate large amount of data which is used for taking appropriate action by

actor on this condition. [11].Rest of paper is organised as Section II related work of existing algorithm and protocol, Section III system model, Section IV performance evaluation, Section V conclusion.

II. RELATED WORK

Depending on the application, the network should rapidly respond to critical situation in which input is coming from sensor unit and appropriate control action will be taken by the actor nodes without any delay. In order to prolong the lifetime of sensor networks, energy saving is done using sleep scheduling algorithms. There are many algorithms to minimize the energy consumption in WSN. They are Flooding, PEGASIS, LEACH, TREEPSI, TEEN, ADCP, Gossiping, Directed Diffusion, and ELRS. Though these existing methods save energy, they lead to a large increase in end-to-end latency, which affects the efficiency of the sensor-actor network which requires fast control action.

A. LEACH (Low is Energy Adaptive Cluster Head algorithm)

In LEACH there is a formation of cluster of neighbouring nodes. There is one cluster head (CH) who will collect sensed data from other nodes. Thus two CH communicates with one another and send fused information to the sink [8].

B. PEGASIS

It is chain based protocol in which each node communicates only with a close neighbour and takes turn to transmit to the sink [8].

C. Flooding

In this, as name suggest, the sink flood inquiries to each sensor node and each sensor node flood event information to the sink [7].

D. Gossiping

It is a derivation of flooding in which node don't flood but send only incoming packet to randomly selected neighbour. But Flooding and Gossiping can lead unbalanced energy consumption problem [7].

E. Directed Diffusion

In this, the sink sends interest to the nodes. Then this node stores this interest entry in cache. This entry contains timestamp field and several gradient fields. When source has data for interest it sends data along interest's gradient path then sink refresh and reinforce the interest when it receives data from the source [7].

F. ELRS (Energy Efficient Layered Routing Scheme)

In this, communication will be done in layers. In which actor can communicate with actor and sink directly and sensor can communicate sensor and actor hop by hop [7].

G. TREEPSI (Tree based Energy Efficient Protocol for Sensor Information)

In this, there is a construction of tree from root node i.e. ith node which is placed at random location in the field. Construct hierarchical path of nodes. There are two different ways to collect information from field. with

1) Root will initialise data gathering by sending small control packet to child using standard tree traversal algorithm.

2) All leaf nodes will start to send sensed information towards parent nodes. Then this parent node fuse the received data with own and forward to parent and continues till root node receives the resultant data [8].

H. ADCP(Actor Directed Clustering Protocol)

In ADCP, the main objective is to achieve reliable and efficient communication with low energy consumption. It is based on two parameters like position of node with respect to actor and remaining energy of node [6].

I. SEC (Sleep schedule of nodes for fast and Efficient Control)

SEC protocol with a semi-automated architecture requires minimum latency. During normal operation, the sensor nodes sense the parameters periodically using a static schedule. If the value of any parameter exceeds the set point the sink calculates the error signal and the sleep schedule is changed dynamically to activate the actor nodes in the area of interest. The corresponding sensor-actor nodes are made completely active till the error signal becomes zero, i.e. till the parameters are brought within the set point. Energy management is concerned with set of nodes which should be turned on/off and when, for the purpose of energy saving and network longevity. Several MAC protocols have been proposed to reduce the energy consumption by sleep planning methods in order to increase the lifetime of sensor networks. TRAMA is a scheduling protocol that determines which node can transmit at a particular slot based on the traffic information. However, TDMA-based protocols are complex to maintain in a multi-hop network, due to their timing synchronization. When no event occurs, the nodes follow a static sleep schedule. In static schedule, Regular data collection is done using the sensor nodes periodically and the actor nodes are completely off. To control the parameters, the sensed data are compared with the reference input to find the error signal. Control action should be initiated immediately by activating the actor nodes till the error becomes zero. In dynamic schedule, When an event occurs i.e. if any parameter varies from the set point, the schedule of the sensor-actor nodes is changed dynamically based on the time of the event detection and they are kept active till the actor nodes vary the parameter by their control action i.e. till the error signal becomes zero. Sensor nodes have limited supply of power and energy savings should be done to improve the network lifetime. In addition energy consumption for SEC is based on the occurrence of an event. Energy consumption for the three protocols is calculated based on the hop length, packet transmission time, and active period of the nodes as follows: *In S-MAC:*

$$E(t) = E_{active} + (E_{tx} * h)$$

In SEC:

Sensor nodes:

$$E(t) = E_{active} + (E_{tx} * h)$$

Actor nodes:

When there is no event:

$$E(t) = 0$$

When there is an event:

$$E(t) = E(\text{Error})$$

Here, E(Error) denotes the total energy consumption to perform an action by an actor node for Error amount of time. In S-MAC, energy consumption is less because of its periodic sleep. In SEC, energy consumption is less because the sensor/actor nodes are made active only at the data/control packet arrival time and the event occurrence time i.e., when an error is present. Total energy consumption can be calculated based on the number of packets sent by each node and the number of nodes.

$$E = n * P(n)$$

Where E=energy consumption

n=number of nodes

P(n)= Total no. of packets sent by node [10]

Now a days researcher have proposed to use WSN for road surveillance which is called as Road Sensor and Actor network. There are many applications like vehicle tracking, driver warning, and incident detection.

III. SYSTEM MODEL

In RSAN (Road sensor and Actor Network), sensor detects an event and send their data to nearby actors. In this model assumption is actor is capable of sensing and performing long range communication. Each actor has two states: working or non-working. If actor is in working state it can sense event i.e. to collect data from sensor and pass that information to the sink. If actor is in non-working state then it acts like a normal sensor i.e. only to sense the event.

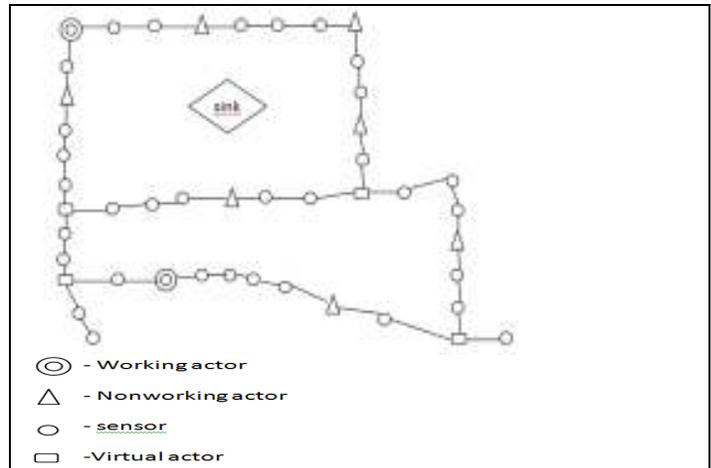


Fig. 1 RSAN

To simplify the system, we assume imaginary actors. These type of actors are deployed at intersection of the road and they are always in working condition. These are shown by double circle in the fig.1. The objective to keep imaginary actors at road intersection is that, its a section of road where traffic is more during busy hours and need careful surveillance. In the real application if such imaginary node is not deployed then this actor will redirect the workload to nearby real actor in the area. Thus imaginary actor divides road network into segment. As we have assumed the imaginary actors stay always in working state, we need to minimize only sensor-actor communication in each road segment.

Consider data communication between two imaginary actors in road segment which is shown in fig.2. Complete Work is Divided into 4 steps

- Find Working Actor Set (WAS)
- Finding and reducing Network Comm. Cost
- Problem of choosing the optimal working actors to minimize total CC
- Solutions to above Problem is by OPT algorithm

a) Find Working Actor Set (WAS)

Let A=no. of actors $1 < a_m < n$

S = no. of nodes/Sensors

$S = \{1,2,3, \dots, n\}$

$A = \{a_1, a_2, a_3, \dots, a_m\}$

$w_k =$ Working actors from 1 to k

Thus $w_k \subseteq A$

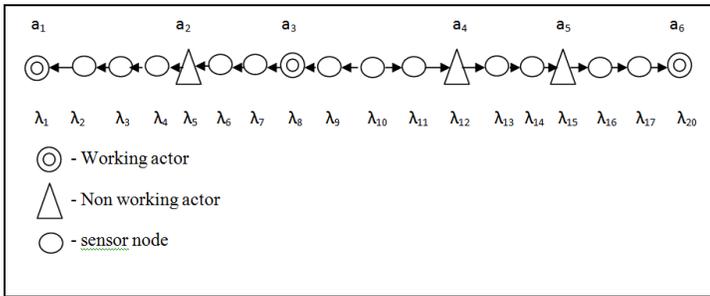


Fig. 2 data communication at road segment

b) Finding and reducing Network Communication Cost

In RSAN, there are three main components in the network. They are as follows

- 1) Sensor – sensor communication
- 2) Sensor – actor communication
- 3) Actor – sink communication

In the analysis assume that energy cost for unit data transmission in each hop of sensor-sensor and sensor-actor communication is same which is denoted as ξ .

$\xi =$ Cost for unit data transfer in each hop of S-S or S-A

$C_{as} \propto R_s * n$

R=data generation rate

n=no. of hops between them

$C_{as} =$ CC of Actor collection from Sensor

$\xi_{ai} =$ energy cost for Actor to Sink

$m_{ai} =$ energy cost for keeping actor in working state

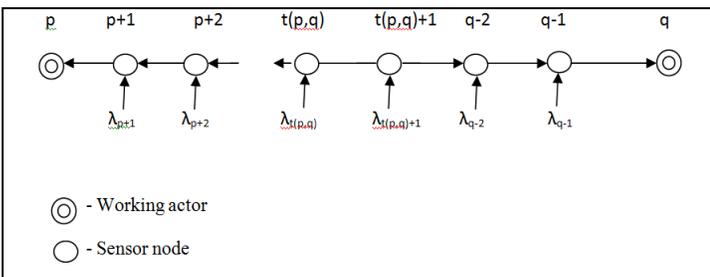


Fig. 3 communication between 2 working actors

In fig. 3 p and q are working actors and there is no working actor present between them so, sensed data will be sent to either p or q. Now consider node i ($p < i < q$) then its communication cost to p

and q is given by $|i-p| \lambda_i \xi + \lambda_i \xi_p$ and $|i-q| \lambda_i \xi + \lambda_i \xi_q$. to minimize cost, if i satisfies $|i-p| \lambda_i \xi + \lambda_i \xi_p \leq |i-q| \lambda_i \xi + \lambda_i \xi_q$ i.e. $i \leq (1/2)(p+q - (\xi_p - \xi_q / \xi))$. Data from i will be sent to p otherwise it will be sent to q. $s(p,q) = [(1/2)(p+q - (\xi_p - \xi_q / \xi))]$ where $s(p,q)$ is split point of p and q. From fig.3 we can say that data from node $p+1, \dots, s(p,q)$ are sent to actor p and data from node $s(p,q)+1, \dots, q-1$ are sent to actor q. When $\xi_p = \xi_q$ then $s(p,q)$ is exact midpoint of p and q.

$$\Phi(p,q) = \sum_{i=p+1}^{s(p,q)} \lambda_i * (i-p)\xi + \sum_{j=s(p,q)+1}^{q-1} \lambda_j * (q-j)\xi + \sum_{i=p+1}^{s(p,q)} \lambda_i * \xi_p + \sum_{j=s(p,q)+1}^{q-1} \lambda_j * \xi_q \quad (1)$$

In equation (1) first two terms gives communication cost for collection of data from sensor node by p and q and last two terms for cost sending data from actor to sink. These p and q nodes are also working as a sensors which will give actor-sink communication cost $\lambda_x \xi_x + \lambda_y \xi_y + m_x + m_y$

The energy consumption per bit is calculated as $E = 2E_{elec} + \beta d^\alpha$ where, α is the exponent of path loss β is constant and E_{elec} is energy need to transmit or receive one bit. Communication energy parameter are set as $E_{elec} = 50nJ/bit$, $\beta = 10pJ/bit/m^2$ and $\alpha = 2$.

IV. PERFORMANCE EVALUATION

In this part, we conduct simulation experiment to evaluate the performance of proposed algorithm. In this different simulation parameters set as

Sr. No.	Parameter	Value
1	Channel type	Wireless
2	Radio propagation model	Two ray ground
3	Antenna type	Omni antenna
4	Interface queue type	DropTail/PriQueue
5	Routing protocol	AODV
6	Dimension of topography	500x500
7	Number of nodes	30,50,100
8	Initial energy level	24,3,21,20 respectively

Table 1 Simulation Parameters

Following Fig.4 shows energy consumption graph for different no. of nodes which clearly indicates energy consumption get reduced.

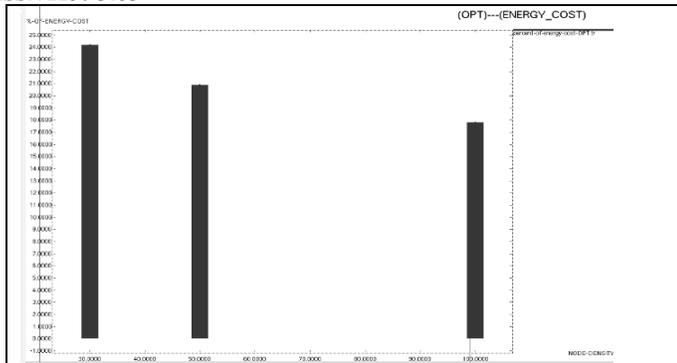


Fig. 4 Minimum Energy Consumption Graph

V. CONCLUSION

The WSN is used for real time application where instant response is major factor. One such application is road surveillance in which complete area is divided into road segment and apply OPT algorithm to minimize energy consumption. In this survey we had studied different protocols and algorithms to minimize energy consumption. In WSN, it's important to choose working actor and then forward all data to these actors which will be then send to sink for appropriate action. On these working actors, apply Dijkstra's algorithm for finding shortest route to the sink. Future work will contain to change the deployment strategy and re-check the result as deployment of nodes is one of parameter to minimize the energy.

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Afghanistan: US Policy and Post 9/11 Afghan War Scenario

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Abstract- The Afghan conflict poses several challenges: that of building up stability in a territory ravaged by three decades of conflicts, with a strong tribal identity, and where several external actors are involved; that of the adequacy of the law to deal with the current crisis; and that of humanitarian action conducted by actors with varying goals and methods who are all operating in the same context. The article profiles the genesis of the US policy and its execution in Afghanistan. It examines the US agenda in deposing *Taliban* regime and fixing in place a regime suiting to the US, her ends and interests, in South and Central Asia. In fact, it demonstrates how US imperial designs actually destabilised the region with little or no prospects of future peace and development. The US strives to drive advantage of Afghan conflict to her benefit regardless of ethical values set by the international standards. The article also furnishes how sophisticated military technology was employed to eliminate the *Taliban* and its splinter groups in and around Afghanistan. The massive American military operation made the *Taliban* to retreat and give way to a new government lead by US-backed Pashtun leader, Hamid Karzai, in December 2001. No matter country is showing no signs of peace even after one decade's old government of Hamid Karzai. High level of insecurity still reigns supreme in the country. The ill-will among the warlords persists thereby affecting the programmes of social and economic reconstruction. People's sufferings and miseries multiply and the US exercises its writ to deal with Afghanistan in the name of the "war against terror". The lack of security, economic development, effective rule of law, and coordination of effort stand in the way of sustainable progress in the country. These problems are interrelated, none of which can be addressed without simultaneously addressing the others.

Index Terms- al-qaeda, honeymoon, jihad, mujahedin, taliban

I. US POLICY IN AFGHANISTAN

War against global terror is the dominant political reality of the twenty-first century. United States (US) is especially engaged in this war to arrest the disorder and trauma afflicting the entire world though the US Invasion of Afghanistan in the post-9/11 scenario is often termed to be motivated by expansionist designs.¹ It is perceived to be humanitarian in theory but imperialist in actual practice, for it forged 'sub-sovereignty,' in such states that hitherto, possessed 'independent identity.'² While as Afghanistan experienced Anglo-Russian rivalry for imperial ends in the 19th century, it registered, overt or covert, US-Russian

conflict on ideological grounds in the 20th century. However, the current US-*Taliban* conflict, *inter alia*, is thought to be governed by the factor of economic determinism and the US foreign policy agenda to access Central Asian resources through Afghanistan.³ Therefore, the decades-long Afghan crisis was a direct result of self-seeking interference by the two leading imperialist powers, the Soviet Union and the United States, during the Cold War era. Thus each superpower wished Afghanistan to remain within its own sphere of influence for specified political, economic and strategic interests. The clash of interest surfaced with US opposition to the growing Soviet influence in the region. It is reported that: "Despite formal denials, the United States launched a covert operation to bolster anti-Communist guerrillas in Afghanistan at least six months before the 1979, Soviet invasion."⁴ She provided some covert support to the *Mujahedin* (militant groups) to counter Soviet designs,⁵ and, at the same time transformed Afghanistan into her own sphere of influence. For their intended aggression against Soviet Union and intrigues in West Asia, Afghanistan was a base for them.⁶ For the purpose, she recruited local leaders and warlords as mercenaries to fight against the Soviet-backed Communist government in Afghanistan.⁷ The argument is supported by Afghan analyst Nour Ali. To quote him, "Following the invasion of Afghanistan by the Soviet Union in late December 1979, hundreds of high ranking Afghan politicians and technocrats, including army officers entered into Pakistan with the hope of organising the needed resistance to oppose the invader in order to liberate Afghanistan."⁸ Regrettably, however, the US in collusion with Pakistan leadership exploited the situation to her exclusive and threefold illegitimate benefits: to promote US-friendly Afghan regime, to oppose the Red Army by using exclusively the very blood of Afghans against them, and to make Afghanistan a satellite if not an integrated part of Pakistan notwithstanding the scarifies and the loss of Afghan sovereignty.⁹ To bolster anti-Soviet resistance, the US and Pakistan used the card of extremist religious ideology: "Predominant themes were that Islam was a complete socio-political ideology, that holy Islam was being violated by the atheistic Soviet troops, and that the Islamic people of Afghanistan should reassert their independence by overthrowing the leftist Afghan regime propped up by Moscow."¹⁰ The overall result was a brutal civil war manipulated by the two superpowers that drove six million Afghans from their homes. But finally it resulted in the Soviet withdrawal in 1989, and the prominence of most strong Afghan faction, the *Taliban*, on the Afghan scene by the mid 1990s. It also created a great hope for the fulfillment of US ends. J. W. Smith comments that

“Afghanistan was also a US destabilisation and the covert US intervention began long before the USSR sent in its troops to Afghanistan. It is to be noted that a country rapidly developing and moving towards modernisation was politically and economically shattered, almost two million Afghans were killed, the most violent and anti-American of the groups supported by the CIA are now the leaders of Afghanistan.”¹¹ The US policy triggered extremism by supporting and inculcating the religious frenzy among the *Taliban* and its splinter groups.¹² They created a monster which they wanted to fiercely fight the Soviets and used them for their own imperial interests.¹³ Indeed, the extremist religious ‘*jihadi*’ ideology nurtured under the CIA patronage and its training programmes.¹⁴ The end result was that the *Taliban* became hegemonic and used crude methods to Islamise Afghanistan.¹⁵ In a sense, it encouraged the growth of Islamic fundamentalism to frighten Moscow and of drugs to get Soviet soldiers hooked. The CIA even helped ‘Arab Afghans’ like Osama Bin Laden, to fight Soviets¹⁶ regardless of international covenants. It allowed the *Taliban* to rise to power and consolidate its control,¹⁷ and persuaded Pakistan, Saudi Arabia and the United Arab Emirates to recognise the *Taliban* as the sole regime in Afghanistan.¹⁸ The US provided substantial aid and assistance to the *Taliban* to sustain it and guarantee regional policy though such a policy is seen as the US proxy war in Afghanistan. More so, America’s professed commitment to support the United Nations (UN) peace agenda was thought to be highly flawed: “US support of the UN as the proper vehicle for a negotiated settlement of the Afghan conflict was undermined by congressional refusal to allocate funds for UN dues or the US share of peacekeeping expenses.” On top of it, the US always felt comfortable with the growing Pak-Saudi influence in Afghanistan. “Public statements by the State Department condemned such interference but never identified any party thereby, annulling the whole purpose of condemnation.”¹⁹ The peace settlements following the Soviet withdrawal were negotiated in the UN, though, yet the Afghans were always excluded from them which presupposes the US policy to derecognise the national Afghan government. In sequence, “no national Afghan government has emerged; the country was fragmented and no longer independent; its fate was in the hands of alien powers; all its social, political, and administrative services were abolished; the warring factions prevailed in the country” to the detriment of the regional peace and security. The simple reason was being the US-*Taliban* friendly policy. “Amnesty International refers to visits by *Taliban* representatives to the United States and that of the senior US State Department officials to Kandhar, including one immediately before the *Taliban* took over Jalalabad.” It further reports that “Senior *Taliban* leaders attended a conference in Washington in mid 1996, and US diplomats regularly traveled to *Taliban* headquarters.”²⁰ Agence France also supports US-*Taliban* honeymoon while arguing that Robin Raphel, former US Assistant Secretary of State for South Asia, organised an intense round of shuttle diplomacy to facilitate the fulfillment of its UNOCAL project to optimise Central Asian resource and scuttle the Russian and Iranian monopoly on their production and trade.²¹ In fact, the *Taliban* movement was groomed by the Pakistani ISI and the US CIA with multiple geo-economic and geo-strategic interests.²²

Thus US policy, besides all else, aimed at building a 4.5 billion dollar oil and gas pipeline by a US led oil consortium across war-ravaged Afghanistan. The US energy diplomacy was indeed motivated by a couple of considerations: to minimise her dependence on Gulf imports, economise energy costs, marginalise Russian and Iranian trade monopoly of Central Asian energy resources, and provide the new-born Central Asian states the options with which to better bargain their energy resources.²³ *Taliban*’s initial success to ensure law and order seemed attractive to Washington.²⁴ It, therefore, supported the *Taliban* regime with the interest in economics of oil.²⁵ In early October 1996, UNOCAL was given the go-ahead from the new holders of power in Kabul to build a pipeline from Turkmenistan via Afghanistan to Pakistan.²⁶ It was proposed from Krasnovodsk on the Caspian Sea to Karachi on the Indian Ocean coast.²⁷ Besides UNOCAL, AMOCO, BP, Chevron, EXXON, and Mobile companies were jubilantly interested in exploiting Caspian oil, apparently at any human expense.²⁸ By December 1997, *Taliban* representatives were invited as guests to the Texas headquarters of Union Oil of California, (UNOCAL) to negotiate their support of the pipeline. UNOCAL had also given training to Afghan men in the skills required for pipeline construction, with US approval. UNOCAL commissioned the University of Nebraska to teach Afghan men the technical skills needed for pipeline construction.²⁹ Equally important was that the creation of a client state with Pak support was due to earn her regional leverage in Afghanistan. Strategic and economic interests, therefore, motivated US to be friendly with the *Taliban*.³⁰ As a result, Afghanistan prominently characterised the US planning of energy pipeline transmission corridors to world markets. Most interestingly, US wanted to push Afghanistan as “a prime transshipment route for the export of Central Asia’s vast oil, gas and other natural resources.”³¹ The Clinton Administration had foreseen that *Taliban* victory would act as a counterweight to Iran and explore new trade routes while by-passing Russian and Iranian traditional routes.³²

Till 2000, a great deal of optimism prevailed in US-*Taliban* ties, and US played the role of a clandestine partner in the new ‘Great Game’ with manifold objectives: to sway Iran; to expand its power beyond the Amu Darya; to control Central Asian energy resources; and to marginalise Russian influence in the South, and mainland China in the North West. The US intended placing in Afghanistan a government that could serve and watch dog US interests on the one hand and checkmate Russia, China, Iran, etc. on the other.³³ However, US took a u-turn with 9/11 tragedy and became hostile to the *Taliban* for its pro-*Al-Qaeda* stance and its refusal to handover to US, Osama Bin Laden, the main suspect in 9/11 catastrophe. Pursuant to this, the US with NATO support penetrated into Afghanistan, eliminated *Taliban* with military might and got economic sanctions ratified against Afghanistan in the UN. Thus the US engineered a punishing Iraq-style embargo of war-ravaged Afghanistan at a time when many of its 20 million people were starving and homeless.³⁴ In fact, the war against *Taliban* was long planned due to its growing indifference to US and quite conservative measures that it adopted to Islamise Afghanistan.³⁵ The 9/11 was nadir of the long-designed anti-*Taliban* US policy. The 9/11 provided US a pretext to cut across the *Taliban* and enforce its supremacy in a region which served her, a gateway to Central Asia and Eurasia.³⁶ It constructed military bases³⁷ in Afghanistan,

Pakistan, and the three of the former Soviet republics to purportedly guarantee security though to the great discomfort of China and Russia. The US policy in Afghanistan was supported by every section of US. Shocked by 9/11 tragedy, the US ruling elite was quick enough to exploit it for a new global military crusade in the Cold War era. The US power elite solidly stood behind a global expansion of the US military role thereby subjecting the whole world to US imperialism.³⁸ In the process, the sovereignty of the nations was subjected great threat in all conflict situations³⁹ obviously due to the hegemonistic role of US with all means at its disposal.⁴⁰ In this view, US was seen carrying out a “world police” action in Afghanistan, and elsewhere in the name of global terror.⁴¹ The US presence in Afghanistan is justified as an act of war against global terror, which China, Russia, and other regional powers, look upon with suspicion and fear. They, as such, weave counter strategies to cut across the US designs in Afghanistan.

II. POST 9/11 US-AFGAN WAR SCENARIO

After 9/11 attacks, the US and NATO launched offensive in Afghanistan to punish the *Taliban* for harbouring and collaborating with the 9/11 attackers and coerce the regime into bringing those involved to justice. Subsequently, it was aimed at toppling the *Taliban* regime and instituting a pro-US regime in Afghanistan, though finally the US terminated the *Taliban* regime as an act of punishment.⁴² The US declared its “War on Terror,” against the *Taliban* and *Al-Qaeda* in and outside Afghanistan on 7th October 2001.⁴³ The operation began with air strikes against selected military targets, and later expanded to political and infrastructures to weaken the *Taliban* revolts.⁴⁴ In that, the US and NATO forces killed up to 5,000 Afghan civilians—almost double the number of civilians killed in the World Trade Center and Pentagon attacks.⁴⁵ Meanwhile, the sudden collapse of the *Taliban* was surprising. On 9 November, the key northern town of Mazar-i-Sharif fell to Northern Alliance troops. The *Taliban* attempted to retreat south to the Kandhar region. Command and control, however, broke down catastrophically, and the retreat became a rout, characterised by a succession of defections. The massive US bombardment with the support of the regional powers resulted in the change of the *Taliban* regime by a new interim government in Afghanistan vide the resolution of the United Nations organised in Bonn (Germany) conference in December 2001.⁴⁶ It was followed by the setting up of a new government under Pashtun leader, Hamid Karzai, on 5th December 2001.⁴⁷ The new regime meant a return to the pre-*Taliban* era, when Northern Alliance⁴⁸ ruled most of Afghanistan. However, it was now regulated by the US-UN brokered agreements to ensure harmony among different warring factions, restore regional security and facilitate energy pipeline structure along Afghanistan.⁴⁹

The collapse of the *Taliban* was probably a result of a number of factors. One was the synergy between US air power and Northern Alliance ground offensives and second was the inherent weaknesses of the *Taliban* as the *Taliban* was a loose coalition that had failed to grow out of its regional roots, and the third was that *Taliban* did not take recourse to guerilla warfare as was characterised of them against the Soviets.⁵⁰ However, with the collapse of *Taliban* resistance in Kandhar and the establishment of an interim authority in Kabul, most of Afghanistan entered a

period of post-conflict reconstruction. For the US, however, the conflict continued, though its nature changed. The US described its mission aiming at locating and destroying remaining pockets of *Taliban* and *Al-Qaeda* in Tora Bora, south of Jalalabad and elsewhere.⁵¹ More significant, however, was Operation Anaconda, on 2 March 2002, in mountainous area of the Paktia province in which top *Taliban* leadership excepting Osama Bin Laden and Mullah Omar was believed to be dead.⁵²

The US operations in Afghanistan were significant in many ways. First, bombing operations were conducted from CENTCOM’s base in Tampa, Florida: due to the advanced technology that allowed security agencies not only to video-conference the connections of local commanders, but to see the battlefield with ‘unparalleled situational awareness’. Second, the US ensured that the war is conducted to punish what they termed as ‘terrorists’ who threatened US with weapons of mass destruction.⁵³ Third, a real fear remained that September 11 would not be the last attack on American soil. Therefore, although conventional military operations might be fought elsewhere, asymmetric attacks could be conducted against the United States itself, as well as its allies. Therefore, Operation Enduring Freedom (OEF) was launched in Afghanistan in 2003⁵⁴, and in that the enemy was not the Afghan people but the *Taliban* and *Al-Qaeda*. Thus President Bush stated that ‘America is a friend of the Afghan people’, and had compassion for their suffering in principle if not in practice. He assured to marginalise collateral damage which the US officials claim did not go beyond the killing of 1,000 Afghan civilians, though, in actual practice their number was substantially high and so was that of the refugees and displaced, which was complicated by food scarcity.⁵⁵ Though, Operation Enduring Freedom was launched with caution so that the coalition forces had fewer losses, which however, is diluted due to current enemy counter attacks.⁵⁶ But all this was readily justified in the name of what US strategists termed as the war for justice. Operation Enduring Freedom was evolving into a mature counter-insurgency force, operating mostly in the southeast and eastern parts of Afghanistan, while International Security Assistance Force (ISAF) was confined to Kabul. ISAF had a muddled mandate and without the resources to carry it out, functioned as a nearly symbolic European presence in Kabul. A pilot program intended to coordinate OEF efforts with those of the provincial chieftains and the embryonic Afghan National Army, called the Joint Regional Teams,⁵⁷ was established in Gardez by mid 2003. By this time the Afghan National Army program was convoluted, and little progress had been made because of the inability of ISAF to support the task effectively. Moreover, infrastructural damage after three decades of war was another impediment to extending federal government control over the provinces. Nongovernmental organisations (NGOs) were intimidated in insurgency areas, which had a spill-over effect in secured areas: the insurgents targeted NGOs in the southeast knowing that the organisations would pull out of the whole country if enough casualties were taken by aid workers. OEF operations against the insurgents were complicated by the sensitive matter of Pakistani territorial sovereignty and the volatile political situation in that country.⁵⁸ However, on the plus side, the insurgency was forced by OEF operations to alter its methodology, which in turn, made insurgent operations less effective.

The primary problem, however, was the embryonic nature of the interim and transitional Afghan governments and the possibility that fragile structure could be destabilised and toppled before it could get to work. Connected to this was the questionable legitimacy of President Hamid Karzai. On the ground, Karzai was variously portrayed as a pawn of the United States or implicitly controlled by the Northern Alliance. The Northern Alliance exerted explicit control over Kabul and the associated political processes by dint of its 27,000 man military contingent in Kabul and its environs. There was no countervailing federal governmental coercive power in Kabul, let alone throughout the rest of the country. This power was in the hands of local leaders anti-*Taliban* chieftains “warlords.” Remnants of the *Taliban*, supported by the remnants of *Al-Qaeda*’s military forces, were by this time in the process of transitioning from a conventional guerrilla war to a low-level terrorist campaign, and the possibility of a return to the destructive post-Soviet era infighting between the chieftains existed in various locations, including Kabul.⁵⁹ In fact, Gulbuddin Hekmatyar, *Taliban* and *Al-Qaeda* forces were constantly operating against the Afghan government and its Coalition partners. Gulbuddin Hekmatyar’s *Hizb-I Islami* Gulbuddin (HIG), still seeking to influence the brokerage of power in Kabul, and still mounts usually ineffective attacks on ISAF, OEF, and Afghan National Army forces wherever possible. Meanwhile, the *Taliban* appear to have shifted from guerilla warfare to pinprick terrorist attacks, usually in ethnically Pashtun areas in the southeast. In addition to provide training and equipment to both HIG and the *Taliban*, *Al-Qaeda* mounts its own limited raids on Coalition forces. These raids appear to employ the well-equipped remnants of *Al-Qaeda*’s ‘conventional’ formations which worked with the *Taliban* prior to 2001. Unlike HIG and *Al-Qaeda*, the *Taliban* are still trying to create a parallel government to garner popular support in Pashtun areas with the aim of retaking the country. However, the synergy of HIG, the *Taliban*, and *Al-Qaeda* has been unable to significantly influence the direction that the Afghan people are taking under the Karzai government.

Nevertheless, even after decades long Karzai’s government, situation in Afghanistan is unstable. Presently, the writ of President Karzai is confined largely to the Kabul proper. In the countryside, the regional power brokers, (warlords) and their provincial troops are restive⁶⁰, and are bent upon to throw Karzai’s government out of power.⁶¹ Most alarming are the whopping militant activities of the *Taliban* to strike back with greater vigour than before causing immense human losses and damages to infrastructure.⁶² In 2006 alone, over 4000 deaths were registered in Afghanistan including those of the civilians and foreign soldiers. Besides, southern part of Afghanistan in Helmand and Kandhar, the heartland of the *Taliban*, witnessed great deal of fighting and damage to infrastructure during the same year. The suicide attacks were on the rise despite constant US and Pakistan army strikes.⁶³ In a wave of violence, during 2006, the *Taliban* led militants carried out about 140 suicide attacks more than five times the 2005 number and 35 in 2007.⁶⁴ While some top *Taliban* leadership reported that: “The suicide martyrs and those willing to blow themselves up are countless.”⁶⁵ Meanwhile in summer 2008, the situation worsened to an extent that a sophisticated *Taliban* assault on a Kandhar prison freed 1,200 inmates, including 350 *Taliban* members. Violence in

Afghanistan rose 40% from the previous year. Ambushes, suicide attacks, and targeted assassinations rose sharply. NATO reports that the *Taliban*’s presence is strongest in the Helmand, Kandahar, Zabol, and Oruzgan provinces in southern Afghanistan, and is either significant or conspicuous in the Paktia, Khowst, Nangarhar, Konar, and Nuristan provinces in eastern Afghanistan. In many of these areas, the *Taliban* have usurped the traditional functions of a sovereign state, collecting taxes, maintaining order, and providing basic services.⁶⁶ In one single incident, a sophisticated *Taliban* suicide bomber killed 8 CIA employees on 30 December 2009, while 4 Canadian troops and a journalist died in a separate attack in Khost province.⁶⁷ Meanwhile, in 2010, the human cost of the conflict grew in Afghanistan and some 2,777 civilian deaths were recorded, an increase of 15% as compared to the previous year.⁶⁸ Since 2001, the security conditions across the country remained volatile with an increase in number of suicide attacks. On the whole, “the security at present is out of control, governance is limited and development is slow as a sequel of intermittent bomb explosions, suicide attacks and military encounters.”⁶⁹ Consequently, whole lot of population presents a deplorable lot as regards their resource, psyche, education, health care, economy, social organisation, political culture, etc. Moreover, the agony and discomfort to the Afghan population especially in southern and northern Afghanistan is not yet over. The process of reconstruction involving huge costs has not yielded desired results. It has correspondingly hampered the institutional growth in the country, and badly impacted the sectors of human security, healthcare, educational growth, and works of public utility. The spill over of *Taliban* actions has even reached to Pakistan proper with ruining blasts and suicide attacks killing tens and thousands of humans and damaging invaluable property assets. To restrict the *Taliban*, the Pakistan government has geared up all its forces in NWFP, Baluchistan, Waziristan, and other strong holds of the *Taliban*. Under a new Afghan stabilisation strategy, president Obama, besides other things, has sent 30,000 extra foreign troops to Afghanistan, reinforcing to the 68,000 US and 40,000 allied forces already in theater⁷⁰ to tackle the mounting violence and to uproot *Al-Qaeda*, *Taliban*, and other militant safe havens, though it seems to be a billion dollar question. Moreover, US has funneled well over \$10 billion in military aid to bolster Pakistan’s counter-terrorism capabilities in the volatile border regions with Afghanistan.⁷¹ In sum, the Afghan transitional government under Karzai had questionable legitimacy among the people, it is subject to coercion by better-armed entities, and is dependent on international forces in every way. Without security, there can be no reconstruction, and with no reconstruction there would be no nation-building, thus leaving Afghanistan susceptible to continued instability and penetration by international terrorism. The lack of security, economic development, effective rule of law, and coordination of effort stand in the way of sustainable progress in the country.

The foregoing discussion amply demonstrates that Afghanistan passed through difficult times over the past two centuries. The people in general are conservative in outlook due to tribal organisation. They are simultaneously sensitized to the Islamic faith; hence are resistant to every sort of change in the given religio-tribal structures which they hold dear to an appreciable extent. The level of development in diverse sectors is sluggish if not non-existent as is rightly said that the Afghans can be

“coaxed to hell but can not be compelled to heaven.”⁷² The trend to industrial, transportation, communication, constructions and other fields was set in the mid-20th century. It was also manifest in the educational and healthcare sectors. However, post-1978 period hampered the set trend due to recurring tribal infauds, conflicts and wars following the growth of fundamentalism and the multi-victor strategy of the US, NATO and Pakistan to root it out for regional and global peace and industrial, social and educational development. When and how for such a joint strategy can succeed depends on time and the mutual understanding among the contending parties and their neighbourly world including China, Russia, India and Iran.

A dialogue with the dissident groups is a must while keeping historical realities in mind. A large-scale military infusion of Western forces would place Americans in the same position that the Soviets found themselves in during the 1980s. In fact, outside soldiery will be an extensive and daunting undertaking. The history of the region shows that Afghanistan’s fiercely independent and battle-tested Pashtuns are extremely resilient in resisting conventional armies. Time and again, Persian, Greek, Turk, Mughal, British, and Soviet invaders have been unable to subdue a virtually unconquerable people. Like the Soviet Union’s ignominious departure from the region, US and NATO

troops, despite their sophisticated military gadgetry, could easily meet the same fate. Brute force solutions will not work in Afghanistan. Therefore, the effort should be to win the “hearts and minds” of the Afghans by addressing their problems, and satisfying their development-related needs rather than using force and perceiving about the exploitation of the regional resources.⁷³ It must be remembered that Afghanistan is not, Vietnam, Colombia, Bosnia, nor is it Kosovo. It has had three decades of prolonged conflict with devastating impact on every aspect of human life. Milosevic-style indictments will not work in Afghanistan, where almost everybody may be guilty of violating some Western-based law. A South African-style “Truth and Reconciliation Commission” would be the better tool. Afghanistan needs reconciliation, not a reprise of Nuremberg. Moreover, creating a stable government that is capable of providing for the basic needs of its people will be essential to containing *Al-Qaeda* and other militant groups in Afghanistan. Because the region is so interconnected that stability in one area is a necessary pre-requisite to stability in another.

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Muslim Women Education and Empowerment in Rural Aligarh (A Case Study)

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Abstract- For the development of rural environment, education should be taken on priority as it is the most important factor. Education is the basis for creativity and foresightedness that triggers change; it helps in economic growth, quality of life and quality of human resource. Education takes us away from tradition backwardness, darkness, poverty, misery and overpopulation to enlighten, prosperity and happiness. Women in India have been playing predominant role in the development of society by their direct and indirect contribution, their active participation in the economic as well as social activities would cause for the overall national development. The present study attempt to analysed the Muslim women education and empowerment in rural areas of Aligarh district. The study is mainly based on primary sources of data. The data reveals that socio economic conditions are the major determinants of women liberation than the religion. It illustrates the fact clearly that family structure has an association with the participation of women in the decision making process as well as the status of women.

Index Terms- women, employment, education, households, empowerment

I. INTRODUCTION

The status of women has been low and subordinate in major part of the human history. From the ancient times to modern period, the female component of humanity has been deprived of the basis of human right of dignity and freedom. Women's participation in education is low may not leads their low participation in economic activities, more discussing point is that their contribution is much lower in Indian economy. According to 2001 census of India the Muslim constitutes 13.4 per cent of India's population. Muslim literacy is 59.1 per cent is lower than the national average literacy rate (64.8) per cent. But it is varies within the sex that the literacy rate among Muslim women is 50.1 per cent against the male 67.6 per cent. The literacy rate in Muslim women in rural areas is 42.7 per cent lower than the urban areas which are 63.2 per cent.

Education does not merely mean the acquisition of knowledge or experience but it means the development of habits, attitudes and skills which help a person to lead a full and worthwhile life. Education plays an active role in educating women's position and promoting their rights in society. With the spread of education among women, exploitation and oppression of women will be considerably reduced. Education of women is of paramount importance for the development of individuality. It is

also an instrument for strengthening socially useful skills, habits and attitudes of common citizenship.

For the development rural environment attention is to be paid to education on priority as it is the most important factor. Education is the basis for creativity and foresightedness that triggers change; it helps in economic growth, quality of life and quality of human resource. Education takes us away from tradition backwardness, darkness, poverty, misery and overpopulation to enlightenment, prosperity and happiness.

It is the women who nurture the child and take care of his/her overall development, particularly in formative years. Hence she has to be educated to provide a sound base for upbringing of the child.

Education is an essential factor in achieving economic development, individual development and technical progress and in creating a social order founded on the values of freedom, social justice and equality of opportunities, to avoid social evils and taboos through educating them.

Education of rural women also assumes great importance to enable them to get the fullest benefit of globalization.

Empowerment is the process of gaining control over self, over ideology and the resources which determine power and it is exercised through a series of order or decision making capacity. Empowerment as a concept was introduced at the International Women's conference at Nairobi in 1985. Empowerment is a process, by which women gain greater control over material and intellectual resources which assist them to increase their self-reliance and enhance them to assert their independent right.

Women's education and empowerment is not only essential to economic development, but it will also have a transformative effect on the goals of both economic and social development. Women's participation, thus, does not mean simply increasing women members or integrating them into existing development models, rather it is part of the process of employment policies and programmes more people-oriented.

II. AVAILABLE LITERATURE

Available literature indicates that there is a close relationship between the spread of female education on the one hand and the development status on the other. As, (Sharma, 2002) says that the greatest problems discerned by the Muslim women are that women lack proper knowledge of their faith, and that this is why Muslim men sometimes mistreat their women. Decision making is the main constituent of empowerment especially in the case of household level (Blumberge, 1991; Bruce, Lloyd and Leonard, 1995; Mason, K. O. and H. L. Smith, 2003). As (Kumari, Y. I. and Sambasiva, 2005) and (Sharma, 2006) Empowerment of

Women is the key route for the development of any society in all areas including health, education, asset ownership, skills, political participation etc.

III. OBJECTIVES

The basic objectives of this study are:

1. To study the percentage of educated and uneducated Muslim women in the area.
2. To study the level of education amongst the educated women.
3. To know the family structure of the respondents.
4. To know the percentage of women involved in the economic activity.
5. To examine the rate of employment amongst Muslim women and the type of work.

IV. DATA BASE AND METHODOLOGY

The study is primarily based on mainly primary and partially secondary sources of data which were collected with the help of questionnaire and interviews from the residents living in selected villages of Aligarh district. The survey was conducted in June-July 2010 of 12 villages from 12 blocks on random sampling basis i.e., 01 Muslim dominated village from each block, selecting 30 households from each village, 360 households in total.

While secondary source of data are

- District census Handbook, Aligarh.
- Nagar Nigam Office, Aligarh.

- Suchana and Jansampark Vibhag Aligarh.

The various determinants for which questions from respondents were asked relates to socio-cultural, economic and demographic such as education, decision making and family size.

V. STUDY AREA

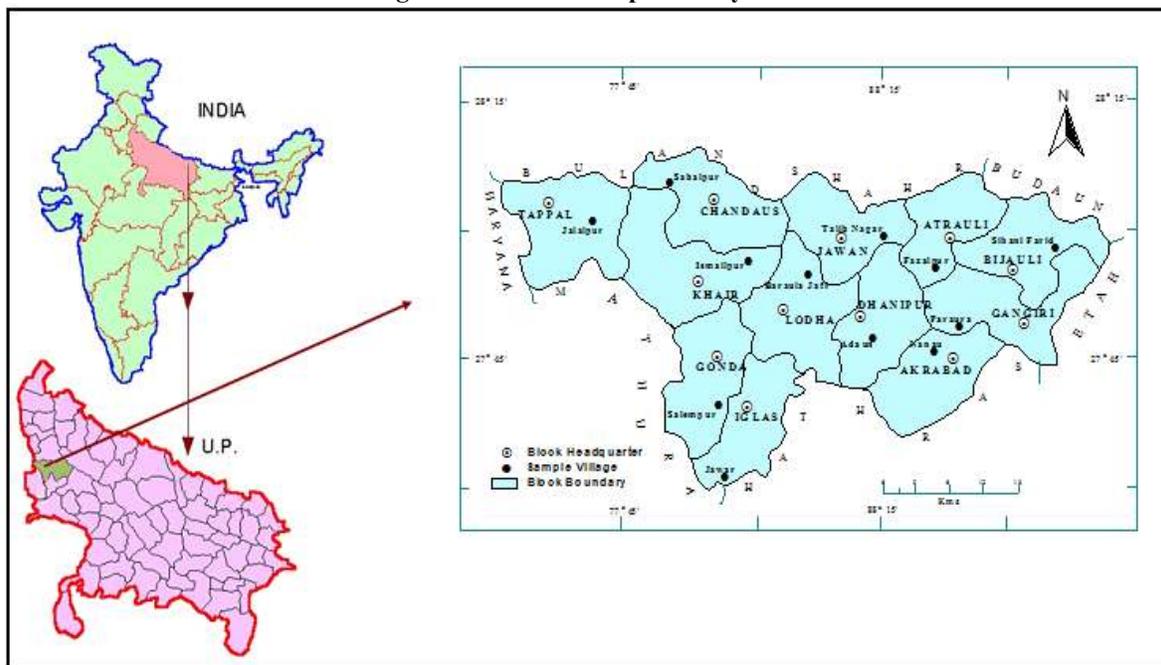
Aligarh district is one of the highly developed, prosperous and agriculturally advocated district of Western U.P. the town is located in the east from Delhi at the distance of 135 Kms. in the north from Agra at the distance of 85 Kms. and towards west from Kanpur at 288 Kms. It is on the Delhi-Howrah rail and the G.T. road which passes through middle of the city.

Aligarh is one of the important districts of Uttar Pradesh (U.P.), located in the north western part in the fertile region of Ganga and Yamuna, known as Doab. Topographically, the district represent a shallow trough like appearance, Geologically Aligarh District forms a part of the Indo-Gangetic Plain which came into existence in the Pleistocene Period.

The Density of rural population of Aligarh district is mainly influenced by soil fertility, agricultural and Industrial development and the development of transport facility.

Aligarh district is well served by road and railways. The focal point of the district is Aligarh city from where communication arteries radiate to every corner of the district is the famous Grand Trunk Road which passes through the district of Aligarh. It has played an important role in the progress and prosperity of Aligarh District.

Figure: 1 Location Map of Study Area



Sources: Census of India

VI. EDUCATIONAL STATUS OF THE RESPONDENTS

The village survey shows a poor development and so is the literacy level among Muslim women. Out of total household surveyed about two third of them are illiterate they can't even read write their name. the education status at village level is shown in table 1 that in Jalalpur (Tappal) only 26.67 per cent educated and 73.33 per cent uneducated, in Sabalpur (Chandaus) 23.33 per cent educated and 76.67 per cent uneducated, 50 per cent educated and 50 per cent uneducated in Ismailpur (Khair),

and 16.67 per cent, 30 per cent and 20 per cent educated in Fazalpur (Atrauli), Sihani Faridpur (Bijauli) and Paraura (Gangiri) respectively, and remaining are uneducated in respected villages. One third women in Salempur village of Gonda block were educated, 23.33 per cent women in Jawar (Iglas) were educated and same percentage of women also educated in Nanua (Akraabad) and Adaun (Dhanipur). Lastly Baraula Jafrabad (Lodha) had 20 per cent educated women and Talibnagar (Jawan) had 26.67 per cent educated and 73.33 per cent uneducated women among Muslim.

Table: 1

Village	Illiterate	Educated Women					Total
		Primary	Middle	H.S.	10+2	Islamic	
Jalalpur	73.33	13.33 (50.00)	3.33 (12.50)	3.33 (12.50)	-	6.67 (25.00)	100.00
Sabalpur	76.67	6.67 (28.57)	3.33 (14.29)	3.33 (14.29)	-	10.00 (42.86)	100.00
Ismailpur	50.00	30.00 (60.00)	6.67 (13.33)	3.33 (6.67)	3.33 (6.67)	6.67 (13.33)	100.00
Fazalpur	83.33	10.00 (60.00)	-	-	-	6.67 (40.00)	100.00
Sihani Faridpur	70.00	13.33 (44.44)	3.33 (11.11)	3.33 (11.11)	-	10.00 (33.33)	100.00
Paraura	80.00	10.00 (50.00)	3.33 (16.67)	-	-	6.67 (33.33)	100.00
Salempur	66.67	16.67 (50.00)	6.67 (20.00)	-	-	10.00 (30.00)	100.00
Jawar	76.67	-	6.67 (28.57)	3.33 (14.29)	-	13.33 (57.14)	100.00
Nanau	76.67	10.00 (42.86)	6.67 (28.57)	-	-	6.67 (28.57)	100.00
Talib Nagar	73.33	3.33 (12.50)	6.67 (25.00)	3.33 (12.50)	-	13.33 (50.00)	100.00
Baraura	80.00	6.67 (33.33)	3.33 (16.67)	-	-	10.00 (50.00)	100.00
Jafrabad	76.67	10.00 (42.86)	3.33 (14.29)	-	-	10.00 (42.86)	100.00
Adaun							
Total	73.61	10.83 (41.05)	4.44 (16.84)	1.67 (6.32)	0.28 (1.05)	9.17 (34.74)	100.00

Source: Based on Field Survey, 2010

VII. LEVEL OF EDUCATION

It is also depict from the table 2 that out of total literate/educated in Jalalpur (Tappal), 50 per cent woman was educated upto Primary level, 12.50 per cent was Middle School and same percentage was educated upto High School and remaining 25 per cent had Islamic education.

In Sabalpur (Chandaus), 28.57 per cent were Primary educated, 14.29 per cent were Middle School, same percentage were High School passed and remaining 42.86 per cent were

Islamic passed. In Ismailpur (Khair) out of total women, 60 per cent woman was primary educated, 13.33 per cent was Middle School passed, 6.67 per cent was High School passed, same percentage was 10+2 passed and remaining 13.33 per cent was Islamic passed. In Fazalpur (Atrauli) 60 per cent primary educated and remaining 40 per cent was Islamic passed. Out of total women educated in Sihani Faridpur (Bijauli) 44.44 per cent woman was primary educated, 11.11 per cent was Middle School, same percentage was High School passed and remaining 33.33 per cent woman was Islamic passed.

In Paraura (Gangiri) 50 per cent women were Primary educated, 16.67 per cent was Middle School and remaining 33.33 per cent was Islamic passed. In Salempur (Gonda) 50 per cent women were Primary educated, 20 per cent was Middle School and remaining 30 per cent had Islamic education. In Jawar (Iglas) 28.57 per cent women was Middle School, 14.29 per cent was High School and remaining 57.14 per cent was Islamic passed. In Nanua (Akrabad) 42.86 per cent was Primary educated, 28.57 per cent was middle school passed and 28.57 per cent was

Islamic passed. In Talibnagar (Jawan) 12.50 per cent women was Primary educated, 25 per cent was Middle School passed, 12.50 per cent was High School passed and remaining 50 per cent was Islamic passed. In Baraura Jafradad (Lodha) 33.33 per cent women was Primary educated, 16.67 per cent was Middle School passed and remaining 50 per cent was Islamic passed. In Adaan (Dhanipur) 42.86 per cent was Primary educated, 14.29 per cent was Middle School passed and remaining 42.86 per cent was Islamic passed.

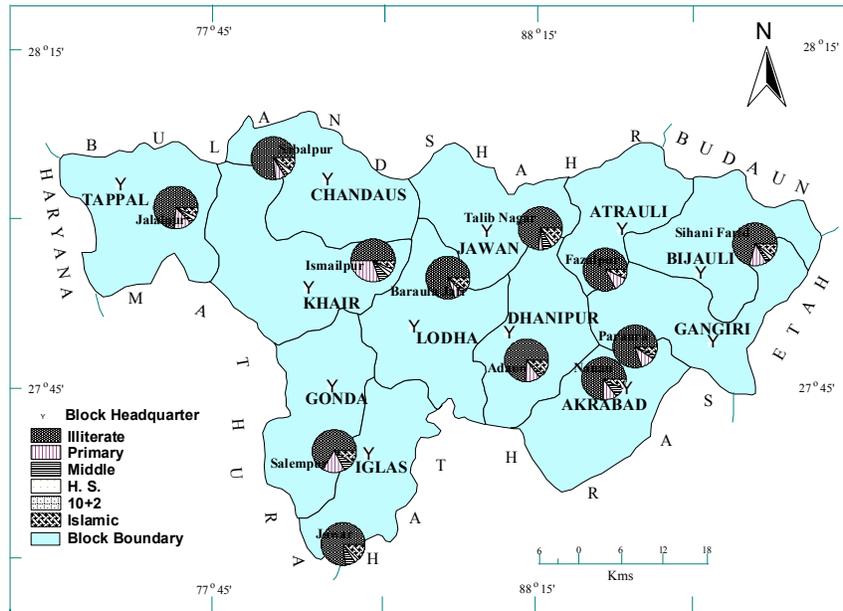


Figure: 2

VIII. WORKING CONDITION OF WOMEN ENGAGED IN DIFFERENT TYPES OF WORK

As for the working condition of women in Muslim is concern we found that about 60 per cent were house wife and remaining were working in different economic activities. Out of total working women about half percentage engaged in Agricultural activities, one third were working as a labourer and remaining were engaged in other type of activities such as washing utensils, collection of polythenes, etc.

In Jalalpur (Tappal) out of total household surveyed, 63.33 per cent women were housewife and remaining 36.67 per cent women engaged in some kind of work. Out of 36.67 per cent

16.67 per cent was in Agricultural Land, 13.33 per cent was labourer and 6.67 per cent was engaged in other working sectors.

In Sabalpur (Chandaus), 53.33 per cent women were housewife and remaining 46.67 per cent were working women, i.e., 23.33 per cent was in Agricultural Land, 13.33 per cent was labourer and 10 per cent was others. In Ismailpur (khair) 50 per cent was House Wife and remaining were working women. Out of 50 per cent working women 30 per cent was in agricultural land, 13.33 per cent was labourer and 6.67 per cent was others.

In Fazalpur (Atrauli) 90 per cent was house wife and 10 per cent was working women. Out of 10 per cent working women 6.67 per cent was in agricultural land and 3.33 per cent was others.

Table: 2

Village	House wife	Working				Total
		Agricultural Land	Labourer	Others	Total	
Jalalpur	63.33	16.67 (45.45)	13.33 (36.36)	6.67 (18.18)	36.67 (100)	100.00
Sabalpur	53.33	23.33 (50.00)	13.33 (28.57)	10.00 (21.43)	46.67 (100)	100.00
Ismailpur	50.00	30.00 (60.00)	13.33 (26.67)	6.67 (13.33)	50.00 (100)	100.00
Fazalpur	90.00	6.67	-	3.33 (33.33)	10.00	100.00

Sihani Faridpur Paraura	46.67	(66.67) 20.00 (37.50)	23.33 (43.75)	10.00 (18.75) 3.33 (6.67)	(100) 53.33 (100)	100.00
Salempur	50.00	23.33 (46.67)	23.33 (46.67)	3.33 (20.00)	50.00 (100)	100.00
Jawar	83.3	6.67 (40.00)	6.67 (40.00) 3.33 (11.11)	6.67 (22.22)	3.33 (20.00)	100.00
Nanau	70.00	20.00 (66.67)	20.00 (30.00)	6.67 (10.00)	30.00 (100)	100.00
Talib Nagar	33.33	40.00 (60.00)	13.33 (36.36)	3.33 (9.09)	66.67 (100)	100.00
Baraura Jafrabad	63.33	20.00 (54.54)	6.67 (20.00) 16.67 (29.41)	10.00 (30.00) 13.33 (23.53)	36.67 (100)	100.00
Adaun	66.67	16.67 (50.00)	16.67 (50.00)	13.33 (23.53) 56.67 (100)	33.33 (100)	100.00
All	59.44	20.83 (51.37)	12.78 (31.51)	6.94 (17.12)	40.56 (100)	100.00

Source: Based on Field Survey, 2010

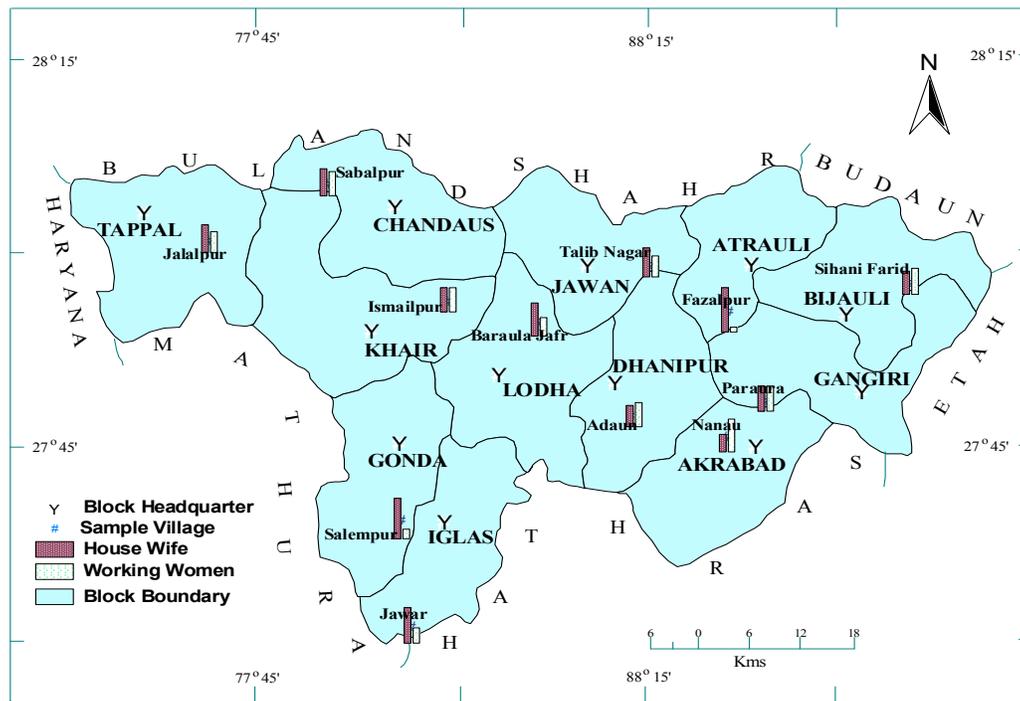


Figure: 3

In Sihani Faridpur (Bijauli) 46.67 per cent was house wife and 53.33 per cent was working women. Out of 53.33 per cent women only 20 per cent engaged in Agricultural land, 23.33 per cent was labourer and 10 per cent was others.

In Paraura (Gangiri), there are 50 per cent working women and 50 per cent housewife. 23.33 per cent was agricultural land, 23.33 per cent labourer and 3.33 per cent others. In Salempur (Gonda) it was 16.67 per cent for working women out of which 6.67 per cent was in agricultural land, 6.67 per cent was labourer and 3.33 per cent others. In Jawar (Iglas) 30 per cent was working women out of which 20 per cent agricultural land, 3.33 per cent labourer and 6.67 per cent was others. In Nanua (Akraabad) 66.67 per cent was working women. Out of 66.67 per

cent 40 per cent agricultural land, 20 per cent labourer and 6.67 per cent others. In Talibnagar (Jawan) 36.67 per cent were working women, 20 per cent was in agricultural land, 13.33 per cent was labourer and 3.33 per cent was others. In Baraula Jafrabad (Lodha) 33.33 per cent was working women out of which 16.67 per cent was in agricultural land, 6.67 per cent labourer and 10 per cent others. In Adaun (Dhanipur) 56.67 per cent working women, 26.67 per cent was in agricultural land, 16.67 per cent labourer and 13.33 per cent others.

IX. HOUSEHOLD SIZE

Table 3 and figure 4 depicts the size of households in Muslims of Aligarh district. It is found that in general the average

household size for the sampled population as a whole is 6.79, which is very high as our national average household. Our national average household is about is 5.4 (Census 2001).

Table: 3

Village	Family size				Average
	<4	4-6	7-9	>9	
Jabalpur	3.33	40.00	30.00	26.67	6.87
Sabalpur	6.67	36.67	30.00	26.67	6.83
Ismailpur	10.00	60.00	26.67	3.33	5.73
Fazalpur	6.67	43.33	23.33	26.67	6.9
Sihani Faridpur	6.67	40.00	26.67	26.67	6.73
Paraura	-	46.67	50.00	3.33	6.63
Salempur	6.67	33.33	43.33	16.67	6.79
Jawar	6.67	26.67	40.00	26.67	7.13
Nanau	3.33	36.67	26.67	33.33	7.07
Talib Nagar	-	43.33	30.00	26.67	6.97
Baraura Jafrabad	3.33	26.67	40.00	30.00	7.3
Adaun	6.67	40.00	36.67	16.67	6.47
Total	5.00	39.44	33.61	21.94	6.79

Source: Based on Field Survey, 2010

There is variation in the average household size within the Muslim villages of Aligarh. The highest average household size is reported in Jawar, which is 7.13 and lowest household size is reported in Ismailpur, which is 5.73 due to the highest and lowest illiteracy among Muslim women respectively in these areas. It is

also shows from the table that 39.44 per cent household have 4 to 6 member family and about one third have 7 to 9 family members. 21.94 per cent Muslim rural population in Aligarh have more than 9 members in their houses and only 5 per cent have less than 4 members.

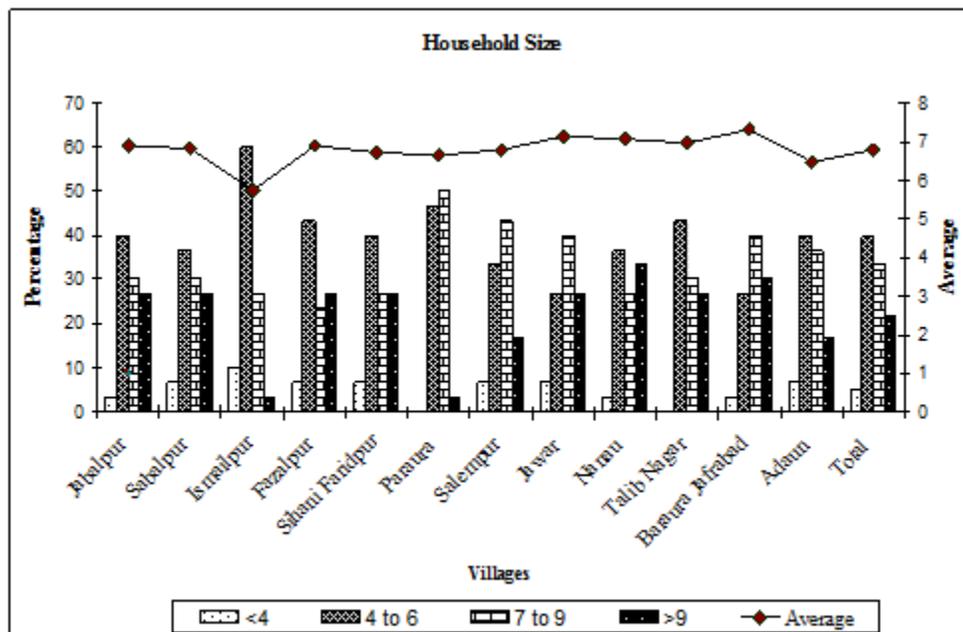


Figure: 4

X. HEALTH CONDITION

The Muslim women in Aligarh district generally life consists of high ratio of disease, malnutrition and ill health. Her general health care is almost ignored due to inadequate nutrition, poor health, lack of maternity centers etc. A house wife who take the responsibility of health care of the family on her shoulder, there is hardly anyone to take care of hers.

XI. DECISION MAKING

Participating in decision making and politics is an important tool to facilitate democracy in the country. But women in rural areas are still fighting for their participation in decision making organizations. The women in Muslim are bound to live within the walls of the house, they can't think beyond the boundary walls. Muslim women are not participating freely in all families and social matters are illiteracy, low family income, large family size and child care etc. Table 4 depicts the percentage distribution of respondent's decision making power. Women are the key decision maker about family welfare, but in Aligarh district Muslim women are more vulnerable about their equal right. It indicates from the table that majority 59.4 per cent women take decision for household affairs so it can be pointed out that women enjoyed empower in the sector of decision

making for household affairs. Only 13.1 per cent Muslim women expressed their opinion having freedom of movement outside the home without husband's permission. Freedom of movement is one of the most important indicators of domestic empowerment for the women. This movement away from the home may have important implications for exposure to information, development of interpersonal skills, increased self- confident and opportunities to take independent action (Syed H et al., 1993). It can be said that a large percentage of women got freedom from their husband to move outside the home freely. About 23.9 per cent women have controlled over daily household expenditure. Hence it appears from the data that, women have not dominating power over the family in respect of daily expenditure for the family. Women were much more behind than the men in decision-making of taking care of their children. 10 per cent of women took care of their child according to their own decision and remaining 90 per cent of respondent took care of their child with husband decision. 46.9 per cent of the respondent expressed their opinion in favour of women's participation as a representative in the society. It is also find out from the table that only 8.1 per cent Muslim women in Aligarh district cast vote by their own decision. They mainly cast their vote by the decision of husband and also head of the household.

Table: 4

S. No.	Opinions of the Respondent	Percentage
1	Household affair	59.4
2	Freedom of movement	13.1
3	Daily household expenditure	23.9
4	Child health	10.0
5	Women participation	46.9
6	Caste of vote	8.1

Source: Based on Field Survey, 2010

XII. GIRL'S EDUCATION

Mother is called as the first teacher of the child; hence she has to be educated. It is important for the proper up bringing of child and for the family as well and for the over all development of the society/ nation. Educational backwardness of Muslim women is the only cause of their socio-economic and political backwardness. Table 5 shows percentage distribution of

respondent's view about their daughter's education, nearly a positive view of respondent seen towards their daughter's education. About 65.3 per cent respondents gave their opinion for equal right in education of son and daughter and 31.4 per cent were agreed for daughter's education less than son. Only 3.3 per cent were agreed for daughter's education more than son because her marriage in good family and they feel that if daughter is educated then she can handle her family easily.

Table: 5

S. No.	Opinion of the Respondent	Percentage
1	Equal to son	65.3
2	Less than son	31.4
3	More than son	3.3
Total		100.0

Source: Based on Field Survey, 2010

XIII. CONCLUSION AND SUGGESTIONS

Education of women is having supreme power for the development of individuality. It is also an instrument for

strengthening socially useful skills, habits and attitudes of common citizenship. Education of rural women also assumes great importance to enable them to get the fullest benefit of globalization. The study reveals that socio economic conditions are the major determinants of women liberation than the religion.

The data illustrates the fact clearly that family structure has an association with the participation of women in the decision making process as well as the status of women. Women are conscious about family welfare but still they are to depend on husband because in most of the cases they are out of the access to money. Most of the respondents agreed for existing equal rights in society but they were not enjoying freedom of exercise regarding their opinion about vote, freedom of movement away from home without husband's permission, daily household expenditure and child health care.

The data indicates a formidable gape between the employment eligibility and the employment availability among the educated Muslim, particularly in the public sector government employment. Most of the Muslim women are housewife besides working as agricultural labourer in their own fields. A Muslim woman is by and large confine to indoor activities. Their opinions and suggestions are not taken into consideration even for some serious families matter. A woman being a mother and a housewife is also expected to look after the domestic works that includes also the cattle feeding etc.

XIV. SUGGESTIONS

For the overall socio-economic development, women should be allowed to pursue their own path in respect of education and employment and should be allowed to participate, particularly in decision making.

1. There was a need for adopting an alternative approach to women's education particularly for women in the lower socio-economic strata in rural areas.
2. Women should be paid equal wages for equal work.
3. Women participation in hazardous work should be prohibited because it affects the health of infants and herself.
4. Skilled education should be given to women in rural areas of Aligarh district.
5. Women are given a required level of skill, education and training not only for their employment, but as necessary requirement for their independence, freedom and to become a fully developed social and cultural being.
6. Should be allowed to participate in political, social and economic activities at all level.

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Agricultural Insect Pest: Occurrence and Infestation Level in Agricultural Fields of Vadodara, Gujarat

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Abstract- The two year of field study were undertaken during year 2009-2010. 49 species of insect pest species were recorded. The maximum numbers of insect pests identified are from the orders Hemiptera and Lepidoptera having 16 and 13 species respectively. Coleoptera is having 9 insect pest species. Minimum insect pests are from the Orders Orthoptera and Thysanoptera having 2 species each whereas from the order Diptera only 1 insect species has been found damaging the crops. The major damage was seen from order Hemiptera and Lepidoptera. Hence the present studies provide good information about different insect pests with cause major crop loss.

Index Terms- insect pest, hemiptera, lepidoptera, coleoptera

I. INTRODUCTION

Today the pest becomes major concern for the farmers across the world. In world food plant are damaged by more than 10,000 species of insects (Dhaliwal *et al.*, 2007). Sometimes the yield loss by insects reaches as high as 60-70%. Dhaliwal *et al.* (2010) reported that the Indian agriculture is currently suffering an annual loss of about Rs. 8, 63, 884 million due to insect pests. In spite of various control measures against pests farmers are mainly depend on chemical control which cause consistently increase in crop loss (Dhaliwal and Koul, 2010). This is due to misuse and overuse of insecticides which cause resistance and increase the survival rate of insect pests. Therefore, toward heavy crop loss, farmers resort to use the pesticides in large quantity, under the adage "if little is good, a lot more will be better" (Aktar *et al.*, 2009). This causes harmful effect on non target living organism (Cork *et al.*, 2003). The extensive field survey was done during 2009-2010 to record the insect pests and their host plant crops in agricultural fields of Vadodara. This study will be helpful in knowing the major insect pests and their extent of damage so that proper control measures can be used in future to minimize the load of insecticides.

II. MATERIALS AND METHODS

Vadodara is in the eastern part of the state of Gujarat in western India. It is located at 22°11' N latitude and 73° 07' E longitude. Vadodara District covers an area of 7,794 sq km. Agriculture fields were selected in all the four directions on the basis of accessibility and location of ecoregion. Economically important crops severely damaged by insect pests were examined; to know about the extent of damage to the crop, as well as to collect insect stages from the crop. Insects were then identified in the laboratory.

A. Study Sites

Areas included were

Savli (North): The field surveyed had crops of Sorghum, Castor, Pigeon pea, Potato, Brinjal, Radish and Cauliflower.

1. Padra (Southwest): The field surveyed had crops of Wheat, Paddy, Pigeon pea, Cabbage and Radish.
2. Waghodia (East): The field surveyed had crops such as Cotton, Castor, Sugarcane and Brinjal
3. Dabhoi (Southeast): The field surveyed had crops of Wheat, Paddy, Maize, Sorghum, Castor and Pigeon pea.

B. Collection Method

Collection of insects was carried out depending upon the season in which crop was grown. Each study site was visited twice a month. On each day the sampling was done twice once in morning hrs (7 am to 9 am) and second time in evening hrs (5pm to 7pm). Collection was done by sweeping and hand picking method. In sweep net method each quadrat was swept several times. Every sweep was repeated after a gap of 10 minutes and 10 sweeps were performed each time. Large sized caterpillars, Mealy bugs, Adult females of Aphids and bugs were handpicked. Large insects were killed using killing jars with potassium cyanide powder. The tiny ones like Aphids and Mealybugs were transferred in the vials having 70-90% ethyl alcohol, brought to the laboratory, mounted on slides and then observed and identified.

C. Identification

Identification and labeling was done using standard taxonomic literature. Collected insects were identified with the help of keys available in Richard and Davies (1997), Borror *et al.* (1992), Leffroy (1909), Ananthkrishnan and David (2004) and standard manuals. The identified material was confirmed from Entomology Division Anand Agriculture University (AAU), Gujarat, India.

D. Host Plants and Assessment of Incidence and Infestation Rate of Insect Pest

Assessment of infestation by insects on various crops was done as per the scale given by Vennila and his Co- author in National Centre for Integrated Pest Management, New Delhi in year 2010.

0-4 Scale infestation

0 Grade: No insect/ indecently seen

1 Grade: Scattered appearance of few insect pests on the plants

2 Grade: Severe incidence of insect pests on only one branch

3 Grade: Severe incidence of insect pests on more than one branch

4 Grade: Severe incidence of insect pests on whole plants was recorded

III. RESULTS AND DISCUSSION

Vadodara has a rich bio-diversity of insects. There are large numbers of agricultural fields of 2-5 hectares surrounding the city. An extensive survey of the agricultural fields in and around Vadodara was done for a period of two years from January 2009 to December 2011. Assessment showed that agricultural fields having economically important crops like Cotton, Maize, Castor, Wheat, Sorghum, Sugarcane, Brinjal, Ladies Finger, Cauliflower, Cabbage etc., were being damaged by a wide range of insect pests. The present study identified 49 species of insects as pests. The number was reported from the collection and identification of insects from the severely damaged crops. The result of insect pest percentage within the agroecosystem of Vadodara reported the maximum insect pests, 33% from order hemiptera. Order lepidoptera was showing 27% of pest percentage followed by coleopteran i.e. 18%. However, the minimum pest percentage was recorded from order diptera (2%) in Vadodara agricultural fields (Graph 1).

In order hemiptera *Aphis gossypii*, *Aphis crassivora* and *Myzus persicae* (Family: Aphididae); *Bemisia tabaci* (Family: Aleyrodidae); *Phenacoccus solenopsis* (Family: Pseudococcidae) are considered as serious threat to agricultural crops which was causing major infestation to cotton, brinjal, cauliflower, cabbage, chickpea in Vadodara fields (Table I). The species of Aphididae, Aleyrodidae and Pseudococcidae families attack various plants, infesting leaves, stems, fruits and roots (Blackman and Eastop, 2000; Vinobaba *et al.*, 2009). *Aphis gossypii* and *Phenacoccus solenopsis* are considered to be a serious pest to almost all agricultural crops and alternative host plants because of their polyphagous feeding habits (Minks and Harrewijn, 1987; Arif *et al.*, 2009). Whereas, Olivera *et al.* (2001) described *Bemisia tabaci* as one of the most important pests worldwide in subtropical and tropical agriculture as well as in greenhouse production systems causes damage to more than 600 plant species. Vennila (2008) reported that the sap sucking pest like aphids, white flies and mealybug as emerging serious pest in India.

Whereas, *Plutella xylostella* (Family: Yponomeutidae); *Scripophaga auriflua* (Family: Pyralidae); *Spodoptera littoralis*, *Helicoverpa armigera* and *Earias insulana* (Family: Noctuidae) belonging to order lepidoptera were considered as major threat to agricultural crops in Vadodara fields due to their wide range of host (Table I). Kartosuwondo and Sunjaya (1991) mentioned *Plutella xylostella* (L.) (Lepidoptera: Yponomeutidae), commonly known as the Diamond Back Moth as one of the most important pests of cruciferous crops throughout the world, which can cause serious economic losses if not checked. Amuwitagama (2002) reported the *Scripophaga auriflua* as major pest in Sri Lanka. Monobrullah *et al.* (2007) mentioned the tobacco caterpillar (*Spodoptera litura* F.) as the most difficult insect pest to control. Tamhankar and Dongre (1992) mentioned *Earias insulana* as major pest of cotton and okra in India. These major pests cause major yield loss to the crops. Attle *et al.* (1987) reported as high as 100% yield reduction of different bean crops due to aphid infestation and during 2006 the mealybug caused economic damage, reducing yield by up to 40-50 % in infested fields in several parts of Gujarat (Nagrare *et al.*, 2009). The outbreak of *S. litura* led to more than 90 per cent yield loss of sunflower cultivar germplasm (Sujatha and Lakshminarayana, 2007). To prevent yield loss farmers are mainly depend on chemical control method. Due to vigorous use of chemical caused resistance, resurgence, environmental hazards and discontinuation of it use (Mascarenhas *et al.*, 1996 and 1998). Therefore the proper management of insect pests are needed as suggested by Gupta *et al.* (2004) integrating them with other proven methods of pest control against the target pests which replace insecticides to which the pest had developed resistance by reducing the number of spray and increases the yield (Dhawan *et al.*, 2011; Grewal *et al.*, 2011; Ahuja, *et al.*, 2012).

Hence, the information provided by present study gives the important understanding of vast range of host plant which is helpful in survival of insect pests throughout the year. Therefore, in future the proper effective and significant ecofriendly method were use for management of these polyphagous insect pests.

Table I: Insect pests and the crops they damage in the agricultural fields of Vadodara

ORDER	FAMILY	PEST NAME	CROP	STATUS
Orthoptera	Gryllotalpidae	<i>Gryllotalpa fossor</i> (Mole cricket)	Paddy	1 Grade
	Acrididae	<i>Schistocerca gregaria</i> (Desert locust)	Cotton, Wheat	2 Grade
Isoptera	Termitidae	<i>Microtermes obesi</i>	Cotton, Sugarcane & Wheat	0 Grade
		<i>Microtermes mycophagus</i>	Castor, Cotton & Sugarcane	2 Grade
		<i>Odontotermes redemanni</i>	Sugarcane & Wheat	0 Grade
		<i>Ox`dontotermes obesus</i>	Sugarcane, Cotton, Wheat & Castor	1 Grade
		<i>Odontotermes guptai</i>	Sugarcane, Cotton, Wheat & Castor	1 Grade
		<i>Odontotermes bhagwathi</i>	Sugarcane, Cotton, Wheat & Castor	1 Grade
Hemiptera		<i>Leptocentrus taurus</i> (Horned treehopper)	Brinjal	0 Grade
		<i>Nephotettix nigropictus</i>	Paddy	0 Grade

ORDER	FAMILY	PEST NAME	CROP	STATUS
	Aphididae	(Green rice leafhopper)		
		<i>Aphis gossypii</i> (Cotton aphids)	Cotton, Brinjal	4 Grade
		<i>Aphis crassivora</i> (Cow pea aphids)	Chick pea, Bean	4 Grade
		<i>Rhopalosiphum maidis</i> (Maize aphid)	Maize, Wheat	2 Grade
		<i>Myzus persicae</i> (Green peach aphids)	Cotton, Spinach, Cabbage, Radish, Brinjal	4 Grade
	Aleyrodidae	<i>Bemisia tabaci</i> (Whitefly)	Cotton, Tobacco, Spinach, Cabbage, Radish, Brinjal	4 Grade
	Lophopidae	<i>Pyrilla perpusilla</i> (Sugarcane leaf hopper)	Sugar cane, Maize, Wheat, Pea.	2 Grade
	Pseudococcidae	<i>Maconellicoccus hirsutus</i> (Hibiscus mealy bug)	Cotton, Tomato, Ladies finger	3 Grade
		<i>Phenacoccus solenopsis</i> (Cotton mealybug)	Cotton, Tomato, Ladies finger, all crops	4 Grade
		<i>Lygaeus militaris</i> (Plant bug)	Cotton	0 Grade
		<i>Lygaeus hospes</i> (Lygaeid bug)	Cotton	2 Grade
	Coreidae	<i>Riptortus linearis</i> (Spined legume bug)	Chick pea, Bean, Gram	0 Grade
		<i>Anoplocnemis phasiana</i> (Coreid bug)	Chick pea, Brinjal	0 Grade
		<i>Clavigralla gibbosa</i> (Pod sucking bug)	Chick pea	1 Grade
	Pentatomidae	<i>Nezara gramineae</i> (Green plant bug)	Wheat, Paddy, Castor	2 Grade
Psychidae	<i>Bagrada picta</i> (Bagrada bug/ Colourful bug)	Cabbage	0 Grade	
Thysanoptera	Thripidae	<i>Caliothrips indicus</i> (Groundnut thrips)	Brinjal, Wheat	4 Grade
		<i>Scirtothrips dorsalis</i> (Chilli thrips)	Cotton, Brinjal, Radish	2 Grade
Coleoptera	Dynastidae	<i>Oryctes rhinoceros</i> (Coconut rhinoceros beetle)	Sugarcane	2 Grade
	Melolonthidae	<i>Holotrichia insularis</i> (White Grub)	Sugarcane, Paddy	2 Grade
		<i>Holotrichia tuberculipennis</i> (Bomboo beetle)	Sugarcane, Paddy	1 Grade
		<i>Autoserica insanabilis</i> (Scarab beetle)	Sugarcane, Paddy	1 Grade
	Bruchidae	<i>Callosobruchus maculatus</i> (Bruchid beetle)	Gram	1 Grade
	Bostrychidae	<i>Rhyzopertha dominica</i> (Lesser grain borer)	Rice , Wheat	1 Grade
	Coccinellidae	<i>Henosepilachna vigintioctopunctata</i> (Twenty- eight spot lady bird beetle)	Brinjal	0 Grade
	Meloidae	<i>Psaldolytta menoni</i> (Blister beetle)	Bean	0 Grade
<i>Mylabris pustulata</i>		Bean	1 Grade	

ORDER	FAMILY	PEST NAME	CROP	STATUS	
		(Orange Blister Beetle)			
Diptera	Agromyzidae	<i>Melanagromyza obtuse</i> (Pigeonpea pod fly)	Chick pea, Bean	2 Grade	
Lepidoptera	Yponomeutidae	<i>Plutella xylostella</i> (Diamondback Moth)	Cabbage	4 Grade	
	Pyralidae	<i>Scirpophaga auriflua</i> (Sugarcane top shoot borer)	Sugarcane	4 Grade	
	Gelechiidae	<i>Platyedra gossypiella</i> (Pink bollworm)	Cotton	4 Grade	
	Nymphalidae	<i>Melanitis leda</i> (Common Evening Brown)	Paddy, Wheat	0 Grade	
	Lycaenidae	<i>Lampides boeticus</i> (Long-tailed Blue)	Gram, Chick pea	4 Grade	
	Noctuidae		<i>Earias insulana</i> (Spiny bollworm)	Cotton	4 Grade
			<i>Trichoplusia ni</i> (Cabbage looper)	Cabbage	2 Grade
			<i>Achaea janata</i> (Castor Semi-looper)	Castor	3 Grade
			<i>Helicoverpa armigera</i> (American bollworm)	Cotton, Cabbage, Radish	4 Grade
			<i>Spodoptera littoralis</i> (African Cotton Leaf worm)	Cotton, Cabbage, Radish	4 Grade
			<i>Pericallia ricini</i> (Darth Maul Moth)	Maize, Brinjal	2 Grade
	Tipulidae	<i>Cretonotus gangis</i> (Hong Kong Tiger Moth)	Paddy, Sugarcane	2 Grade	
Arctiidae	<i>Estigmene lactinea</i> (Cram hairy caterpillar)	Cotton	2 Grade		

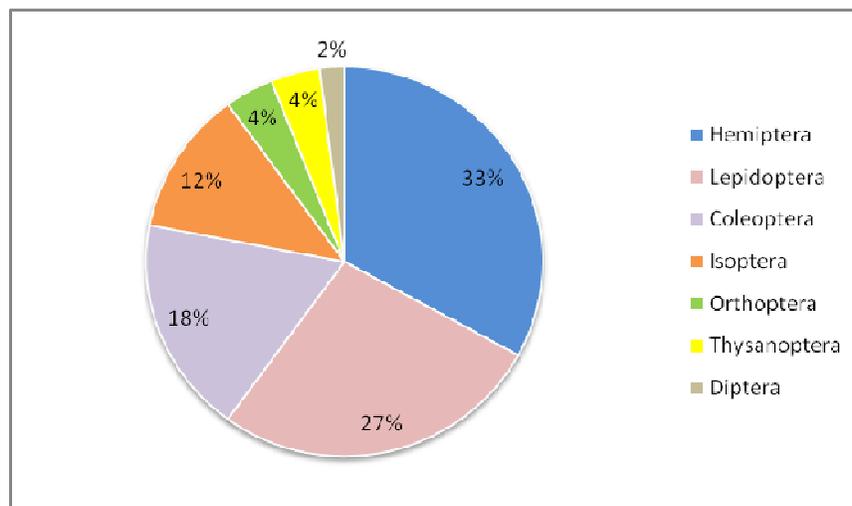


Fig- 1: Insect Pest Percentage within the Agroecosystem of Vadodara

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Automatic Reconfiguration in Wireless Mesh Networks Using Static and Dynamic IP Allocations with Security Considerations

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Abstract- The demands for the network usage are increasing day by day. Result of this is the interference between users and many such losses, which may degrade the system performance. Security techniques could be incorporated to give the ultimate protection to the entire network. The existing techniques like cryptography make the system complicated. This paper is going to deal with a system which can automatically reconfigure the wireless mesh network (WMN). Necessary changes are made in local and radio channel assignments for failure recovery. From the changes made the system make appropriate reconfigurations in the settings of the network. A WMN with an IEEE standard 802.11 along with a Microsoft Visual Studio-10 based evaluation is done. Along with this security is introduced by making use of the dynamic routing which reduces the complexity of security implementation. This routing algorithm can in turn randomize the delivery path of data transmission.

Index Terms-Self reconfiguration,Wireless Mesh networks IEEE 802.11, dynamic routing, link-failures, security, and sensor selection.

I. INTRODUCTION

Wireless mesh networks, an emerging technology, may bring the dream of a seamlessly connected world into reality. Wireless mesh networks can easily, effectively and wirelessly connect entire cities using inexpensive, existing technology. Traditional networks rely on a small number of wired access points or wireless hotspots to connect users. In a wireless mesh network, the network connection is spread out among dozens or even hundreds of wireless mesh nodes that "talk" to each other to share the network connection across a large area. Mesh nodes are small radio transmitters that function in the same way as a wireless router. Nodes use the common WiFi standards known as 802.11a, b and g to communicate wirelessly with users, and, more importantly, with each other. Nodes are programmed with software that tells them the way to interact within the larger network. A system which can adapt to failures by automatic reconfiguration is thus introduced [1].

Security has become one of the major issues for data communication over wired and wireless networks. Different from the past work on the designs of cryptography algorithms and system infrastructures another method to provide security

through routing is to be implemented [2], [3]. Dynamic routing protocols are supported by software applications running on the routing device (the router) which dynamically learn network destinations and how to get to them and also advertise those destinations to other routers. This advertisement function allows all the routers to learn about all the destination networks that exist and how to reach those networks. To implement such dynamic routing protocols, each device needs to communicate routing information to other devices in the network. Each device then determines what to do with the data it receives — either pass it on to the next device or keep it, depending on the protocol. The routing algorithm used should attempt to always ensure that the data takes the most appropriate fastest route to its destination [2].

Maintaining the performance of WMNs in the face of dynamic link failures remains a challenging problem. The quality of wireless links in WMNs can degrade (i.e., link-quality failure) due to interference in other collocated wireless networks. Links in some areas may not be able to accommodate increasing QoS demands from end-users (QoS failures), depending on spatial or temporal locality. Links in some areas may not be able to access wireless channels during a certain time period (spectrum failures) due to spectrum etiquette [4]. Next, the network runs routing protocols to determine the path of the admitted flows. This routing protocol is also assumed to include route discovery and recovery algorithms that can be used for maintaining alternative paths even in the presence of link failures.

As wireless sensor networks continue to attract attention for use in numerous commercial and military applications, there have been many efforts to improve their energy efficiency so that they can operate for very long periods with no manual maintenance. Because of the limited energy supplies of typical micro sensors, however, achieving long network lifetimes has been a very challenging task. Since the cost of manufacturing sensor nodes continues to decrease and large-scale networks consisting of thousands of sensors become realizable, the redundancy that exists among the data generated by the sensors can be exploited. Recent work in this area has focused on techniques such as dynamic sensor selection, in-network aggregation, and distributed source coding that reduce the amount of data generated by the network but ensure that the cumulative data from the sensor network at any given time meets

the sensor network's application quality of service (QoS) requirements.

In this work, Dynamic Antenna Range and Packet aware Routing (DAPR), is proposed which is an integrated routing and sensor selection protocol for wireless sensor networks that attempts to avoid these critical sensors by assigning novel routing costs that incorporate coverage overlap and choose sensors to actively sense and generate data with the knowledge of the effects that this has on potential routers. Routing costs are the first parameter that is to be attempted to avoid routing through sensors that are critical in the sense of meeting application QoS requirements. Sensors are used to sense the various parameters in the network. Here no hardware unit is used. Instead of that software or otherwise coding is written for the working of the sensor part.

II. NETWORK MODEL

The network is assumed to be consisting of mesh nodes, wireless links and gateway. Multi-radio mesh refers to a unique pair of dedicated radios on each end of the link. This means there is a unique frequency used for each wireless hop and thus a dedicated CSMA collision domain. This is a true mesh link where maximum performance without bandwidth degradation in the mesh and without adding latency can be achieved. Such a WMN is shown in Figure1.

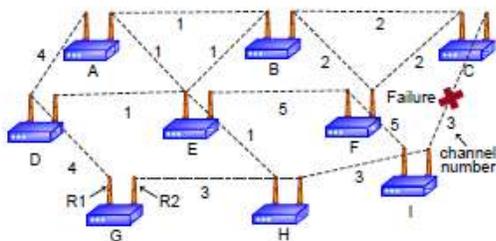


Figure 1: Multi –radio WMN, which has an initial channel assignment as shown

E. Drawbacks of existing approaches

Earlier approaches confine the network changes to be as local as possible. It cannot opt for entire network settings. Even though the approach called greedy channel assignment resolves the above drawback it still has ripple effects which result in the neighboring node settings even if a local change occurs. While considering the QoS, the channel and scheduling algorithms can provide optimal configurations in the network. But this may result in network disruptions. Cross layer interaction can reduce the detouring overhead but has to take extra care in reducing the interference [5]-[10]. Existing work on security-enhanced data transmission includes the design of cryptography algorithms, system infrastructures and security-enhanced routing methods. Their common objectives are often to defeat various threats over the Internet, including eavesdropping, spoofing, session hijacking, etc. All such security treatments make the entire network implementation complicated [3].The existing systems can only deal with large organizations and cannot deal with small

ones. Static IP allocation along with dynamic allocation makes the system applicable in small as well as large organizations.

F. Architecture of ARS

The algorithm given below describes steps follows by the ARS.

Monitoring period (t_m)

- 1: for every link j do
- 2: measure link-quality (l^q) using passive monitoring;
- 3: end for
- 4: send monitoring results to a gateway g;

Failure detection and group formation period (t_f)

- 5: if link l violates link requirements r then
- 6: request a group formation on channel c of link l;
- 7: end if
- 8: participate in a leader election if a request is received;

Planning period (M, t_p)

- 9: if node i is elected as a leader then
- 10: send a planning request message (c, M) to a gateway;
- 11: else if node i is a gateway then
- 12: synchronize requests from reconfiguration groups M_n
- 13: generate a reconfiguration plan (p) for M_i ;
- 14: send a reconfiguration plan p to a leader of M_i ;
- 15: end if

Reconfiguration period (p, t_r)

- 16: if p includes changes of node i then
- 17: apply the changes to links at t;
- 18: end if
- 19: relay p to neighboring members, if any.

The monitoring period indicates that whether we are in a network or not otherwise monitoring period implies the period for which it will take the system to get monitored. The results of this will be time. During the failure detection and group formation period, the s/m under same operating system will be brought into same groups, so that a common access can be given to all. Important term to detect the failure is time to live (TTL). Requesting a group formation on channel c of link will be helping in such a way that, if a power failure occurs in one node neighbors can be asked for clarification to take further steps. The explanations of the steps are given in [1].

ARS undergo localized reconfiguration [8] together with the QoS [5], [6], [11] aware planning. Autonomous reconfiguration is done only after monitoring the link quality. To include rerouting for the reconfiguration planning, the prescribed system interacts across the network and link layers [9],[10].The flow chart shown in Figure 2 gives the diagrammatic explanation of the entire work. The diagrammatic representation of the steps to be followed is shown in Figure 2. Distance vector –based algorithm is used for dynamic routing.

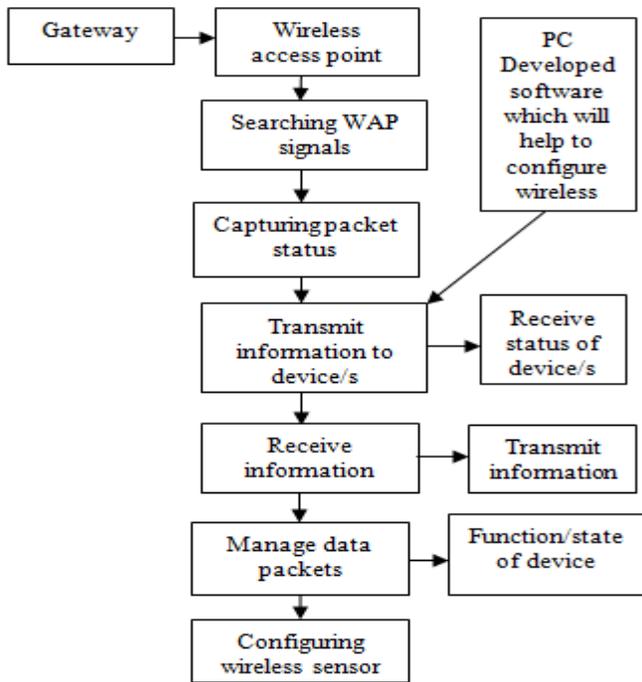


Figure 2: Process flow

A dynamic routing algorithm that could randomize delivery paths for data transmission is proposed here. The algorithm is easy to implement and compatible with popular routing protocols, such as the Routing Information Protocol in wired networks and Destination-Sequenced Distance Vector protocol in wireless networks, without introducing extra control messages. In previous systems such messages were present. Dynamic routing describes the capability of a system, through which routes are characterized by their destination, to alter the path that the route takes through the system in response to a change in conditions. The adaptation is intended to allow as many routes as possible to remain valid (that is, have destinations that can be reached) in response to the change.

G. Functions of ARS

ARS undergo localized reconfiguration together with the QoS aware planning. ARS systematically generates the reconfiguration plans into three processes like feasibility, satisfiability and optimality together with different constraint levels. The constraints used are connectivity, QoS demands and utilization. The plans thus formulated should be feasible since they are necessary to search all the required link changes in a faulty area.

The initial step to be done by the ARS is to detect the faulty links or channels. The system considers three primitive link changes S R and D. Channel switch S is used to simultaneously change the tuned channel, radio switch R is used to to switch and associate one radio in node A with another in B. Routing switch D is to redirect the traffic along the faulty link to another path. ARS follows a two-step approach-generation of feasible plans per link using the primitives and then combines a set of feasible plans that enable a network to maintain connectivity.

III. SYSTEM IMPLEMENTATION

The software architecture of ARS is shown in Figure 3.

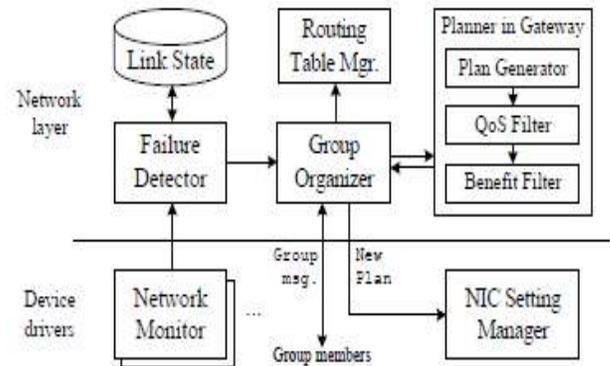


Figure 3: Software architecture of ARS

The software specification can be describes as follows:

A. Front End

Microsoft Visual studio 2010 is used in this project
 Platform: Windows XP or later Versions
 Programming language: C SHARP.Net

B. Features

Microsoft Visual Studio is an integrated development environment (IDE) from Microsoft. It is used to develop console and GUI with Windows applications, web sites, web application, and web services for all platforms supported by Microsoft Windows, Windows Mobile, .NET Framework, and .NET Compact Framework. The result to be achieved is seen in the Microsoft Visual Studio-10 window.

IV. SECURITY CONSIDERATIONS

The aim is to propose a dynamic routing algorithm to improve the security of data transmission. The eavesdropping avoidance problem can be defined as follows:

Given a graph for a network under discussion, a source node, and a destination node, the problem is to minimize the path similarity without introducing any extra control messages, and hence reduce probability of eavesdropping consecutive packets over a specific link.

Rely is on existing distance information exchanged among neighbouring nodes which can also be routers for the seeking of routing paths. In many distance-vector-based implementations, e.g., those based on Routing Information Protocol, each node N_i maintains a routing table in which each entry is associated with a tuple $(t, W_{N_i,t}, \text{Next hop})$, where t , $W_{N_i,t}$, and Next hop denote some unique destination node, an estimated minimal cost to send a packet to t , and the next node along the minimal-cost path to the destination node, respectively. For secured dynamic routing an extended routing table is needed.

The algorithm considered for the security in this paper, Distributed Dynamic Routing Algorithm (DDRA), consists of two parts:

1. Randomizer process for packet deliveries
2. Maintenance of extended routing table.

Consider the delivery of packets with destination t at a node Ni. To reduce or avoid eves-dropping the following algorithm is used. Among these nodes the packets are randomized. For that certain procedures are needed. The algorithms for the above two processes are shown below.

A. Randomized selector

- 1: Let h_s be the used next hop for the previous packet delivery for the source node s
 - 2: if $h_s \in C_t^{N_i}$ then
 - 3: if $|C_t^{N_i}| > 1$, then
 - 4: randomly choose a node x from $\{C_t^{N_i} - h_s\}$ as a next hop, send the packet pkt to node x.
 - 5: $h_s \leftarrow x$ and update routing table of N_i
 - 6: else
 - 7: send pkt to h_s
 - 8: end if
 - 9: else
 - 10: randomly choose node y from $C_t^{N_i}$ as a next hop and send pkt to y
 - 11: $h_s \leftarrow y$, and update the routing table of
 - 12: end if
- For the routing table maintenance the distance vectors have to be taken into consideration. The distance vectors can be exchanged among the adjacent nodes based on predefined time duration.

B. Maintenance of routing table

- 1: if the destination node t is not in the routing table then
- 2: add the entry $(t, (w_{N_i, N_j} + W_{N_j, t}), C_t^{N_i} = \{N_j\}, H_t^{N_i} = \emptyset)$
- 3: else if $(w_{N_i, N_j} + W_{N_j, t}) < W_{N_i, t}$, then
- 4: $C_t^{N_i} \leftarrow (w_{N_i, N_j} + W_{N_j, t})$, and is marked as the minimal cost next hop
- 5: $W_{N_i, t} \leftarrow (w_{N_i, N_j} + W_{N_j, t})$
- 6: for each node $N_k \in Nbr_i$ except N_j do
- 7: if $W_{N_k, t} < W_{N_i, t}$, then
- 8: $C_t^{N_i} \leftarrow C_t^{N_i} \cup \{N_k\}$
- 9: end if
- 10: end for
- 11: send $(t, W_{N_i, t})$ to each neighboring node

- $N_k \in Nbr_i$
- 12: else if $(w_{N_i, N_j} + W_{N_j, t}) > W_{N_i, t}$ then
- 13: if $(N_j \in C_t^{N_i})$ then
- 14: if was marked as the minimal cost next hop then
- 15: $W_{N_i, t} \leftarrow \text{MIN}_{N_k \in Nbr_i} (w_{N_i, N_k} + W_{N_k, t})$
- 16: $C_t^{N_i} \leftarrow \emptyset$
- 17: for each node $N_k \in Nbr_i$ do
- 18: if $W_{N_k, t} < W_{N_i, t}$ then,
- 19: $C_t^{N_i} \leftarrow C_t^{N_i} \cup \{N_k\}$
- 20: end if
- 21: end for
- 22: send $(t, W_{N_i, t})$ to each neighboring node
- 23: else if $W_{N_j, t} > W_{N_i, t}$, then
- 24: $C_t^{N_i} \leftarrow C_t^{N_i} - \{N_j\}$
- 25: end if
- 26: else if $(N_j \notin C_t^{N_i}) \wedge (W_{N_j, t} < W_{N_i, t})$ then
- 27: $C_t^{N_i} \leftarrow C_t^{N_i} \cup \{N_j\}$
- 28: end if
- 29: end if

V. RESULT

The effectiveness in meeting the varying QoS requirements in a multi radio wireless mesh network is evaluated. We initially assign the link capacities symmetrically. Available capacity of the ARS is increased via reconfiguration. The dynamic routing introduced gives security to the routed packets. The steps followed in the entire ARS processing and the associated results are shown in figures 4 and 5 and the security incorporated output is shown in Figure 6. The results shown are results viewed in the Microsoft Visual Studio -10 window. These are formed by using the networks available in the system used.

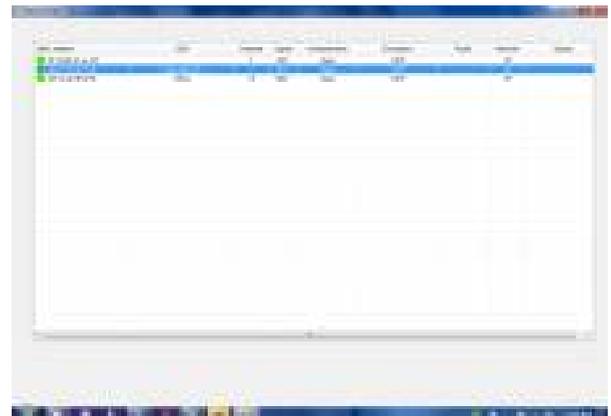


Figure 4: Retrieving the access points



Figure 5: Creation of profile

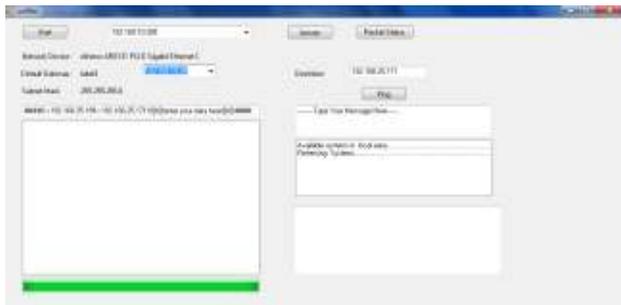


Figure 6: Security incorporated result

VI. CONCLUSION

This paper represents a system which automatically reconfigures the wireless mesh networks. Only local configuration changes are required in this method. This change is done by properly exploiting the radio and channel diversities. Thus the ARS detects real-time failure and reconfigures the network thereby increasing the channel efficiency. The dynamic routing reduces the complexity which was present in the previous cryptographic based systems. Since both the IP allocations are used this system can be used for large and small organizations.

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SQL Based Paperless Examination System

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Abstract- Paperless examination is an important role of modern education, which can effectively reduce the teachers' workload and improve work efficiency. However, the current paperless examination system mainly deals with the objective questions, it is almost impossible to deal with subjective questions such as programming languages, particular in SQL. There is no such practical system as far as know. This article describes a novel SQL-based paperless examination system, including objective questions as well as SQL programming questions.

Index Terms- Database; SQL programming; Paperless Examination

I. INTRODUCTION

Paperless examinations play a very important role in the development of modern education in that they effectively reduce teachers' grading load and increase their overall efficiency. In addition, paperless examinations reduce errors in grading and promote the fairness of the examination. Up till now, we have already had a rich class of paperless examination systems. However, those systems concentrate mostly on dealing with objective questions and fall short on more subjective issues such as programming. There are a few paperless examination systems that orient on programming languages. Up till now; we have already had a rich class of paperless examination systems. However, those systems concentrate mostly on dealing with objective questions and fall short on more subjective issues such as programming. There are a few paperless examination systems that orient on programming languages. For instance, the Paperless Examination System of C Programming Languages by Zhejiang University is a rather comprehensive system that covers a complete series of functions, which include practice, testing, and grading.

For years course has been part of computer science. It has been noticed that while teaching that the biggest challenge the students encounter lies in applying the knowledge and concepts that they learn in class to practice. Although we might be able to partially solve the problem by designated experiments; the approach fails to guarantee prompt feedbacks on the accuracy of students operation. Usually, students would have to submit experiment reports and get feedbacks from the teacher who grades the reports.

II. FUNCTIONS AND AUTHORIZATION

Users of the SQL paperless examination system are classified into three categories, each granted with a different level of

authorization. Namely, we have system administrator, teacher, and student.

System administrator is in charge of management of the system infrastructure. Normally the role is assigned to the responsible party of the course.

This role permits access to the following functions:

a) Account management: add, edit, and delete teacher and student accounts as well as setting permission level of various accounts in lot quantity.

b) Question lib management: set and maintain the global lib of practice questions and the lib of examination questions.

c) Test management: set up the test by customizing the time, format, types of questions of the test. Also includes the export and analysis of scores after a test.

d) System Maintenance: system functions such as regular data backup and data recovery. Authorization associated with the teacher account is related to teaching and management of student information.

Specifically, the role is granted following functions:

a) Customize and announce course materials: a teacher may post course materials onto the systems for students' reference, including presentation slides, experiment notes, introduction of the course, syllabus, and so on.

b) Question lib management: a teacher can post and maintain certain portion of the practice questions for students in his class to use; he may also set the availability of the global lib of practice questions. However, teacher users cannot browse or edit the lib of test questions.

c) Student management: maintain student information, including add, edit, and delete information of students in one's class.

d) Grade management: manage test scores, including edit, delete, export, etc. Student accounts have access to download materials, do practice, and tests.

The functions below are permitted:

a) Material download: browse and download course materials.

b) Practice: solve practice questions and submit answers within the time frame pre-designated by the teacher.

c) Test: solve test questions and submit answers within the time frame pre-designated by the teacher. With the description of functions and authorization, we present the system function module in Figure 1:

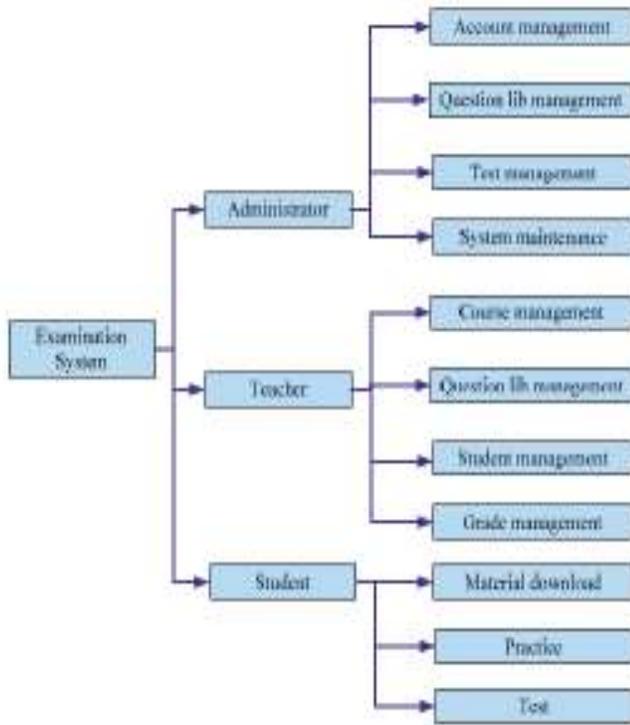


Figure.1 System function module

III. MVC ARCHITECTURE

The main aim of the MVC architecture is to separate the business logic and application data from the presentation data to the user. Here are the reasons why we should use the MVC design pattern.

1. They are reusable: When the problem recurs, there is no need to invent a new solution; we just have to follow the pattern and adapt it as necessary.
2. They are expressive: By using the MVC design pattern our application becomes more expressive.

Model: The model object knows about all the data that need to be displayed. It is model who is aware about all the operations that can be applied to transform that object. It only represents the data of an application. The model represents enterprise data and the business rules that govern access to and updates of this data. Model is not aware about the presentation data and how that data will be displayed to the browser. In the SQL based paperless examination system the model is consist of net-beans, EJB.

View: The view represents the presentation of the application. The view object refers to the model. It uses the query methods of the model to obtain the contents and renders it. It remains same if there is any modification in the business logic. In other words, we can say that it is the responsibility of the view's to maintain the consistency in its presentation when the model changes.

In the system view is JSP and HTML with which actual designing is to be performed.

Controller: Whenever the user sends a request for so meeting then it always go through the controller. The controller is responsible for intercepting the requests from view and passes it to the model for the appropriate action. After the action has been taken on the data, the controller is responsible for directing the appropriate view to the user. In GUIs, the views and the controllers often work very closely together.

In this database system controller is nothing but the Servlets. With the help of this all validation and data storage is controller.

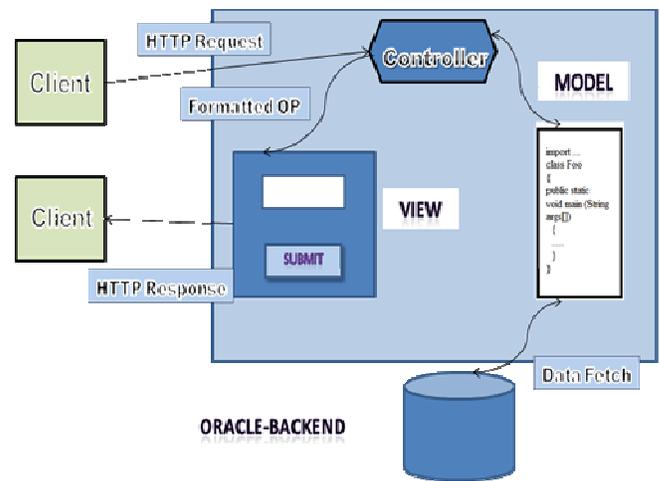


FIG: MVC Architecture for system

IV. EXAMINATION SYSTEM

The SQL based paperless Examination system is consisting of the three main views.

1. Administrator
2. Teacher
3. Student

The Administrator is one who controls all over the examination system. The scheduling of the exam is generally handled by the administrator only. The administrator can update his profile also. The administrators have rights to view that how many number of students are giving exam.

The Teacher is the second important view of the system. Teacher is one who creates Question set for the exam. Also teacher is storing the correct answer in the database so when student submit the answer of the question at that time the answer given by the student and correct answer stored in the database are checked syntactically first.

If no syntax errors then UNION operation is performed on the answer of the student and correct answer. If the operation is giving the true value then the answer given by the student is correct and marks are given to the student. Teacher can also see

the result of the student. He can update his profile. Student is the third and central view of the sql based paperless examination system. The student can update his profile. Now student give the test and view the result.

These all three views are controlled by the examination system.

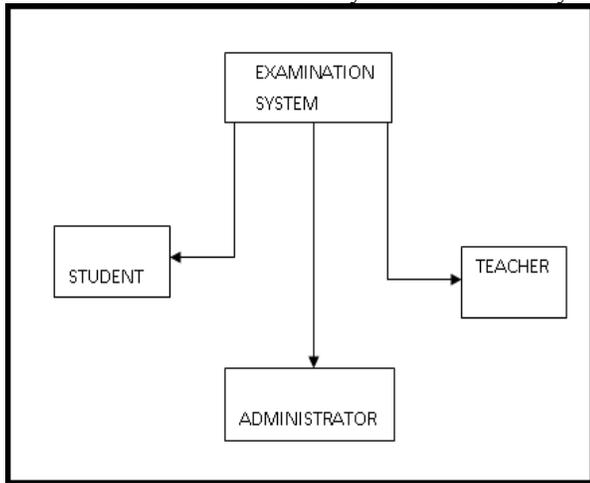


Fig: System Diagram

The above diagram is the functional diagram of the sql based paperless examination system. It gives the designing idea of the examination system. And also gives how all three views are controlled by the examination system.

V. NOVEL FEATURES OF THE SYSTEM

Comparing to existing paperless examination systems, the novel feature of our system is that it implements not only the examination of objective questions, but also questions that involve SQL operation. All the existing test systems handle objective questions well, including multi-choice questions with one or more answers. However, as for operation questions, mostly we need to grade manually which has the problem of heavy load of teachers and high error rate. We did not have a mature machine grading program due to the multi-formity of SQL language, i.e. we have more than one standard answers to a single question. Thus, we cannot execute machine grading with simple methods such as text comparison. We propose an efficient solution with our system. Namely, we are able to filter the multi-formity and compare the results directly, with setup of testing data and comparison of resulting inquiry sets. This method can effectively judge the results of inquiries. For DML commands, with proper transition to corresponding inquiries, we may perform the same process of judging. Meanwhile, we separate the practice lib and standard answer lib. The practice lib is used for students to test their inquiry commands during tests; whereas the standard answer lib is used to determine the correctness of submitted inquiries. The two-lib design prevents students from getting by with a final result set pieced together with the contents in practice lib. The mechanism of system grading is shown in Fig:

THE MECHANISM OF SYSTEM GRADING:

The following flow diagram gives the idea that how the marking i.e. grading is controlled in the SQL based paperless examination system.

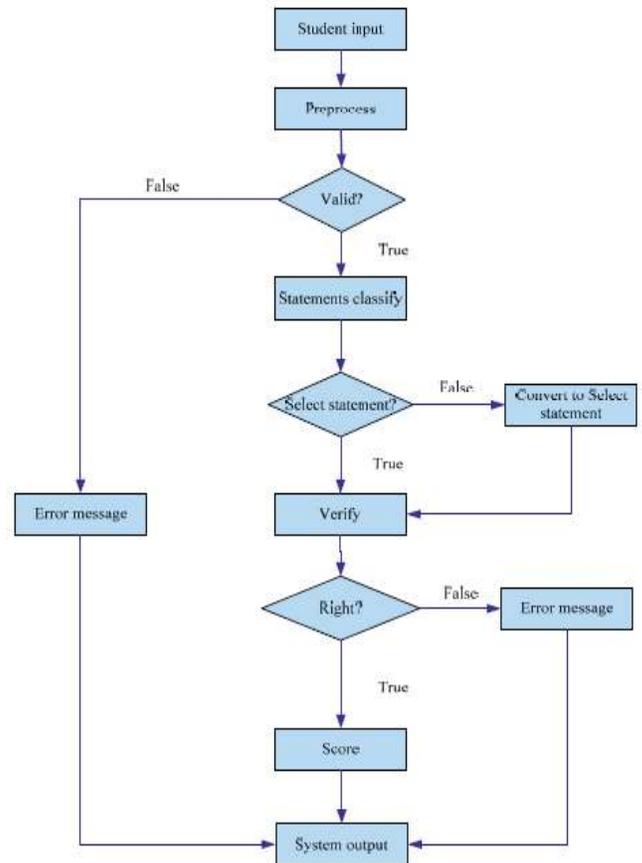


Fig: Mechanism Of Grading System

VI. CONCLUSION

The SQL paperless Examination system shall effectively improve the automation level of examination for courses especially related to DBMS SQL .The project shall improve student performance by introduction of prompt feedback mechanism. The teacher shall also be benefited by analysis provided by the system, which will reduce workload of teachers effectively. Fair grading due to automation shall improve student confidence in examination systems, one of the major goals which all premier universities intend to achieve. The system shall act as a stepping stone for further improvement in DBMS systems due to allied research in storage techniques and data retrieval systems.

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A Semi-Minimalistic Approach to Humanoid Design

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Abstract- Locomotion of a Humanoid robot with lesser number of actuators is a choice of interest, as it leads to energy efficient design. This paper put emphasis on design of a humanoid robot with minimal actuation, minimal control and minimum development cost. It describes, design considerations and methods used for balancing and walking gait generation of a Humanoid Robot with 8 Degrees of Freedom. The proposed robot finds the place in between most sophisticated, complex humanoid robots and simple, miniaturized humanoids.

Index Terms- Centre of Mass (COM), Dead Weight, Degrees of Freedom (DOF), Humanoid Robot, Inverted Pendulum, Joint Structure

I. INTRODUCTION

A Humanoid Robot has an appearance resembling a Human being. Simulation of Human body gives a better understanding about Humanoids. The research interest on Humanoid robotics has incredibly grown in last decade. This is because, Humanoid Robots have proved to be ideal robot design to interact with people naturally.

Huge amount of money is spent for developing Humanoid Robots. Many researchers had put forward minimalistic approaches for designing Humanoids, with reduced development costs. One such minimalistic approach for designing Humanoid robot is to utilize springs and the oscillatory motions of pendulum [1]. These robots have simple control mechanisms, minimal actuation and minimal energy usage. In one such design, the robot has “chicken like legs” and two cooperated pendulum arms. The swinging of the pendulum arms allows the robot to make steps [1]. This design accomplishes the locomotion of the robot, but keeps it away from productive tasks.

The main objective of this research is to develop a Humanoid robot that could find a place in between these minimal Humanoids and complex humanoids, those are similar to human

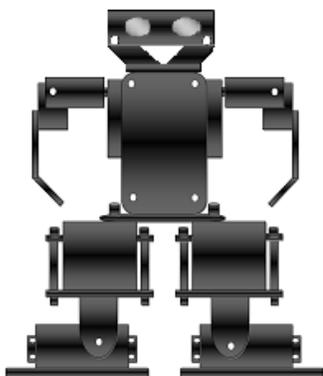


Figure 1: Model of Proposed Robot beings. The development cost, control and complexity of the proposed robot will be a more than minimal humanoids but much lesser than Complex ones. The robot has 8 DOFs 4 DOFs on upper body and 4 DOFs on lower body. Design model of the proposed robot is shown in Figure 1.

II. MECHANICAL DESIGN

A. Configuration of Links and Joints

Figure 2 shows configuration of links and joints of the proposed robot. In the upper body, shoulders are of 1 DOF each and exhibit Pitch orientation. Elbows exhibits roll orientation and are of 1 DOF each on both arms. While considering lower body, hips exhibits yaw orientation and ankles exhibits roll orientation each of 1 DOF on both legs.

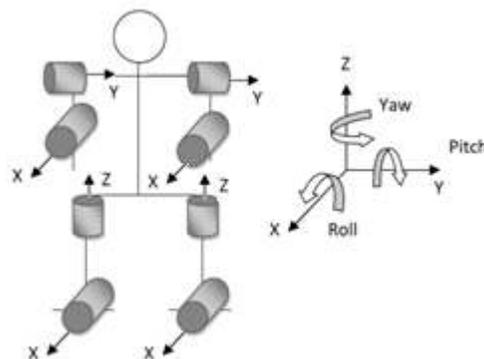


Figure 1. Configuration of Links and Joints

B. An Overview on Inverted Pendulum Model for stability

A biped walker undergoes two support phases. In single support phase, only one feet of the robot is in ground and in Double support phase, both the feet are on ground [2]. During single support phase, the dynamical model of a biped robot can be represented by a simple inverted pendulum. Inverted pendulum model consists of a point mass and a mass less telescopic leg. Figure 3 shows a 3D Inverted pendulum model. The position of the point mass P is specified by variables Θ_x , which is the angle between the pendulum and the xz plane, Θ_y , is the angle between the pendulum and yz plane and L, which indicates the length of mass less leg [3,4]. If biped is walking on a flat plane and vertical height of Centre of Mass (COM) is kept constant, then the dynamics of the pendulum can be expressed as

$$\ddot{x} = \frac{g}{L}x + \frac{1}{mL}T_y \quad (1)$$

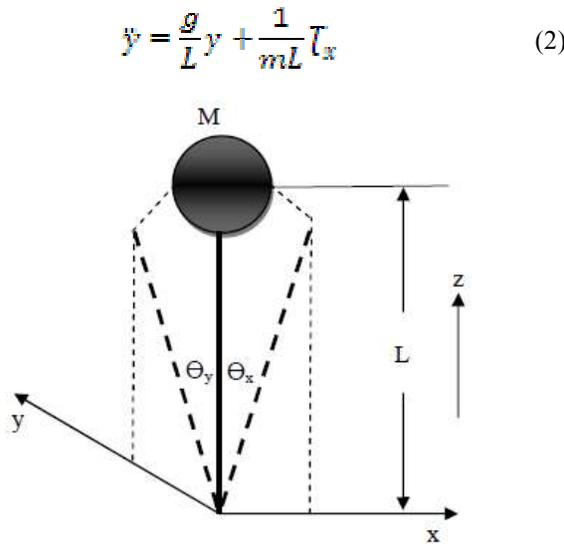


Figure 3. 3D Inverted Pendulum Model

where

g is gravitational acceleration

τ_x and τ_y are Torque applied across x and y axis respectively.

Figure 4 shows, Linear biped Model. It consists of two super imposed Linear Inverted Pendulum models (LIPM) in x -plane. It represents a biped in Double Support Phase [5]. Then equation (1) could be rewritten as

$$\ddot{x} = \frac{g}{L}x + \frac{\tau}{mL} \quad (3)$$

Then the dynamics of two super imposed LIPM could be formed from Equation (3) as follows

$$\ddot{x} = \frac{g}{L}\omega_L(X - x_L) + \frac{g}{L}\omega_R(X - x_R) + \frac{\tau_L + \tau_R}{mL} \quad (4)$$

where

x_L and x_R are locations of two feet

$X = \frac{1}{2}(x_L + x_R)$ is distance halfway from two feet

ω_L and ω_R are stance weight of Left and Right legs respectively

τ_L and τ_R are torque applied to both feet.

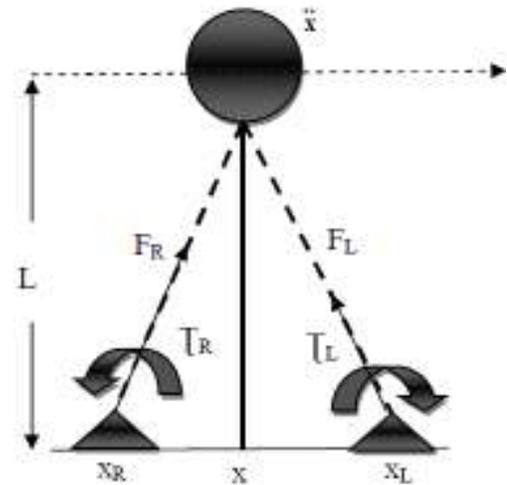


Figure 4. Linear Biped Model; Two super imposed LIPM
 C. Kinematic Model of a 4 DOF Lower limb

Calculating the position and orientation of the end effectors of the robot is called Forward kinematic analysis. Here the end effectors are the foot of the robot that enables locomotion. Kinematic modeling is the computation of Joint space from Cartesian space. This computation is necessary, as it determines orientation of the foot, position of COM of the links, generalized position vector (q), generalized velocity vector (\dot{q}) and generalized acceleration vector (\ddot{q}). Figure 5 shows Joint angles and link parameters of a 4 DOF lower limb.

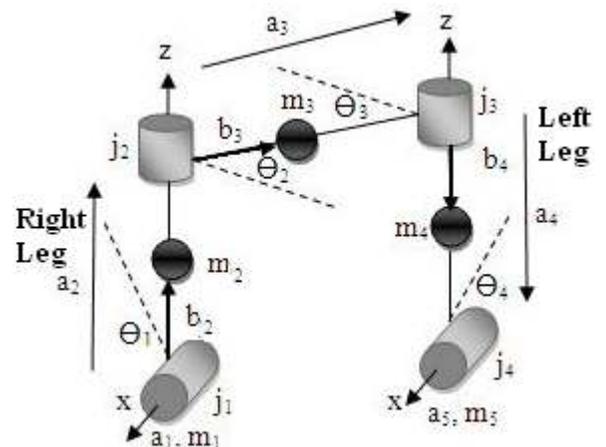


Figure 5. Joint angles and link parameters

The robot basically has 5 links and 4 joints at its lower body. To reduce the mathematical complexity, the foot links, a_1 and a_5 are virtual links with zero mass and zero length [6]. Thus the structure reduces to a 3 links, 4 joints biped model. From figure 5, J_i represents joint associated with link i and are revolute joints, a_i is the link vector connecting the joints j_{i-1} to j_i , b_i is the COM vector specifying the COM of link i , m_i is the Mass of link i and

θ_i represents angle of rotation of each joints.

The orientation of the third link frame of the biped structure shown in Figure 5, can be found using

$${}^0_3R(\theta_1, \theta_2, \theta_3) = {}^0_1R_x(\theta_1) {}^1_2R_z(\theta_2) {}^2_3R_z(\theta_3) \quad (5)$$

Rotation around x axis is defined as

$${}^{i-1}R_x(\Theta_i) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & \cos\Theta_i & -\sin\Theta_i \\ 0 & \sin\Theta_i & \cos\Theta_i \end{bmatrix} \quad (6)$$

Rotation around y axis is defined as

$${}^{i-1}R_y(\Theta_i) = \begin{bmatrix} \cos\Theta_i & 0 & \sin\Theta_i \\ 0 & 1 & 0 \\ -\sin\Theta_i & 0 & \cos\Theta_i \end{bmatrix} \quad (7)$$

And Rotation around z axis is defined as

$${}^{i-1}R_z(\Theta_i) = \begin{bmatrix} \cos\Theta_i & -\sin\Theta_i & 0 \\ \sin\Theta_i & \cos\Theta_i & 0 \\ 0 & 0 & 1 \end{bmatrix} \quad (8)$$

The orientation of the first link frame is

$${}^0R_1(\Theta_1) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & C_1 & -S_1 \\ 0 & S_1 & C_1 \end{bmatrix} \quad (9)$$

where $C_1 = \cos(\Theta_1)$ and $S_1 = \sin(\Theta_1)$

The orientation of second link frame is

$${}^0R_2(\Theta_1, \Theta_2) = \begin{bmatrix} C_2 & -S_2 & 0 \\ C_1 S_2 & C_1 C_2 & -S_1 \\ S_1 S_2 & S_1 C_2 & C_1 \end{bmatrix} \quad (10)$$

and orientation of third link frame is

$${}^0R_3(\Theta_1, \Theta_2, \Theta_3) = \begin{bmatrix} C_2 C_3 - S_2 S_3 & -C_2 S_3 - S_2 C_3 & 0 \\ C_1 S_2 C_3 + C_1 C_2 S_3 & -C_1 S_2 S_3 + C_1 C_2 C_3 & -S_1 \\ S_1 S_2 C_3 + S_1 C_2 S_3 & -S_1 S_2 S_3 + S_1 C_2 C_3 & C_1 \end{bmatrix} \quad (11)$$

The iterative equation for position of COM of link $i+1$ is

$$P_{i+1} = \begin{bmatrix} x_{i+1} \\ y_{i+1} \\ z_{i+1} \end{bmatrix} = {}^0R_i b_i + P_{j_i} \quad (12)$$

where

P_{j_i} is the position of joint i defined as

$$P_{j_i} = \begin{bmatrix} x_{j_i} \\ y_{j_i} \\ z_{j_i} \end{bmatrix} = {}^{i-1}R_{0i} + P_{j_{i-1}} \quad (13)$$

The Generalized position vector is

$$q = \begin{bmatrix} x \\ y \\ z \\ \Theta \end{bmatrix} \quad (14)$$

where

$$x = [x_1 \ x_2 \ x_3]^T$$

$$y = [y_1 \ y_2 \ y_3]^T$$

$$z = [z_1 \ z_2 \ z_3]^T$$

which contains x, y, z co-ordinates of all COM's

$$\Theta = [\Theta_1 \ \Theta_2 \ \Theta_3 \ \Theta_4]^T$$

contains all joints

Generalized velocity vector

$$\dot{q} = \frac{\partial q}{\partial t} \quad (15)$$

and generalized acceleration vector

$$\ddot{q} = \frac{\partial^2 q}{\partial t^2} \quad (16)$$

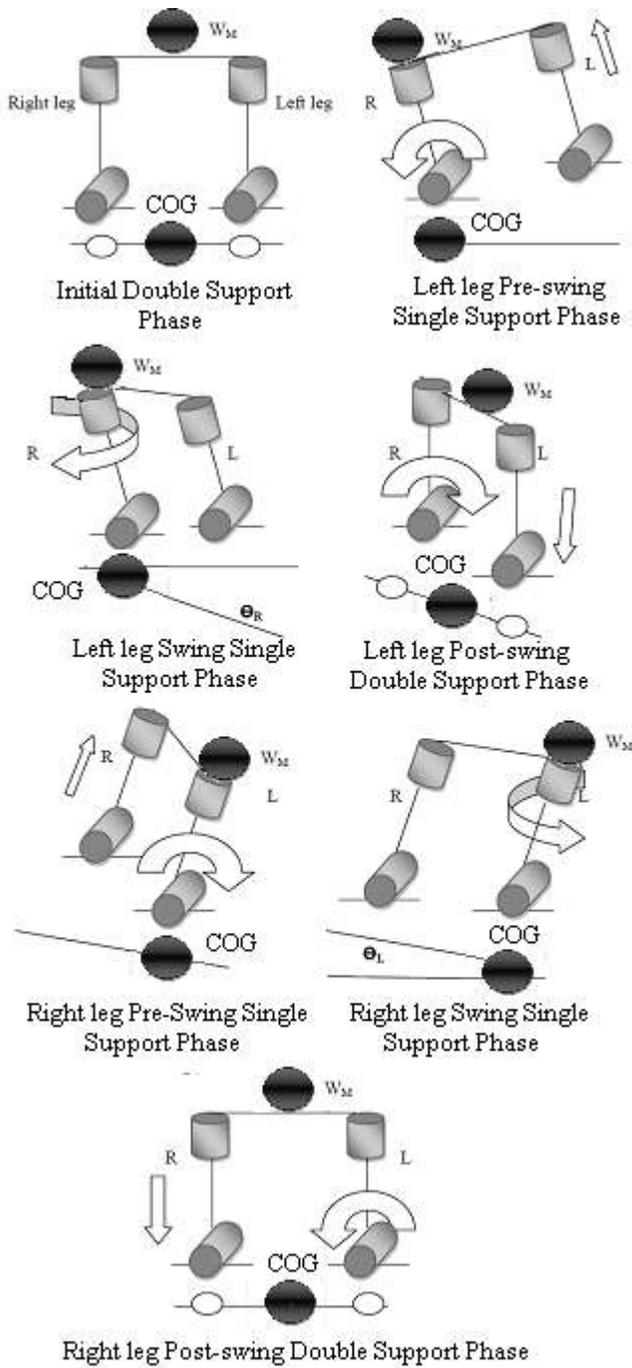


Figure 6. Step by step illustration of forward walking

D. Biped Logic Gait Phases

For a biped robot to walk, it stands on single leg and rotates, the other leg about the standing leg. When both legs comes to footing, the robot is said to be in stable condition. To provide stability in single support phase, concept of Inverted pendulum, as discussed earlier is used. According to this concept, the upper body “Dead Weight” is moved so as to bring the centre of gravity on the axis of footing leg. Various phases of forward walking of the proposed robot is illustrated in figure 6. From figure 6,

W_M is the Weight of the upper body,

θ_R and θ_L are angles around the axis of Left and Right legs respectively.

Each phases are described as follows

- **Initial Double Support Phase-** The robot is in neutral condition. The upper body weight is shared among the two legs. Thus Centre of Gravity (COG) is maintained between the legs.
- **Left leg Pre-swing Single Support Phase-** The robot leans from left to right. The upper body weight is shifted towards right leg. The COG is now concentrated on right foot region.
- **Left leg Swing Single Support Phase-** The lifted left leg swings in air, keeping right feet under the upper body.
- **Left leg Post-swing Double Support Phase-** After swinging the left leg to highest point of its trajectory, the feet is lowered back to ground. The COG is now between the two legs.
- **Right leg Pre-Swing Single Support Phase-** The robot leans from right to left. The upper body weight is shifted towards left leg.
- **Right leg Swing Single Support Phase-** Right leg swings in air.
- **Right leg Post-swing Double Support Phase-** The right feet is lowered back to ground.

While walking these phases are repeated continuously [2,7,8,9].

E. Mechanical Calculations

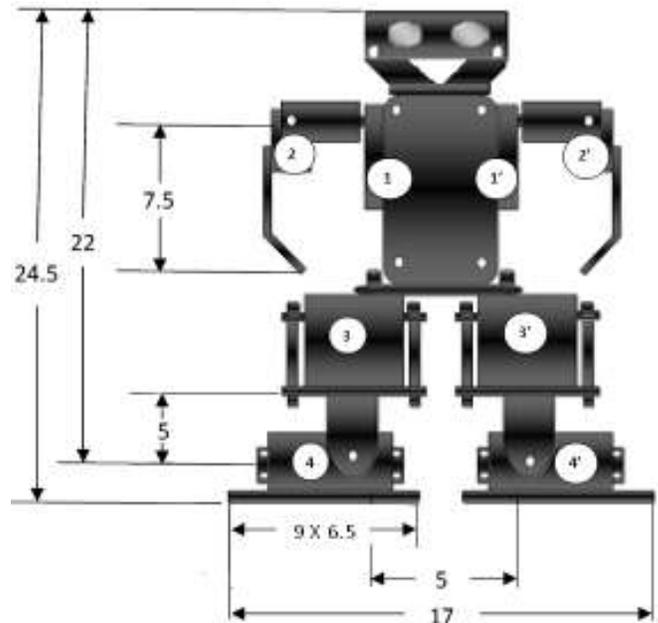


Figure 7. Dimensions and position of motors; All measurements are in centimeters

The dimensions and position of various motors are shown in Figure 7. All motors on right side of the robot is numbered from 1 to 4. Position of motors on left are symmetric to that of right.

• **Torque Calculations**

The Torque required by each motors are calculated by the equation

$$\tau = rF \quad (17)$$

Here, F is the applied load,
 r is the distance from centre support point,
 τ is the resulting torque

Motor 1:

The motor is placed at the shoulder of the robot, which allows the arm of the robot to rotate in pitch orientation.
Weight of the arm including the elbow motor: ~0.025 Kg
Length from centre of shaft of the motor: 7.5 Cm
Using equation (16)
Torque of Motor 1 = $0.025 * 7.5 = \sim 0.1875$ Kg Cm

Motor 2:

The motor is placed on the elbow of the arm, exhibiting Roll orientation.
Weight of the arm link: ~0.015 Kg
Length of the arm from shaft of the motor: 7.5 Cm
Torque of Motor 2 = $0.015 * 7.5 = \sim 0.1125$ Kg Cm

Motor 3:

This motor is at the hip of the robot. It exhibits yaw orientation. During Single support phase, the entire weight of the robot excluding the weight of ankle motor and links of the standing leg is concentrated on to this motor.
Applied load: ~ 0.410 Kg
Length of the shaft of the motor: 5 Cm
Torque of Motor 3 = $0.410 * 5 = \sim 2.05$ Kg Cm

Motor 4:

This motor is at the ankle of the leg and exhibits roll orientation. During Single support phase, the entire weight of the robot excluding the weight of the motor itself is concentrated on to this motor.
Applied Load: ~0.510 Kg
Length of the shaft of the motor: 5 Cm
Torque of Motor 4 = $0.510 * 5 = \sim 2.55$ Kg Cm

III. ELECTRICAL CONSIDERATIONS

The required Electrical power for each motors discussed above could be determined by the equation

$$P = \frac{2\pi N \tau}{60} \quad (18)$$

Where N is RPM of the motor and τ is the Torque.
The current required for each motors are determined by the basic equation

$$I = \frac{P}{V} \quad (19)$$

Where P is the electrical power and V is the applied voltage.
All motors used are of 50 RPM and applied voltage is 5V. Then required electrical power and current for each motors could be calculated.

Motor 1:

Torque = ~ 0.1875 Kg Cm
Using equation (18), required power = 0.9806 Watts
Required current $I = 0.9806 / 5 = 0.1961$ A

Motor 2:

Torque = ~0.1125 Kg Cm
Required power = 0.5884 Watts
Required Current $I = 0.5884 / 5 = 0.1176$ A

Motor 3:

Torque = ~2.05 Kg Cm
Required power = 10.76 Watts
Required Current $I = 10.76 / 5 = 2.144$ A

Motor 4:

Torque = ~2.55 Kg Cm
Required power = 13.34 Watts
Required Current $I = 13.34 / 5 = 2.668$ A

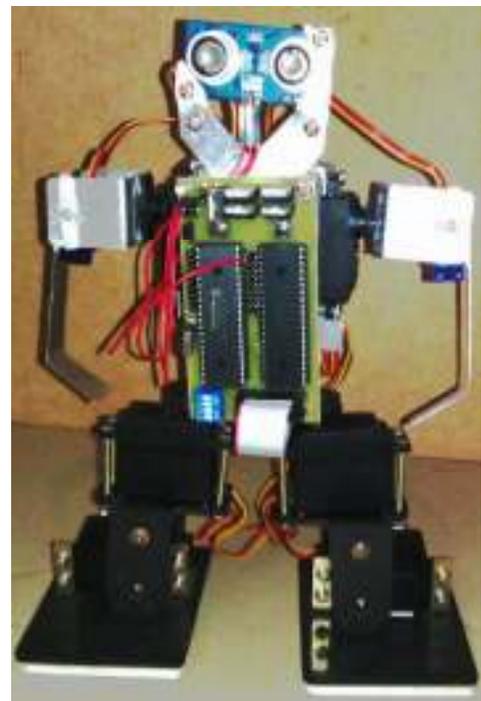


Figure 8: Fabricated Model of the Robot

IV. CONCLUSION

The final fabricated model of the proposed robot is shown in Figure 8. Figure 9 shows the implemented results of various phases of robot gait. This paper is discussing only the designing and gait generation of a simplified humanoid robot. Various applications like obstacle detection, pick and place etc. could be incorporated on to this robot. Human Robot Interaction could also be implemented. Further research is necessary to explore the applications that can be initiated by this robot model. This paper

lays foundations for future research and development of humanoid robots with minimum number of DOFs.

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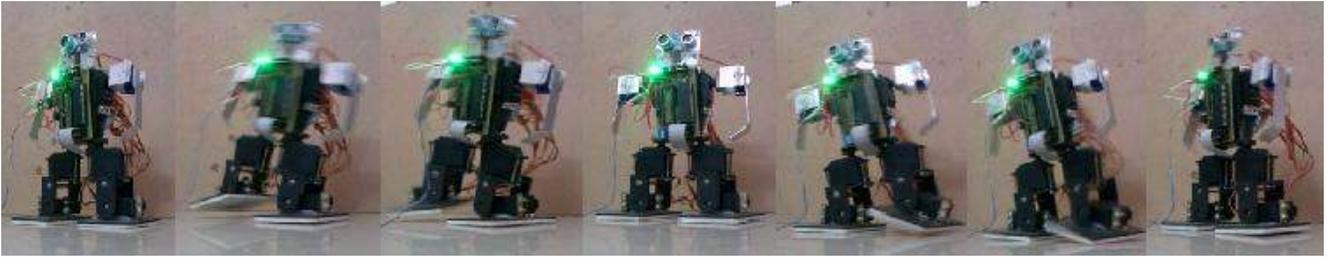


Figure 9: Implemented Results of Phases of robot Gait

A Review of Sub-Carrier Selection Techniques Employed in MC-CDMA System for 4G Networks

Hema Kale, C.G. Dethé, M.M. Mushrif

Abstract- The Multi-Carrier Code Division Multiple Access (MC-CDMA) is becoming a very attractive multiple access technique for high-rate data transmission in the future wireless communication systems. This paper is focused on reviewing different sub-carrier selection techniques for MC-CDMA system. It has been seen that appropriate subcarrier selection technique can significantly improve BER performance, Throughput performance, System capacity, Speed and it results in higher spectrum efficiency as well as reduced power consumption at mobile terminal.

Broadly it can be implemented either by selecting the best sub-carrier and transmitting the whole data of the user through that sub-carrier only or varying the number of sub-carriers allotted according to users requirement and transmitting user's data through the selected group of sub-carriers.

Index Terms- SCS, MC-CDMA, UWB, SNR, BER, ACA, APA

V. INTRODUCTION

A. 4G systems

Future generations of broadband wireless systems will aim to support a wide range of services and bit rates in a bandwidth of the order of tens or even hundreds of megahertz. FCC has mandated that the UWB radio transmission lies between 3.1 and 10.6 GHz, with a minimum bandwidth of 500 MHz [1]. The most important objectives in the design of 4G wireless systems are to address the severe inter symbol interference (ISI) resulting from the high data rates, and to utilize the available bandwidth in a spectrally efficient manner. Recently, multicarrier code division multiple access systems (MC-CDMA) have been considered as the potential candidate for 4G wireless communications which handles ISI most effectively [3]. MCCDMA can outperform OFDMA in the case of varying resource loads. The BER performance of MC-CDMA could be better than OFDMA, when traffic load is not very high.

Sub-carrier selecting MC-CDMA system is employed in development of 4G systems to reduce high power consumption of mobile terminals, to increase cell coverage area and to minimize the effect of high Doppler frequency which are otherwise the concerning issues because of the wide bandwidth transmission needed and the expected use of the high frequency microwave band [2].

B. MC-CDMA

Fourth generation wireless communication demands a better multiple access technique for reducing the multiple access interference (MAI) and intersymbol interference (ISI) and to improve the bit error rate performance. It is pointed out by G.K.D. Prasanna venkatesan in [1] that MC-CDMA can prove to

be the best candidate satisfies the demands of 4G wireless systems.

The conventional code-division multiple-access (CDMA) technique used in third generation system faces serious limitations by channel dispersion causing inter symbol interference (ISI), and it requires advanced signal processing algorithms to implement it. The MC-CDMA employing multiple stream of data channel can combat channel dispersion, hence ISI, thereby increasing system capability to accommodate a higher number of users and its data rate requirements [4].

In MC-CDMA the transmitter spreads each parallel sub stream of data generated with the aid of serial-to-parallel (S-P) conversion given N_p -chip spreading code, $\{c[0], c[1], \dots, c[N_p - 1]\}$ As seen in Fig. (2) the transmitted MC-CDMA signal using BPSK modulation can be expressed as

$$s_{MC}(t) = \sqrt{\frac{2P}{UN_p}} \sum_{i=-M}^M \sum_{u=0}^{U-1} \sum_{j=0}^{N_p-1} b_i [u] c[j] pT_s(t - iT_s) \cos[2\pi(f_c + F_{ju+u})t] \quad (1)$$

where P and f_c represent the transmitted power and carrier frequency respectively, and the processing gain (spreading factor) of $N = T_b/T_c$ represents the number of chips per bit. T_b and T_c represents the bit duration and chip duration, respectively. Furthermore, in Eq. 1 $2M + 1$ represents the number of bits conveyed by a transmitted data burst, $b[i] \in \{+1, -1\}$ is the i th transmitted bit, while $c[j] \in \{+1, -1\}$ is the j th chip of the spreading code, and finally, $p_T(t)$ represents the chip waveform defined over the interval $[0, \tau)$. In Eq.1 U represents the number of bits that are S-P converted, where each transmitted symbol contains U data bits, $2M + 1$ represents the number of U -bit symbols conveyed by a transmitted data burst, and $b_i[u] \in \{+1, -1\}$ represents the u th bit of the i th transmitted symbol [5].

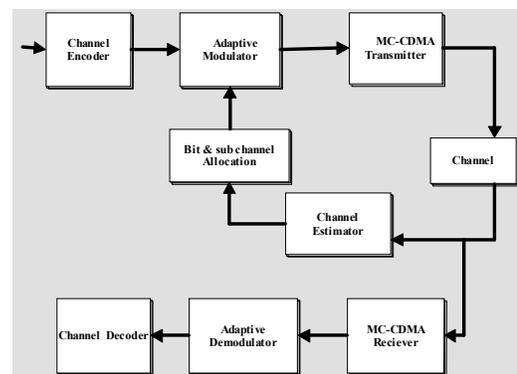


Fig.1: MC-CDMA system [4]

Frequency- domain spreading Data bit:
 1(solid)-1(dashed) Subcarrier bandwidth=2/Ts
 Spreading code: +1+1+1+1-1-1-1-1

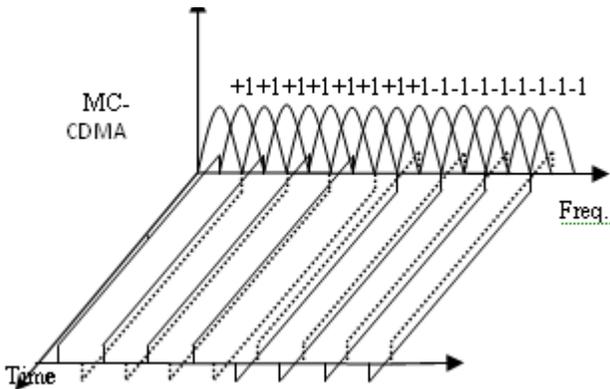


Fig.2 Power Spectra & Time Domain Signal wave forms associated with MC-CDMA using the frequency domain spreading code {+1+1+1+1 -1-1-1-1}and S-P Conversion associated with U=2bits [5].

C. SCS-MC-CDMA

Frequency allocation is a major issue in the performance of wireless networks. In multi user MC-CDMA systems, the channel fading is different at different sub carriers. This feature can be used for allocating the subcarriers to the users according to the instantaneous channel state information. The SCS-MC-CDMA system as seen in Fig.3 assigns to each user a selected number of sub-carriers. The concept of sub-carrier selection is introduced to counter the problem of high power consumption. MC-CDMA systems usually have lots of sub-carriers, by extracting only the assigned sub-carriers from the whole band by using the appropriate sub-carrier selection technique, we can match the power consumption to the user’s data rate.

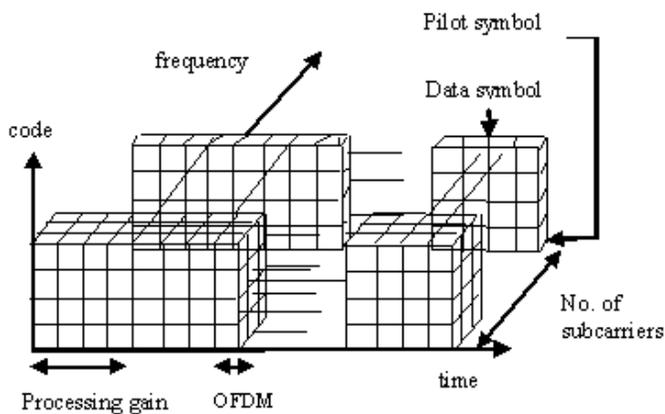


Fig. 3: Frame format of SCS-MC-CDMA system [2]

Sub carriers are allocated depending on user’s data or depending on instantaneous Channel State Information (CSI) which include receiving maximum power on particular sub-carrier or finding the sub-carrier with maximum SNR or determining required amount of transmit power on each subcarrier.

Appropriate sub-carrier selection technique results in High Spectrum efficiency, Reduced high power consumption at the mobile terminal, High data throughput in a multicell environment, Improved BER performance due to the high-speed data processing needed, Reduced signal processing load at the mobile terminal.

We commence with a brief discussion of different sub-carrier selection techniques one by one.

VI. OVERVIEW OF SUB-CARRIER SELECTION TECHNIQUES EMPLOYING SINGLE SUB-CARRIER SELECTION

In this category out of the available sub-carriers at the base station the best sub-carrier is selected for transmission and the whole data of the user is transmitted through that sub-carrier only. Part A and part B discusses a basic technique for sub-carrier selection depending on the SNR of the sub-carrier. In part C a sub-carrier selection technique depending on receiving power of the sub-carrier is discussed.

A. Water-filling algorithm

Water-filling algorithm has been employed in many research studies for selecting the best sub-carrier amongst all. The design of this algorithm is given by Qingxin Chen, Elvino S. Sousa and Subbarayan Pasupathy [10] and it was motivated by the water-filling (WF) principle in information theory. This principle states that given parallel channels with Gaussian noise, information should be first fed into channels with lower noise levels to achieve the maximum channel capacity. This algorithm aims at maximizing the average SINR of the system.

A simple recursive algorithm has been given [10] as follows

Following notations are used in the Algorithm,

K – Total number of users,

$$k = 1, 2, \dots, K,$$

M – Total number of subchannels.

$$m = 1, 2, \dots, M.$$

Algorithm from the paper [10] is simplified as,

Step 0) Define and initialize matrix S , elements of S are given as below by $s_{i,j}$:

$$s_{i,j} = \frac{N_0}{v_{i,j}}, \quad \begin{matrix} i = 1, 2, \dots, K, \\ j = 1, 2, \dots, M. \end{matrix} \quad (2)$$

where

$v_{i,j}$ -- Received energy per bit for the (i,j) sub channel given as,

$$v_{i,j} = \frac{1}{2} Y_{i,j}^2 T \quad (3)$$

where

$$Y_{i,j} = \alpha_{i,j} \sqrt{2P}$$

Where $\alpha_{i,j}$ -- Fading amplitude which measures the channel quality .

Sub channels with $\alpha_{k,m} > 1$ - Enhances the signal levels and

Sub channels with $\alpha_{k,m} < 1$ - Weaken the signal.

P – Transmitted Power per data stream.

N -- Gaussian distribution with variable variance

Step 1) Define a set $Q = \{1,2,\dots,K\}$.

Step 2) Find the (k,m) subchannel such that:

$$s_{k,m} = \max(S_{\min(i)}) \tag{4}$$

Where

$$S_{\min} = \{ s_{\min(i)}, i \in Q \}$$

And

$$s_{\min(i)} = \min(s_{i,1}, s_{i,2}, \dots, s_{i,M})$$

Step 3) Assign data from the k th user to the (k, m) sub channel and update S as follows:

$$s_{i,m} = s_{i,m} + \delta_{i,m}^k \tag{5}$$

$$i = 1, 2, \dots, K$$

where

$\delta_{i,m}^k$ - NIT (Normalised interference term) contributed to sub channel (i, m) by adding one data to sub channel (k, m)

$$\delta_{i,m}^k = \frac{v_{k,m} T^2}{v_{i,m} N} \tag{6}$$

Where

$$T = \frac{T_d}{T_c}$$

Where

T_d - Channel delay spread.
 T_c - Chip duration.

Step 4) Delete the element F from the set Q .

Step 5) If $Q \neq 0$, go to Step 2.

Step 6) Repeat Steps 1 - 5, M times

Flowchart for the above algorithm is constructed as shown in Fig 4 using it one can easily understand the basic principle,

The WF algorithm is simple to implement and it will converge after $K \times M$ iterations. Where K is the total no. of users and M is the total no. of subchannels.

In the next section it is going to consider that how a WF algorithm is used as a subcarrier selection technique for adaptive modulation based MC-CDMA System.

B. Dynamic Sub-Carrier Allocation Technique for Adaptive Modulation based MC-CDMA System

In MC-CDMA the performance of the system is improved by adaptively loading sub-carriers in accordance with the varying channel conditions [3]. This technique is focused on selecting the best sub-carrier and transmitting the data through that sub carrier by adaptive bit loading algorithm. In this technique water filling algorithm is used to select the best sub-carrier, over the existing subcarriers. Differently from conventional MC-CDMA system, in this scheme, a best conditioned sub-carrier is first chosen for each user, and a narrowband direct sequence waveform is transmitted through the chosen sub-carrier instead of all the sub carriers.

From the paper considering given MC-CDMA system with K users, the transmitted signal is given by,

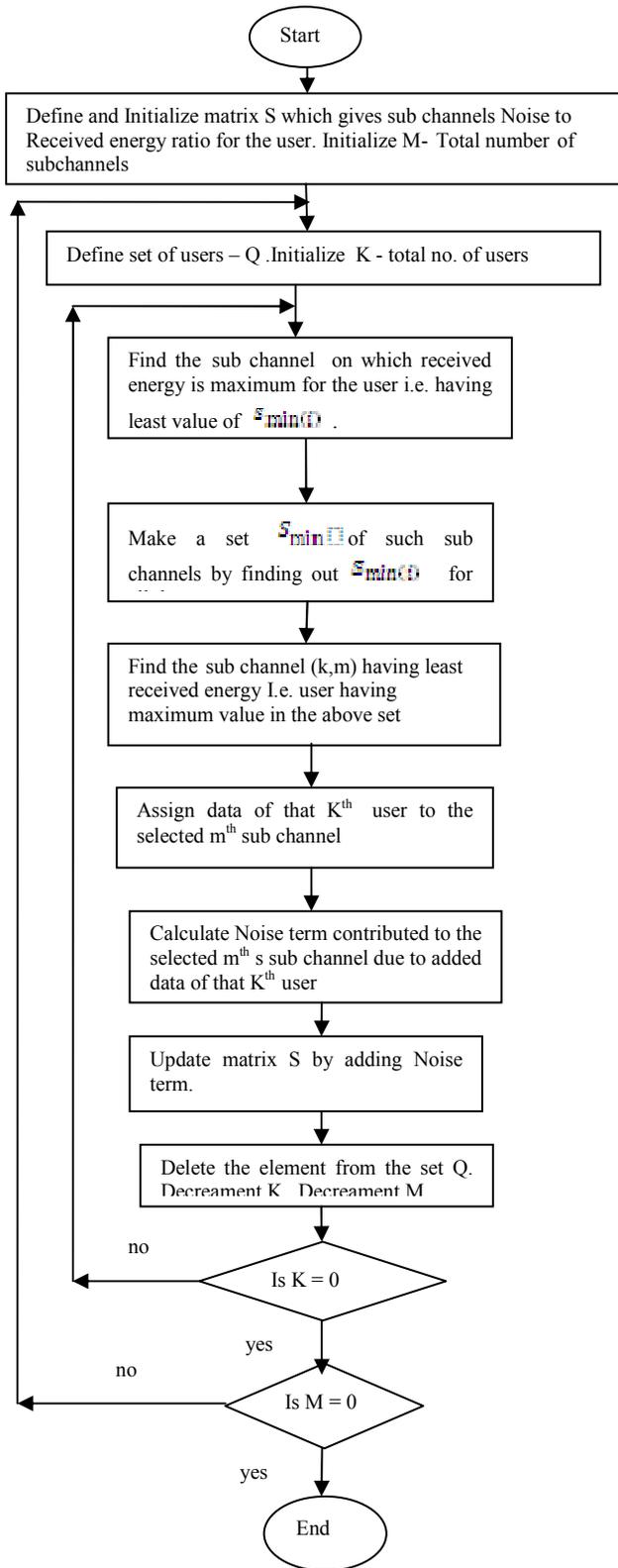


Fig 4 : Flowchart of water filling algorithm

$$s(t) = \sqrt{2ME_c} \sum_{k=1}^K \sum_{l=-\infty}^{\infty} a_l^{(k)} c^{(k)}(t-lT) \cdot \cos w_{j_k} t$$

Where

$$c^{(k)}(t) = \sum_{n=0}^{N-1} c_n^k p(t - nT_c) \tag{7}$$

In Eq. (7), $a_l^{(k)}$ is the binary symbol bit of the k th user, c_n^k is the signature sequence of the k th user, $T = NMT_c$ is the symbol duration with $M T_c$ the chip duration for MC system, and E_c is the energy per chip. M is the number of sub-carriers, j_k indicates the best transmission sub-carrier, and $p(t - nT_c)$ is a rectangular pulse with duration $M T_c$.

Author G.K.D. Prasanna assume the channel is frequency selective Rayleigh fading, but the sub-carriers are frequency nonselective and independent of each other this can be achieved by selecting M properly. Then the complex low pass impulse response of the sub-carriers has been modeled as,

$$h_{k,m}(t) = \alpha_{k,m} e^{j\varphi_{k,m}} \delta(t) \tag{8}$$

where $\alpha_{k,m}$ is the fading amplitude, $\varphi_{k,m}$ is the random phase of the sub-carrier. The amplitude $\{ \alpha_{k,m}, m = 1, 2, \dots, M \}$, are independent and identically distributed (i.i.d.)

Rayleigh fading random variables and $\{ \varphi_{k,m}, m = 1, 2, \dots, M \}$, are uniform i.i.d. random variables over $[0, 2\pi)$.

The received signal at the k th mobile is given by

$$r(t) = \sqrt{2ME_c} \sum_{k=1}^K \sum_{l=-\infty}^{\infty} a_l^{(k)} c^{(k)}(t-lT) \alpha_{k,j_k} \cos(w_{j_k} t + \varphi_{k,j_k}) + n_w(t) + n_j(t) \tag{9}$$

where $n_w(t)$ is the additive white Gaussian noise with a double side spectral density of $N_0/2$, and $n_j(t)$ is partial band interference with spectral density of $S_{n_j}(f)$. The pdf of the partial band interference, $S_{n_j}(f)$ is defined as

$$S_{n_j}(f) = \begin{cases} \frac{N_j}{2}, & f_j - \frac{W_j}{2} \leq |f| \leq f_j + \frac{W_j}{2} \\ 0, & \text{elsewhere} \end{cases} \tag{10}$$

Thus, the adaptive technique will have a higher data throughput when the channel conditions are favorable and will reduce the throughput as the channel worsens. In other words, from the given technique the principle of adaptive modulation consists of allocating many bits to carriers with a high SNR, whereas on carriers with low SNR, only a few or no bits at all are transmitted

C. Adaptive Sub-carrier and Power Allocation

A dynamic sub channel and power allocation algorithm for MC-CDMA system. is proposed in [12]. In this scheme, data is transmitted over the user's best subcarrier and power control is applied for the selected subcarrier, rather than transmitted over all the subcarriers. This scheme outperforms the conventional MC-CDMA in BER performance. In this scheme first $\alpha_{k,m}$, the

magnitude of the channel gain (assuming the coherent reception) of the m^{th} subcarrier is denoted as seen by the k^{th} user, which can be obtained by pilot signal.

Furthermore, P_k the pilot symbol power is denoted and the received power of m^{th} subcarrier for the k^{th} user is equal

$$P_{k,m,r} = P_k \alpha_{k,m}^2 \tag{11}$$

From the paper it can be concluded that the subcarrier that has the maximum receiving power will be the best subcarrier for that user.

Next section throws light on different techniques which are used for selecting no. of subcarriers instead of selecting only one subcarrier for data transmission of one user.

VII. OVERVIEW OF SUB-CARRIER SELECTION TECHNIQUES EMPLOYING NUMBER OF SUB-CARRIER SELECTION

In this category out of the available sub-carriers first the numbers of sub-carriers required for one user are selected and then user's data is transmitted through that selected group of sub-carriers.

In A subcarriers are allocated by computing SNR. In the next technique B subcarrier selection filters are used. In C a different subcarrier selection technique called as Grouped MC-CDMA is used which subdivides system subcarriers into a set of non overlapping subcarrier groups. In D an algorithm is used where the subcarriers are allocated to the user according to the instantaneous Channel State Information (CSI).

A. Dynamic subcarrier allocation and adaptive slot management

By dynamically allocating subcarriers and adaptive slot management the system can meet the large dynamic resource requirements of a real-time multimedia application in Internet [4]. In this scheme the selection of subcarriers is carried out based on it's current SNR to support a minimum BER. In this technique, the effect of asymmetric slot management strategy employing adaptive resource allocation in a MC-CDMA system is studied, in which each cell has its own slot allocation policy according to the level of traffic load. The algorithm manages the subcarrier and slots to meet the quality of service requirement of an application. The slot management algorithm (Fig. 3) decides whether an outgoing slot is to be declared as uplink/downlink based on the existing capacity of the present slot.

System model for MC-CDMA in multi-cell environment has been built by generalizing the two cell model. Paper considers two cell approaches, in which four cases arise: i. cell1 uplink cell2 uplink, ii. Cell1 uplink cell2 downlink, iii. Cell1 downlink cell2 uplink, and iv. Cell1 downlink cell2 downlink. Here cell1 represents a home cell for tagged mobile, and cell2 a cell in first tier interfering cells. First the SNR is calculated using the formulae that falls under any one of the four cases considered. SNR computation from the paper is given as below,

SNR computation for Cell1 UL Cell2 DL:

Assuming at a particular time, slot in Cell1 is for uplink and in cell2 it is for downlink. In the SNR computation, considering noise because of presence of other user, assuming that all MS are perfectly synchronized with uplink and downlink slots in a TDD frame. Further it is assumed that a perfect power control mechanism is implemented, so that BS receives equal power

from all MS in its cell. The background thermal noise N_o , can be ignored as it is very small compare to the I_{int} and I_{ext} . Let the equal power received by BS from every MS in cell1 is P_{rms1} . The internal noise, I_{int} can be related to the number of channels in cell1 and the number of cross slot as,

$$I_{ext} = \lambda(2D)^{-4} \left(\frac{m_2}{N_o}\right) P_{tbs2} \tag{13}$$

Where $2D$ is the distance (i.e. cell radius of D) between two BS, P_{tbs2} is the transmit power at BS2. If W is the total spreading bandwidth, the spreading factor, (also called processing gain) for uplink, SF_u is given by,

$$SF_u = \frac{W}{R_u} \tag{14}$$

Now the SNR for the uplink slot in cell1 is given by

$$SNR = \frac{r^{-4} P_{tms1} SF_u}{\left(\frac{m_1}{N_o} - 1\right) P_{rms1} + (2D)^{-4} P_{tbs2} \frac{m_2}{N_o}} \tag{15}$$

BER Calculation

The BER for the i th Sub-Carrier corresponding to M-QAM is given by [16]

$$BER_i = \frac{1}{5} \times \exp \left[\frac{-1.5 \times SNR_i}{M - 1} \right] \tag{16}$$

Where SNR_i is the signal to noise ratio for i th subcarrier, and M is the constellation points in M-QAM

The SNR is recomputed every time based on the new call arrival rate, and hence the addition of a new subcarrier in a slot. The new call includes handoff user too. The BER is computed using (16) based on the SNR and a high modulation order ($M=8$). If $BER > 10^{-3}$, then order of modulation M is reduced and BER is computed again, and this process is repeated till BER falls below 10^{-3} and the corresponding M value is retained to be used for order of modulation in M-QAM. If BER does not falls below 10^{-3} and $M = 2$, then the next slot is declared as same status (e.g. uplink if the current slot is uplink) and new calls are accommodated in new slots. Based on the existing SNR and application's bandwidth requirement, the no. of subcarriers are allocated to these new calls. If the accumulated bandwidth (BW_c) i.e. no of subcarrier is just enough to meet the requirement (BW_r), the resource allocation completes for a user and the algorithm takes next call to be processed.

In the next technique Butterworth filter is used for subcarrier selection.

B. Sub-Carrier Selecting MC-CDMA System for 4G Systems

Teruya Fujii, Noboru Izuka, Hiroyoshi Masui, and Atsushi Nagate [2] has introduced the concept of sub-carrier selection to counter the problem of high power consumption. For high speed data processing high power consumption at the mobile terminals is needed. In this scheme each user has assigned only as many subcarriers as are needed to support the user's data rate. To reduce the implementation complexity here in the paper, use of only one or two sub-carrier selection filters is considered.

The SCS-MC-CDMA system assigns to each user a selected number of sub-carriers as shown in Figure below,

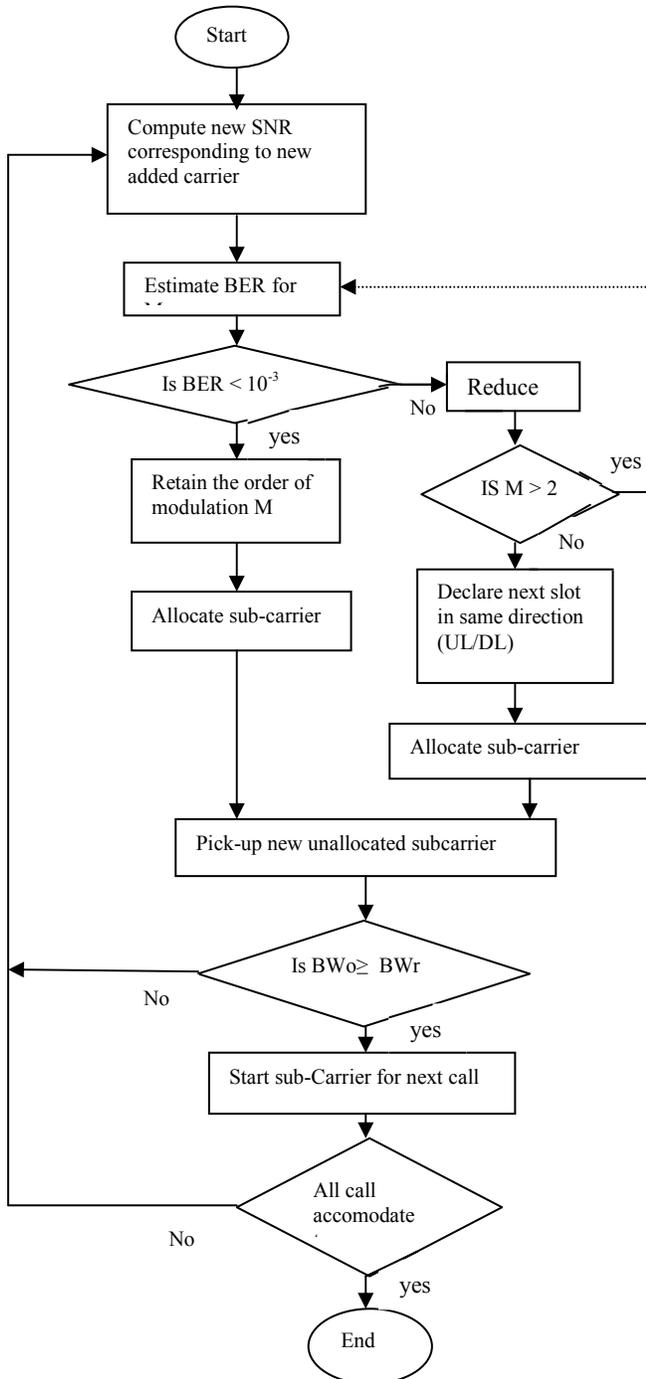


Fig.5 : Flow chart of algorithm [4]

$$I_{int} = \{(m_1 / N_o) - 1\} P_{rms1} \tag{12}$$

The external noise I_{ext} in cell1 is the downlink signal originating from BS in cell2, and can be given by,

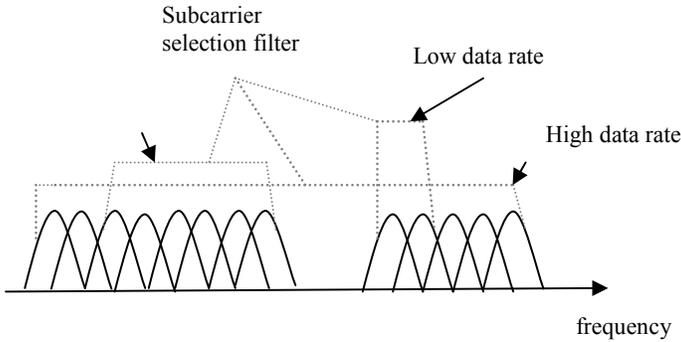


Fig. 6 : Sub carrier selection [2].

For example, 32, 128, or 1024 sub-carriers out of a total of 1024 sub-carriers can be assigned for each low, middle, or high data rate communications, respectively. Therefore, a mobile terminal needs only one or two sub-carrier selection filters. The users who are assigned the same sub-carriers use different spreading codes, so that orthogonality among users is maintained. As for the base station, it just needs to map the data of each user onto the particular sub-carriers. This mapping is the only difference between the base station of the given system and that of the original MC-CDMA systems. Figure shows the block diagram of the receiver.

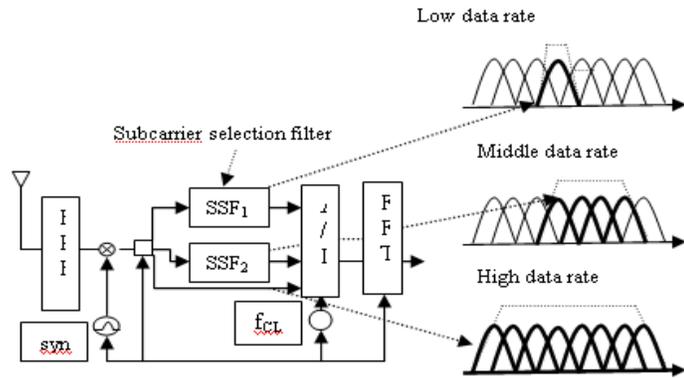


Fig. 7 : Receiver block diagram [2]

The key to the scheme considered is the sub-carrier selection filter (SSF), each of which has a different bandwidth. In the transmitter, the number of assigned sub-carriers is changed as the user’s data rate changes. In the receiver, corresponding to the number of sub-carriers assigned, the controller selects the appropriate sub-carrier selection filter; it also adjusts the sampling frequency of the A/D converter and the number of FFT points. The controller adjusts the frequency of the synthesizer according to the center frequency of the signal at the band-pass filter output.

Because the receiver selects the sub-carrier selection filter with appropriate bandwidth and demodulates only the assigned sub-carriers, the received signal bandwidth is narrower than that with the conventional approach. Therefore, this technique can lower the sampling rate of the A/D converter as well as the signal processing power required for FFT as part of demodulation. As a result, the power consumption of a mobile terminal, which is running a low data rate service such as voice or control, can be

significantly reduced. Without sub-carrier selection technique, the signal processing power required for demodulation is proportional to N_c^2 regardless of the data rate at the receiver, where N_c is the total number of sub-carriers. With the use of sub carrier selection filter on the other hand, the signal processing power at the receiver is proportional to N_d^2 , where N_d is the number of assigned sub-carriers. Moreover, mobile terminals, which do not need high rate communications, such as voice terminals can be downsized easily.

C. Subcarrier Group Assignment for MC-CDMA Wireless Networks

Grouped MC-CDMA systems have the potential of enhancing prospective system capacity. Grouped MC-CDMA subdivides system subcarriers into a set of nonoverlapping subcarrier groups [6]. This opens a platform for isolating the received target signal from sources of intolerably high interference and potentially resulting in capacity improvements.

Two interference-based subcarrier group assignment strategies in dynamic resource allocation are considered in [6] for MC-CDMA wire-less systems to achieve high throughput in a multicell environment. Least interfered group assignment (LIGA) selects for each session the subcarrier group on which the user receives the minimum interference, while best channel ratio group assignment (BCRGA) chooses the subcarrier group with the largest channel response-to-interference ratio. In particular, under low loading conditions, LIGA renders the best performance. However, as the load increases BCRGA tends to offer superior performance.

Consider MC-CDMA cellular network where the system bandwidth, W , is subdivided into N_c subcarriers. Bandwidth of subcarriers is selected such that they each approximately exhibit flat fading channel characteristics (i.e., $W/N_c \leq B_c$ where B_c is the coherence bandwidth). Assume for grouped MC-CDMA that each G subcarriers constitute a group over which individual streams will be spread. As a result of subcarrier grouping, system bandwidth could be described in terms of a set of subcarrier groups,

$$C = \{C^{(1)}, C^{(2)}, \dots, C^{(i)}, \dots, C^{(N_G)}\}, \text{ where}$$

$N_G = N_c/G$ is the number of subcarrier groups. Subcarriers belonging to the same group are selected such that they are G subcarriers, $C^{(j)}$ is used to signify the j th subcarrier group. A multicell network constituted of $B = \{1, 2, \dots, N_B\}$ base stations is considered. Subcarrier grouping defined by the set C is presumed to be the same across all base stations. Each base station, $b \in B$, is effectively simultaneously supporting K active data users. Each base station b operates under the constraint that it has at its disposal a maximum amount of power P_{MAX} to share among active sessions. It is assumed for the analysis presented that each user may be assigned to only one group. Power dedicated for each user assigned to a certain group is assumed to be uniformly distributed over subcarriers of such group. In other words, for a user k of interest allocated with $P^{(b,i)}$ by base station b over $C^{(i)}$, the power share per subcarrier of $C^{(i)}$ will be evenly distributed as $P_k^{(b,i)}/G$.

Next consider the mobile user k of interest served by base station b that offers the best path-loss for such user. If it is assumed that the user has been assigned to $C^{(j)}$, then the total

signal power measured in the downlink direction at the receiver input of user k excluding thermal noise is

$$P_k^{(b,j)} = A \sum_{c=1}^G \left[\left(\frac{P_k^{(b,j)}}{G} \right) H_{kb'}^{(b,j)} S_{kb'}^{(b,j,c)} \right] \tag{17}$$

where A is the average antenna gain for the transmitted signal relative to all interferers; $H_{xy}^{(z)}$ signifies the large-scale path-loss between the mobile user x and base station y given that user x is being served by base station z and assigned to $C(j)$; $S_{xy}^{(z,c)}$ depicts the small-scale fading power for the c th sub-carrier belonging to $C(j)$ defined between the mobile user x and base station y given that user x is being served by base station z ; $I_k^{(b,j)}$ is the total interference measured by user k served by base station b over $C(j)$, expressed as

$$I_k^{(b,j)} = E_k^{(b,j)} + \sum_{b'=b, b' \neq k}^{N_B} \sum_{c=1}^G \left[\left(\frac{P_k^{(b',j)}}{G} \right) H_{kb'}^{(b,j)} S_{kb'}^{(b,j,c)} \right] \tag{18}$$

where $E_k^{(b,j)}$ depicts the intracell interference from users assigned within base station b to the same group as user k ; $P^{(y,j)}$ is the total power transmitted by base station y over $C(j)$. In a multicell environment, it is commonly assumed for intracell interference to be negligible when compared to intercell interference [14]. Furthermore, for a large number of interferers, small-scale fading variations over interfering paths are presumed to inflict minimal effects on SINR performance. Under such circumstances, the average large-scale interference is employed to represent the interference component in the SINR equation. Therefore, the equation for interference affecting user k of interest reduces to

$$I_k^{(b,j)} = \sum_{\substack{b'=1, \\ b' \neq b}}^{N_A} P^{(b',j)} H_{kb'}^{(b,j)} \tag{19}$$

Consequently, given that G (number of subcarriers per group) depicts the equivalent expected processing gain of MC-CDMA signals, then the SINR $\Gamma_k^{(b,j)}$ experienced by a given user k served by base station b over $C(j)$ could be expressed as

$$\begin{aligned} \Gamma_k^{(b,j)} &= \frac{GA}{I_k^{(b,j)}} \sum_{c=1}^G \left[\left(\frac{P_k^{(b,j)}}{G} \right) H_{kb}^{(b,j)} S_{kb}^{(b,j,c)} \right] \\ &= P_k^{(b,j)} \Omega_k^{(b,j)} \end{aligned} \tag{20}$$

Where

$$\Omega_k^{(b,j)} = \frac{GAH_{kb}^{(b,j)} S_{kb}^{(b,j)}}{I_k^{(b,j)}} \tag{21}$$

is the normalized signal to-interference ratio (SIR) corresponding to a unit of power allocated to user k and

$$S_{kb}^{(b,j)} = \left(\frac{1}{G} \right) \sum_{c=1}^G S_{kb}^{(b,j,c)} \tag{22}$$

ROUP ASSIGNMENT STRATEGIES:

Group assignment without interference consideration

RGA

In RGA, active user k is assigned to subcarrier group $C^{(j)}$ in a random manner, that is, $j = \text{rand}(1: N_G)$, where “rand” is a random generator of integers from one to the number of groups (N_G) of the system.

BSGA

In BSGA, user k is assigned to subcarrier group $C^{(j)}$ if it offers the best small-scale fading channel response, that is,

$$C^{(j)} = \max_c c^{(j)} S_{kb}^{(b,j)} \tag{23}$$

Note that in RGA and BSGA, the selection of $C^{(j)}$ for user k is independent of assignments across the network as well as within the same cell.

Interference-based group assignment

LIGA

In a multicell environment, intercell interference inflicts significant contribution on attained throughput performance. Subcarriers with the best small-scale fading channels no longer have the potential to support the highest transmission rates since they might coincide with intolerable interference power generated from other cells of the network. Consequently, it is provisioned in this paper that LIGA has the potential to outperform BSGA that has been popular for single cell scenarios. In LIGA, active user k is assigned to subcarrier group $C^{(j)}$ such that

$$C^{(j)} = \min_c c^{(j)} I_k^{(b,j)} \tag{24}$$

BCRGA

BCRGA is considered as a composite group assignment scheme that is based on LIGA and BSGA. The notion “channel ratio” in BCRGA indicates that the metric used for group selection is based on the ratio of small-scale fading channel to-interference ratio received on a particular group. Accordingly, $C(j)$ in BCRGA is selected such that it supports the best channel ratio, that is,

$$\begin{aligned} C^{(j)} &= \max_c c^{(j)} \left(\frac{S_{kb}^{(b,j)}}{I_k^{(b,j)}} \right) \\ &= \min_c c^{(j)} \left(\frac{I_k^{(b,j)}}{S_{kb}^{(b,j)}} \right) \end{aligned} \tag{25}$$

D. Adaptive sub-carrier and power allocation

In multi-user MC-CDMA systems, the channel fading is different at different sub-carriers. This feature is utilized by some researchers to investigate an Adaptive Channel Allocation (ACA) where the channels are allocated to the user according to the instantaneous Channel State Information (CSI) [11]. This technique [11] is focused on the joint channel and power allocation in the downlink transmission of multi-user MC-CDMA systems and considers the throughput maximization

problem as a mixed integer optimization problem. , under the constraints that the total transmit power should not exceed the maximum transmit power and each channel's SINR should be not be less than a pre-defined value.

In the proposed scheme first the subcarriers are allocated to the different users by calculating required power on each channel and then power is allocated to all the subcarriers..

Throughput maximization problem has been considered as a following optimization problem as,

$$\max \sum_{k=1}^K \sum_{m=1}^M n_m^k \tag{26}$$

Where

n_m^k - number of the k^{th} user's channels on the m^{th} group.

K – Total number of users

M - Total number of groups of subcarriers.

Above problem in equation (26) Subject to

$$\max \sum_{k=1}^K \Phi(n_m^k) \leq 1, \forall m \tag{26.a}$$

Above equation (26.a) imposes the restriction that at most one user can be allocated to each group simultaneously.

Where $\Phi(n_m^k)$ is a function defined as

$$\Phi(n_m^k) = \begin{cases} 1 & n_m^k > 0 \\ 0 & n_m^k = 0 \end{cases}$$

Problem in equation (26) is also Subject to

$$\sum_{k=1}^K \sum_{m=1}^M \sum_{l=1}^L n_m^k P_{m,l}^k \leq P_T^{\max} \tag{26.b}$$

Where

L – Total number of subcarriers in m^{th} group.

Above equation (26.b) is the total transmit power constraint.

where

P_T^{\max} - The maximum transmit power.

$P_{m,l}^k$ – The signal power of one channel on the l^{th} subcarrier of the desired group.

Problem in equation (26) is also Subject to

$$\Gamma \Omega_m^{(k,i)} \geq \gamma, \forall k, m, i \tag{26.c}$$

Above equation (26.c) is the SINR constraint.

Where

$\Gamma \Omega_m^{(k,i)}$ - Signal power to interference-plus-noise power ratio (SINR) of the signal on the i^{th} channel of the m^{th} group.

γ - Target threshold of BER.

Problem in equation (26) is also Subject to

$$P_{m,l}^k \geq 0, \forall k, m, l \tag{26.d}$$

$$n_m^k \in \{0, 1, \dots, L\}, \quad \forall k, m$$

(26.e)

Equations (26.d) and (26.e) ensure the correct values for the transmit power and the channel number respectively.

Before giving the actual scheme, the two sub-problems are discussed, respectively by the author..

Adaptive Power Allocation (APA): In this paper, the criteria used for power allocation is to minimize the transmit power on each channel while satisfying the SINR and given transmit power constraints. If the transmit power consumption of each allocated channel can be reduced, more channels can be allocated to improve the throughput.

Assuming that the m^{th} group is assigned to the k^{th} user, then the optimal power allocation can be obtained by solving the following optimization problem:

$$\min \sum_{l=1}^L P_{m,l}^k \tag{27}$$

Subject to

$$\Gamma \Omega_m^{(k,i)} \geq \gamma, \quad \forall i \tag{27.a}$$

$$P_{m,l}^k \geq 0, \quad \forall l \tag{27.b}$$

Therefore, one channel's minimum transmit power on the i^{th} sub-carrier of the m^{th} group can be obtained as ,

$$P_{m,l}^k = \frac{\gamma N_o \sum_{i=1}^L |\omega_{m,i}^k|^2}{L^2 |\omega_{m,l}^k h_{m,l}^k|^2} \tag{27.c}$$

Moreover, for one channel on the m^{th} group, the required transmit power is expressed as

$$S_m^k = \sum_{l=1}^L P_{m,l}^k = \gamma N_o L^{-2} \sum_{i=1}^L |\omega_{m,i}^k|^2 \sum_{l=1}^L |\omega_{m,l}^k h_{m,l}^k|^{-2} \tag{28}$$

Adaptive Channel Allocation (ACA) : In this paper the criteria used for channel allocation can be defined by two approaches. First each group is assigned to the user who requires the minimum transmit power for one channel on that group and second is if the total power is not sufficient then select the groups and allocate channels to the users according to the increasing order of the associated transmit power.

If the required amount of transmit power of each channel has been determined for all users before the channel allocation, then the constraints (26.b), (26.c) and (26.d) in the optimization problem (26) can be substituted by one constraint as following:

$$\sum_{k=1}^K \sum_{m=1}^M n_m^k S_m^k \leq P_T^{\max} \tag{29}$$

The optimization problem (26) has been further simplified into a channel allocation problem as ,

$$\max \sum_{k=1}^K \sum_{m=1}^M n_m^k \tag{30}$$

subject to

$$\sum_{k=1}^K \text{sgn}(n_m^k) \leq 1, \forall k, m \tag{30.a}$$

$$\sum_{k=1}^K \sum_{m=1}^M n_m^k S_m^k \leq P_T^{\max} \tag{30.b}$$

$$n_m^k \in \{0, 1, \dots, L\}, \quad \forall k, m \tag{30.c}$$

Denoting μ_m as the user whose transmit power for one channel on the m th group is minimum among all users, i.e.

$$\mu_m = \arg \min_{1 \leq k \leq K} \{S_m^k\} \tag{31}$$

Thus following Proposition 1 is given in the paper,.

Proposition 1. There exists one optimal solution to the optimization problem (24) satisfying that each group is assigned to the user who requires the minimum transmit power for one channel on that group, i.e., for $m = 1, \dots, M$, the m^{th} group is allocated to the μ_m^{th} user.

The size of solution space of the optimization problem (30) is $K^M(L+1)^M$, an efficient search method given in proposition 1 can reduce the size of solution space to $(L+1)^M$.

According to Proposition 1, each group is associated with a transmit power, i.e., for $m = 1, \dots, M$, the associated transmit power of the m^{th} group is $S_m^{\mu_m}$. If these associated transmit power for all groups is sorted according to the increasing order, one can obtain an order

$\{v(i)\}_{i=1, \dots, M}$, where $v(i)$ is the group whose associated transmit power is the i^{th} minimum among the associated transmit power of all groups. The associated transmit power according to the increasing order is

$$S_{v(1)}^{\mu_{v(1)}} < S_{v(2)}^{\mu_{v(2)}} < \dots < S_{v(M)}^{\mu_{v(M)}} \tag{32}$$

Then, the following Proposition 2. is given in the paper,.

Proposition 2. Under the constraints of any given maximum transmit power P_T^{\max} and the maximum channel number on every group L , if the transmit power is not enough to be allocated to all channels of all groups simultaneously, that is

$$\sum_{i=1}^M L S_{v(i)}^{\mu_{v(i)}} > P_T^{\max} \tag{33}$$

then the throughput is maximized by selecting the groups and allocating channels according to the increasing order of the

associated transmit power, i.e., one optimal channel allocation for the optimization problem (30) owns the following form

$$\tilde{N} \triangleq \left(\tilde{n}_{v(i)}^{\mu_{v(i)}} \right)_{i=1, \dots, M} = \left(\underbrace{L, \dots, L}_\alpha, \underbrace{1, 0, \dots, 0}_\beta \right) \tag{34}$$

where $\mathbf{l} \in \{0, 1, \dots, L\}$, $\alpha, \beta \in \{0, 1, \dots, M-1\}$ and $\alpha + \beta + 1 = M$

In this method, the channel with lower transmit power requirement owns higher priority to be selected for transmission. According to Propositions 1 and 2, author has proposed ACA algorithm as follows:

Initialization

$P_R = P_T^{\max}$, $C = \{1, 2, \dots, M\}$, $n_m^k = 0$ for $k = 1, \dots, K$ and $m = 1, \dots, M$.

For each group

m = 1, ..., M, do % group assignment.

$\mu_m = \arg \min \{S_m^k\}$

End For

while C ≠ ∅ % channel allocation

t = arg min_{m ∈ C} {S_m^{\mu_m}}; % select the group with

lowest power requirement

$n_t^{\mu_t} = \min \left(\left\lfloor \frac{P_R}{S_t^{\mu_t}} \right\rfloor, L \right)$; % calculate the available channel number

$P_R = P_R - n_t^{\mu_t} S_t^{\mu_t}$; % calculate the residual transmit power

$C = C \setminus \{t\}$;

If $n_t^{\mu_t} = 0$ % since the residual transmit power is not enough, terminate channel allocation.

Break the loop;

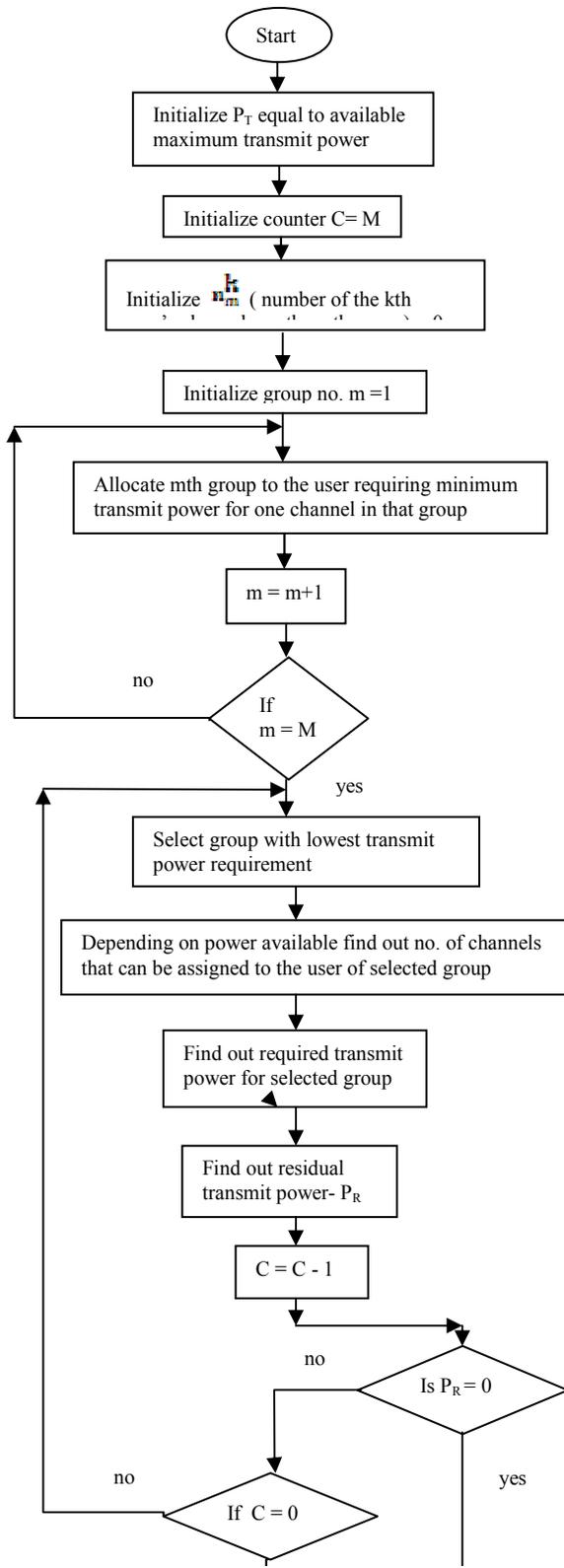
End If

End While

It has been stated that the allocation result of the ACA algorithm discussed above is optimal for the optimization problem (30).

Flowchart for the above ACA algorithm is constructed as below,

Fig. 8 flowchart for ACAalgorithm



Combined final scheme: By combining the proposed APA and ACA algorithms, an adaptive channel and power allocation scheme has been proposed for the optimization problem given by first equation in (19). This scheme consists of three steps and is described as follows:

Step 1: According to the obtained CSI, for all users, the required amount of transmit power to be allocated to one channel of every group S_m^k is determined by (22).

Step 2: Based on the results obtained in Step 1, the channels are allocated to different users by using the ACA algorithm

Step 3: The transmit power is allocated to all sub-carriers of all allocated channels using (21).

Author has carried out simulations of the above scheme and compared it with the conventional systems in terms of throughput.

VIII. OTHER TECHNIQUES

There are some other subcarrier selection techniques which are briefly summarized here.

In MC-CDMA the most power-efficient allocation is to distribute the power of each user over several sub-carriers of better quality and even concentrate on the best one, if it is exclusive[18]. In this paper an iterative power allocation algorithm is proposed after deciding all supportable transmission rates to allocate the sub-carrier power of each user and jointly solve the sub-carrier allocation problem.

Santi P. Maity, Mithun Mukherjee divides the available sub-carriers as even sub carriers and odd sub-carriers [9]. This paper proposes a high capacity carrier interferometry/ multicarrier code division multiple access (CI/MCCDMA) system through the simultaneous support of high and low data rate transmission. This paper attempts to make a good compromise among BER, capacity and computation cost through the development of a new CI/MC-CDMA system where users transmit their data at different rates. This is achieved by allocating all sub-carriers to the users who transmit high data rate. The users of low data rate share alternate odd and even subcarriers. The effect of MAI (multiple access interference), arising out from the cross-correlation among the code patterns, is reduced through the phase shift of even (odd) CI code using even (odd) sub-carriers by an amount $\pi/2$ and odd (even) CI code using even(odd) subcarriers by $-\pi/2$, all measured with respect to the orthogonal CI codes assigned to support high data rate transmission.

In another technique [19] the problem of subcarrier grouping is studied in the downlink of multi-carrier code division multiple access (MC-CDMA) systems with linear minimum mean square error (MMSE) receiver. The problem is treated as

combinatorial optimization problem. An optimal subcarrier grouping scheme is presented. The given scheme is efficient in computational time. According to the instantaneous channel conditions, the given optimal scheme can be applied adaptively subcarrier grouping to maximize the system capacity. The simulation results show that the proposed scheme outperforms the conventional static schemes, and is efficient in improving the system performance.

A deep insight can be made in the above techniques which are equally important as the other techniques mentioned in this paper.

Table I. Different approaches studied in the paper

IX. PERFORMANCE COMPARISON

Simulation results of different techniques are discussed below with respect to BER performance or throughput performance.

In most of the cases Water Filling Algorithm is used for allocating power to the selected sub carriers but in this paper we discussed its application for selecting sub carriers. Fig. 6 shows the BEP's (averaged among all users) obtained with the GA algorithm and the WF algorithm [10]. The important feature of Water Filling Algorithm is that it requires very less time as compared to GA Algorithm. The performance obtained in Fig. 6 with the WF algorithm is slightly inferior. However, even with $K = 5$, where K is the number of users, the time taken by the GA algorithm to reach the solution is almost a thousand times longer than that of the WF algorithm [10]. Hence, the WF algorithm can be considered to be a very strong candidate for sub carrier selection, it has been used in next technique [3] recently. K is set to 64 for the rest of the results in the paper.

In Dynamic Sub-Carrier Allocation Technique for Adaptive Modulation based MC-CDMA System [3] during simulation, the total available bandwidth is the same for both the systems shown in Fig. 7 and $NM=512$. Then the processing gain for each sub carrier signal is $N=256$ when the number of sub carriers is $M=2$ and 128 and when $M= 4$, respectively. The number of users is,

$K=50$. The BER performance for different number of sub carriers and different narrowband interference power to signal power ratio is considered [3]. From the fig. 7 it can be seen that the BER performance is reasonably improved by the proposed method [3] as compared to conventional MC-CDMA. By using higher order modulation on selected sub carriers that means allocating more number of bits to these subcarriers throughput can be increased reasonably.

In the other method of adaptive subcarrier and power allocation [12] while carrying out simulation the total available bandwidth is kept same for the systems and spreading gain equal to 256, symbol duration $T_w = 1/4.8 \times 10^3$, chip duration $T_c = 1/1.2288 \times 10^6$, signal-to- interference-ratio (SIR) 5dB, the power control sampling period 1.25ms, and the power control command BER has been set to 0.01. From the fig.8, it can be seen that the proposed multicarrier system outperforms the conventional MC CDMA system in BER performance for its exploiting frequency diversity positively. As the mobile velocity increases, the BER performance decreases.

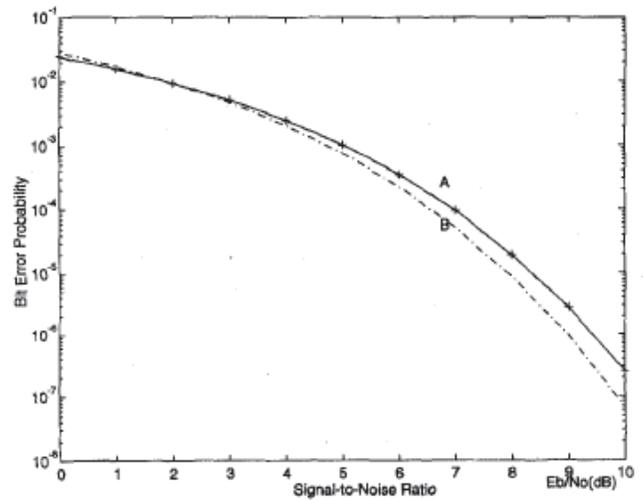


Fig. 9 Average system BEP's obtained with the GA algorithm and with the WF algorithm. $L = 3$, $T_s = 1/G$ jts, $K = 5$, $M = 8$, and $N = 156$. A-WF algorithm and B - GA algorithm [10]

Sr.No.	Class	Sub-Carrier Selection strategy	Supporting Technique	Improvement In performance
1	I	Water- filling algorithm	-	Speed, Avarage SINR of the system
2	I	Dynamic Sub-Carrier Allocation Technique for Adaptive Modulation based MC-CDMA System	Adaptive Modulation	BER performance, Throug-hput can be increased
3	I	Adaptive Sub-carrier and Power Allocation	Adaptive Power Allocation	BER performance
4	II	Dynamic subcarrier allocation and adaptive slot management	Adaptive time slot management	BER performance
5	II	Sub-Carrier Selecting MC-CDMA System for 4G Systems	-	Reduces power consumption of mobile terminal
6	II	Subcarrier Group Assignment for MC-CDMA Wireless Networks	Grouping of sub-carriers	High Throughput
7	II	Adaptive sub-carrier and power allocation	Adaptive power allocation	High Throughput

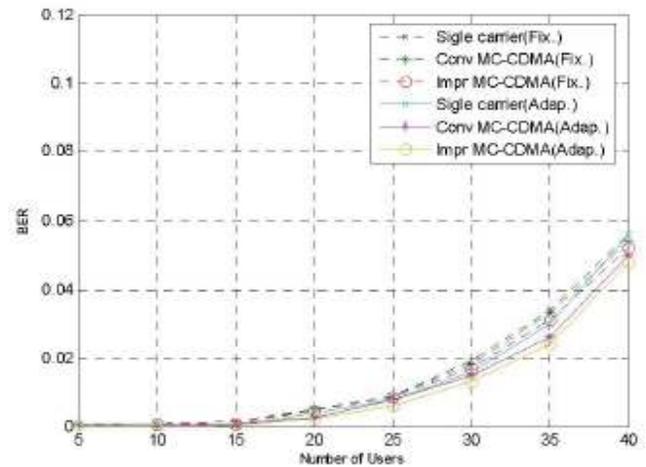


Fig.11 BER performance comparison of different CDMA systems in Rayleigh channel (mobile velocity 5 km/h) [12]

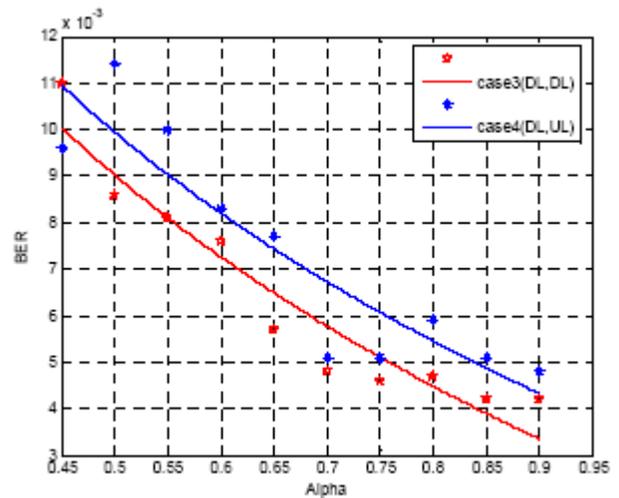


Fig.12 (b). BER with respect to orthogonality factor in internal interference. [4]

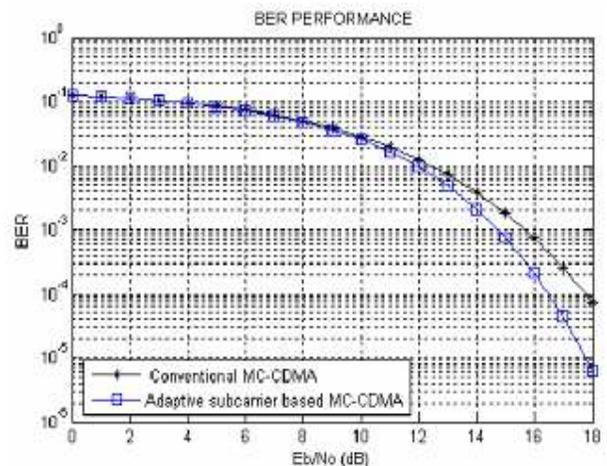


Fig.10 BER Performance of proposed MC-CDMA scheme [3]

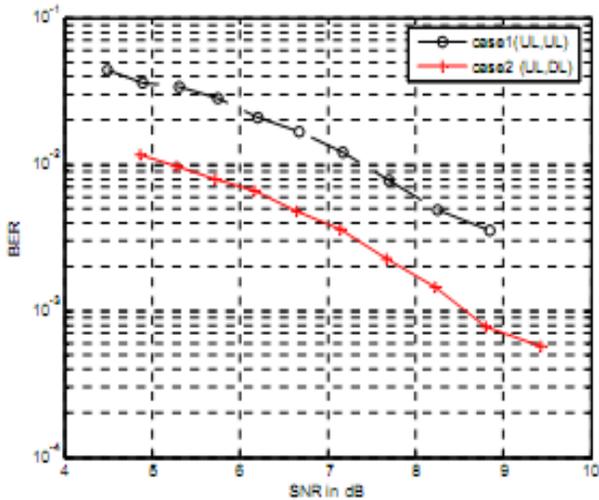


Fig. 12 (a) BER performance in case1 and case2 [4]

Under the second class of sub carrier selection we are considering four different techniques of which simulation results are discussed below,

In the first technique [4] simulations were carried out for the four cases of uplink and downlink scenario of MC-CDMA system. First simulation of the BER performance of proposed algorithm [4] in presence of AWGN and Rayleigh channel was carried out. Different Walsh codes were used for spreading user data on each subcarrier. The major channel parameters considered in simulation are listed in table II,

Table II. [4]

Bandwidth	10 MHz
Spreading Factor	128
FFT Length	1024
Modulation(M-QAM)	2- 8
Rayleigh Channel	Ts =0.01 s , Δf= 10 Hz
Number of users	15 – 30
Length of Walsh Code	8

Table III [4] Simulation scenario

Case	Cell 1	Cell 2
Case 1	Uplink (UL)	Uplink (UL)
Case 2	Uplink (UL)	Downlink (DL)
Case 3	Downlink (DL)	Downlink (DL)
Case 4	Downlink (DL)	Uplink (UL)

In table III each case represents a traffic direction and interference pattern changes accordingly. The BER in case1 shown in Fig.12(a) below follows a higher path as in uplink base station suffers intra cell and inter cell interference from a large no. of users. In downlink the intra cell interference is caused by orthogonality factor. Fig.12(b) shows the BER performance with respect to variation in orthogonality factor. In case of cross slot, i.e. case4, there could be heavy interference, as interfering mobile in neighboring cell may be near to the tagged mobile.

In the next technique [2] The simulations assume a Butterworth filter for sub-carrier selection. The following equation shows the

transfer function of the Butterworth band-pass filter with delay equalization,

$$A(f) = \frac{1}{\sqrt{1 + \left\{ \frac{(2\pi f - 2\pi f_0)}{\pi B} \right\}^{2N}}}$$

Because the equalization removes the delay distortion of the filter, the transfer function is a real value. B and f₀ are the 3dB-bandwidth and center frequency of the filter, respectively Simulation parameters used are,

Table IV. [2]

Subcarrier Spacing	40 KHz
Number of subcarriers	1024
Guard Interval	¼ OFDM symbol length
Processing Gain	16
Number of Users	15
FEC	Convolutional Coding with Viterbi Decoding(R=1/2 ,K=7)
Modulation	QPSK

Next the simulation results for throughput for two schemes is given.

Fig.13 shows the throughput versus the number of users, when the spreading factor is 8, the BER requirement is 10-3 and the MaxSNR is 8 dB. When the number of users is one, no multi-user diversity can be exploited. So, no matter which combining scheme is applied, the two channel allocation schemes have almost the same throughput. However, with the increase of the number of users, the throughput of the proposed channel and power allocation scheme increases as well, while the throughput for the SCA algorithm with APA algorithm remains constant. The differences between the proposed scheme and the SCA algorithm with APA algorithm result from the effects of multi-user diversity. When the number of users exceeds 16 and the EGC or ZFC is applied, all channels have been allocated for transmission and the system throughput becomes a constant.

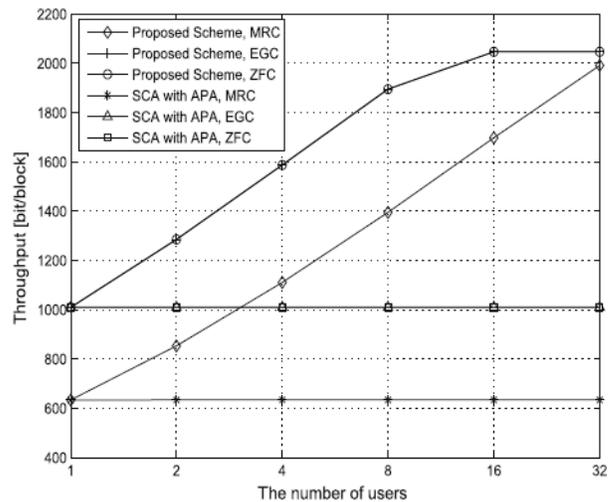


Fig.13 Throughput versus the number of users [11]

X. CONCLUSION

This paper studies various subcarrier selection techniques combined with adaptive power allocation, adaptive modulation, adaptive slot allocation and other schemes.

The sub carrier selection work can be extended for performance improvement in Ultra wide band MC-CDMA, to improve the overall system performance. The BER and system capacity alone were analyzed in some systems and other system parameters like delay and throughput need to be analyzed. Future work can be carried out for reducing computational complexity by reducing no. of iterations while searching for best subcarrier. With the given power constraint and BER the work can be extended giving dynamic priority to the users.

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Structural, Technically and Performance Aspects in Enterprise Applications or Projects

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Abstract- Enterprise applications are complex systems that are hard to develop and deploy in organizations. Although software application development tools, frameworks, methodologies and patterns are rapidly developing; many projects fail by causing big costs. There are challenging aspects that programmers and designers face with while working on enterprise applications. In this paper, we present the three of the significant issues: Structural, technically and performance. The important subjects in each aspects are pointed out and recommendations are given. In Structural issues the lifecycle, meta-architecture, guidelines are pointed out. .NET and Java EE platforms are presented in technological issues. The importance of performance, measuring performance and profilers are explained in performance aspects.

Index Terms- enterprise applications, structural, technically, performance

I. INTRODUCTION

ENTERPRISE applications identify the main components of organizations, information systems and how the components including staff, technology, business and resources work together to achieve business objectives. Enterprise applications are very complex systems that are hard to design and implement. Software development and software architecture have received much attention in the last decade even in highly respected big companies and small software firms in all over the world. The growing role of designing and organizing the system before coding is definitely covered and the importance of software architectures, design principles, design patterns etc. is understood exactly. Many design tools, frameworks, design patterns are being developed for designing software systems but unfortunately still lots of projects fail because of many causes. The Chaos Report in 2004 states that the project success rate is 34 percent of all projects. The project failure rate is 15 percent of all projects. 51 percent of all projects are over time, over budget or lacking critical features and requirements. According to the success and failure percentages, it can be indicated that it is very hard to achieve success in enterprise applications. A large number of people at different backgrounds are involved in enterprise applications. There are complex businesses, management and technical aspects which are difficult to control. Also it takes 6-7 years to complete an enterprise application from early design to successful company transformation. Therefore, it is not unusual to have so many problems like over-budgeting, over-time in enterprise applications. There are many pitfalls, bottlenecks and confusing works from beginning to end of an

enterprise application. In this paper we propose to analyze the significant issues in enterprise applications. In This paper is structured as follows: In Section 2, the Structural aspects in enterprise applications are presented. In Section 3, the technically aspects including Java EE and .NET platforms are pointed out and the frameworks in Java EE are mentioned. In Section 4, the performance aspects are presented.

II. STRUCTURAL ASPECTS

Structural Aspects are defined in the phases of software lifecycles. The software lifecycle is an abstract representation of software process that defines the software development strategy, steps, methods, activities and product of a software application. Developing an enterprise application begins with analyzing and organizing the elements according to the requirements and sources. Then comes, designing the system, defining the true architecture and implementing the architecture in high quality. The traditional lifecycle phases of a software application are shown in Fig. 1. The first step of a good architecture is well done project Planning. In the beginning phases, organizational units and business functions to be supported by the system are defined. Also the technical environment and draft project plans are described. In requirement analysis phase, lack of understanding and communication with customer is an important mistakes that affects the architecture or structural of enterprise applications. It is impossible to think through all the aspects that users need properly; but it is important to understand the requirements correctly. The necessities of users change continuously and this causes redesigning the architecture. Designing the system according to the wrong/changing requirements causes headaches in most of the enterprise applications. If a project deviates too far away from original specifications and does not meet the user requirements, it fails because of being late or over-budget. The solution is communicating the users more often and to get requirements correctly. Making the right architectural decisions is very important. Today's software can be legacy system of tomorrow; therefore good architectures are needed. When beginning a project, the decision of using an existing structural/framework or designing a new one must be made. Architectural decisions are made according to the requirements at different levels. Since architecture is the structural elements of the system together with their externally visible properties and relationships, high level and low level decisions must be made. High level decisions are related with the integrity and structure of the system which is called "meta-architecture". Meta-architecture involves style,

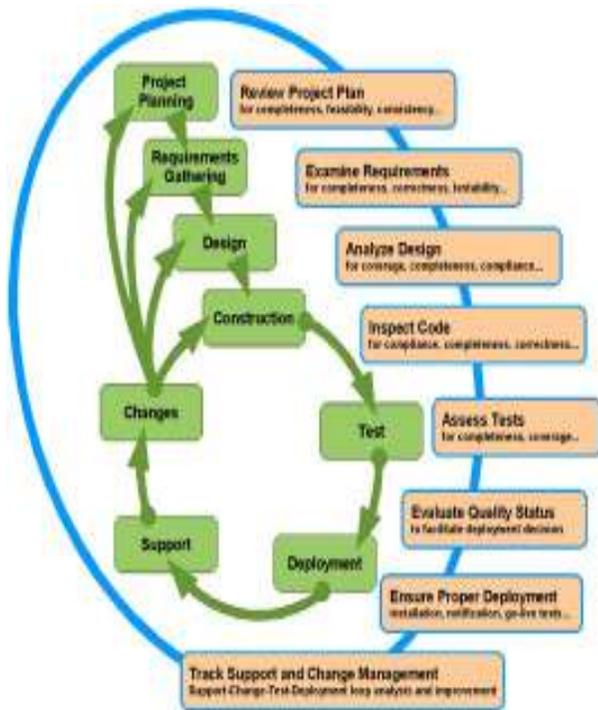


Fig. 1 Software lifecycle

patterns of composition or interaction, principles, and philosophy, rules certain structural choices out, and guides selection decisions and trade-offs among others. As seen in Fig. 2, Structural is the middle layer and by taking care of meta-architecture, architectural diagrams and system priorities are formed. In low-level architecture, architectural guidelines and policies are decided by using design patterns, frameworks, infrastructure and standards.

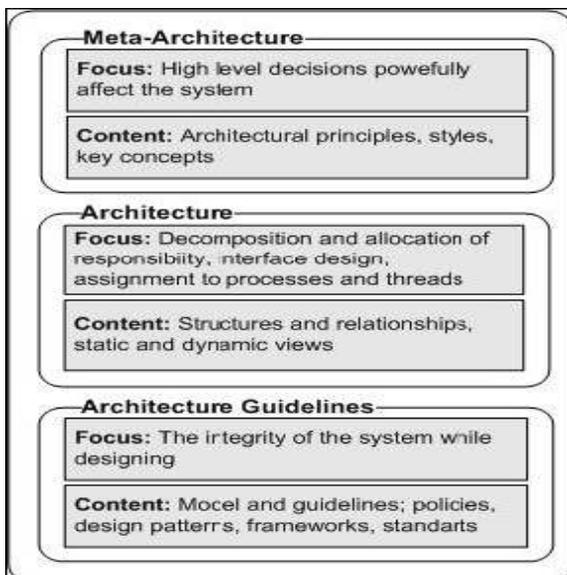


Fig. 2 Structural Guidelines (Architecture)

Software architecture should be designed well and it should be supported with design patterns, reusable class libraries that allow great flexibility for the project. Before the enterprise software

architecture is designed, some of the existing architectural frameworks such as MVC , PCMEF and XWA should be analyzed; MVC is Model-View-Controller paradigm that separates View from Model. Model is the non-visual object that consists of application data. View is responsible from showing Model data in a user interface. Taking input from user, managing the model and updating View is a Controller’s responsibility. PCMEF is layered paradigm that consists of presentation, control, domain, domain and foundation layers. The aim of PCMEF is minimizing package coupling, decreasing dependency and increasing stability with using downward dependencies (higher layers depends on lower layers). When upper layers are changed, lower layers are not affected; this provides loose coupling and allows programmer to build roundtrip architectural modeling. XWA (Extensible Web Architecture) is based on MVC and PCMEF combines the advantages of these frameworks.

III. TECHNICALLY ASPECTS

Enterprise applications are developed with development platforms. A development platform includes programming language/s, run-time environment, and reusable class libraries. There are two leading technologies in enterprise-level application development: .NET and Java EE. In addition, there are alternative technologies like WebObjects, Coldfusion, and PHP (Hypertext Preprocessor) . .NET is a Microsoft product described as the software that connects information, people, systems and devices. Java EE is a set of specifications for developing enterprise-level applications, created by the Java Community Process (JCP). We will analyze .NET and Java EE platforms according to dependency, vendor, usage of web services, cost and security. .NET is a language independent platform that allows programmers to use different properties of programming languages such as C#, VB.NET J# (Java for .Net) etc. Besides, .NET is tied closely to the Windows operating system. Microsoft.Net provides good solutions for enterprise applications (with limited choice and limited influence on future directions but the benefits of one source and a known supplier). Java EE is platform independent that runs on any operating system. However, only java can be used as a programming language. This property of Java EE provides an advantage in heterogeneous environments that include different platforms. Also one of the main advantages of Microsoft.NET is its integrated support for web services. Java Platform achieves this with many components. Since Java has the disadvantage of being developed long before Web Service Standards are set, there is not an integrated architecture for web services in Java EE. However Sun has taken aggressive steps to incorporate Web Services into the Java EE standard. .NET utilized the past experience of Java EE, so while java evolves its security capabilities gradually, .NET incorporated more security capability into its original design. Because of simpler and clearer design, .NET provides advantages in security and scalability. Another important point is the Internet Information Server (IIS) that is the web server of .NET. It is one of the most attacked server software in the world.

Java EE and .NET Enterprise applications are generally considered as multi-tiered applications that consist of three tiers: application (client) tier, middle tier and EIS (Enterprise

Information System) tier. The tiers in Java EE and .NET are illustrated in Fig. 3. The application tier is the client side of application. In Java EE, client tier includes java applets, web browsers and java applications. In .NET, there are applications developed with Windows forms and web browsers in client tier. The second tier is the middle tier, which is divided into two parts: web tier and business tier. In web tier, Java EE uses JSP and Servlets, but .NET technology offers ASP.NET. Business tier

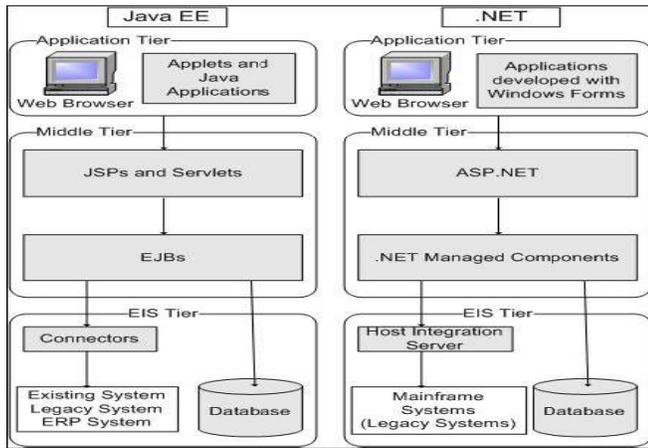


Fig. 3 Java EE and .NET tiers

performs data logic and business processing which are the core functionalities of an application. In Java EE, business code is handled with Enterprise Java Beans (EJB). .Net offers .NET Managed Components as a business tier component of enterprise architecture. The third layer is EIS tier, which consists of database servers, enterprise resource planning systems, and other legacy data sources, like mainframes. Most of the large corporations have existing codes. Both of the technologies offer solutions for legacy integration. .NET uses Host Information Server to connect to legacy systems; but Java EE offers Java EE Connector Architecture (JCA) for integration.

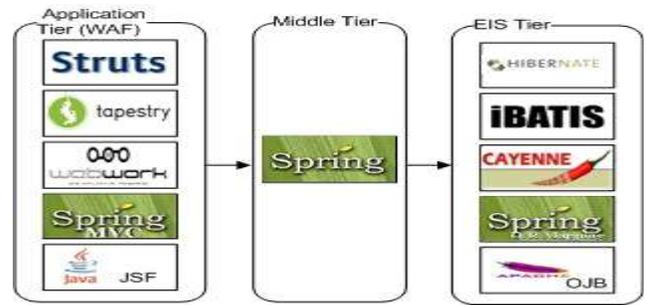
eat and wheat flours are the integral of daily diet of Indian population. The wheat kernels are processed in chakki (flour mill) to produce wheat flour which is then used to make breads, biscuits, pastas etc. In India chapatti and other variants of wheat forms the staple food of majority of population. In manual process the flour is produced by hand cranking the conventional stone wheels. But this method is characterized by slow operation, low production rate. Further this hand cranking process is physically demanding through energy and postural requirements. It may also lead to clinical and anatomical disorders which may affect operator's health.

In order to make it possible to operate the system effectively and efficiently it is necessary to develop this system by giving due respect to human limitation. Hence ergonomic system of pedal operated flour mill is developed. The ergonomic consideration mainly includes the selection of components of system which suits the human capability and develops the

posture to operate system to reduce the fatigue and chances of musculoskeletal disorders.

IV. FRAMEWORKS IN JAVA EE

In Java EE there are many third-party products and open source frameworks. In this section, we will briefly present the third-party products and frameworks used with Java EE. There are different technological choices in Java EE becoming popular in recent years. The open source frameworks and third party products in each tier are shown in Fig. 4.



V. PERFORMANCE ASPECTS

It is important to make the performance tuning in early cycles of the project. If there are architecture mistakes or dangerous bottlenecks, it is beneficial to catch them in early cycles of the project and redesign the architecture. For getting real evidence and ensure level of performance, programmers should use some benchmarks such as web-load testing tools (Microsoft Web Application Stress Tool (WAS), Apache JMeter, etc...). These tools create multiple connections to the web application like real applications in production. Purpose of this test is to measure or observe behaviors of a web. Profiling can indicate which pieces of slow code matter.

VI. CONCLUSION AND FUTURE WORKS

The architecture of enterprise applications is divided into three tiers which are application (client) tier, middle tier and EIS (Enterprise Information System) tier. In Java EE, there are many third-party products and open source frameworks for each tier. This provides alternatives to programmers while implementing an application. Performance determines the success or failure of a project. First, efficient and suitable software architecture should be chosen. If architecture is designed well and it is supported with design patterns, reusable class libraries allow great flexibility for the project. If a project does not meet performance requirements, the whole project goes for nothing and it fails. Determining the performance is not feasible by just looking at the code; to have real evidence about performance the code should be run to get the right performance. As future work, we will implement an enterprise web application by following the architectural, technological and performance issues presented in this paper. We propose to use open source third party Java EE frameworks (Spring, JSF and Hibernate) and implement an enterprise application to be used in municipalities.

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Analysis and Simulation of New Seven Level Inverter Topology

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Abstract- This paper demonstrates how the reduced harmonic distortion can be achieved for a new topology of multilevel inverters. The new topology has the advantage of its reduced number of devices compared to conventional cascaded H-bridge multilevel inverter, and can be extended to any number of levels. The modes of operation are outlined for 5-level inverter, as similar modes will be realized for higher levels. Simulations of seven level of the proposed inverter topology along with corroborative experimental results are presented. This paper deals with the analysis and simulation of the seven level inverter. This paper presents the seven level inverter with harmonics reduction along with the reduction. The harmonic reduction is achieved by selecting appropriate switching angles. The functionality verification of the seven level inverter is done using MATLAB.

Index Terms- New topology of MLI, Fundamental Switching Frequency, PWM, THD

I. INTRODUCTION

The multi level inverter was first introduced in 1975. The three level converters was the first multi level inverter introduced. A multilevel converter is a power electronic system that synthesizes a desired output voltage from several levels of dc voltages as inputs. With an increasing number of dc voltage sources, the converter output voltage waveform approaches a nearly sinusoidal waveform while using a fundamental frequency-switching scheme. The primary advantage of multi level inverter is their small output voltage, results in higher output quality, lower harmonic component, better electromagnetic computability, and lower switching losses. [1][2] While many different multilevel inverter topologies have been proposed, the two most common topologies are the cascaded H-bridge inverter and its derivatives [3], and the Diode-clamped inverter [4]. The main advantage of both topologies is that the rating of the switching devices is highly reduced to the rating of each cell. However, they have the drawback of the required large number of switching devices which equals $2(k-1)$ where k is the number of levels. This number is quite high and may increase the circuit complexity, and reduce its reliability and efficiency.

Cascaded H-bridge inverter has a modularized layout and the problem of the dc link voltage unbalancing does not occur, thus easily expanded to multilevel. Due to these advantages, cascaded H-bridge inverter has been widely applied to such applications as HVDC, SVC, stabilizers, and high power motor drives.

Diode-clamped inverter needs only one dc-bus and the voltage levels are produced by several capacitors in series that divide the dc bus voltage into a set of capacitor voltages. Balancing of the capacitors is very complicated especially at large number of levels. Moreover, three-phase version of this topology is difficult to implement due to the neutral-point balancing problems.

The output waveforms of multilevel inverters are in a stepped form; therefore they have reduced harmonics compared to a square wave inverter. To reduce the harmonics further, carrier-based PWM methods are suggested in the literature [5].

This paper presents how reduced harmonic distortion is achieved for a new topology of multilevel inverters using programmed PWM technique. This new topology has the advantage of its reduced number of switching devices compared to the conventional cascaded H-bridge and diode-clamped multilevel inverters for the same number of levels. It can also be extended to any number of levels. The modes of operation of a 5-level inverter are presented, where similar modes can be realized for higher levels. The inverter operation is controlled using switching angles based on PWM with help of pulse generator. These angles are obtained from solving the waveform equations using the theory of resultants. Simulation of higher levels of the proposed inverter topology is carried out using MATLAB. The validity of the proposed topology and the harmonic elimination method are verified experimentally for 7 level inverters

II. MULTILEVEL INVERTER NEW TOPOLOGY

In order to reduce the overall number of switching devices in conventional multilevel inverter topologies, a new topology has been proposed. The circuit configuration of the new 5-level inverter is shown in Fig.1. It has four main switches in H-bridge configuration Q1~Q4, and two auxiliary switches Q5 and Q6. The number of dc sources (*two*) is kept unchanged as in similar 5-level conventional cascaded H-bridge multilevel inverter. Like other conventional multilevel inverter topologies, the proposed topology can be extended to any required number of levels. The inverter output voltage, load current, and gating signals are shown in Fig.2. The inverter can operate in three different modes according to the polarity of the load voltage and current. As these modes will be repeated irrespective of the number of the inverter levels, and for the sake of simplicity, the modes of operation will be illustrated for 5-level inverter, these modes are

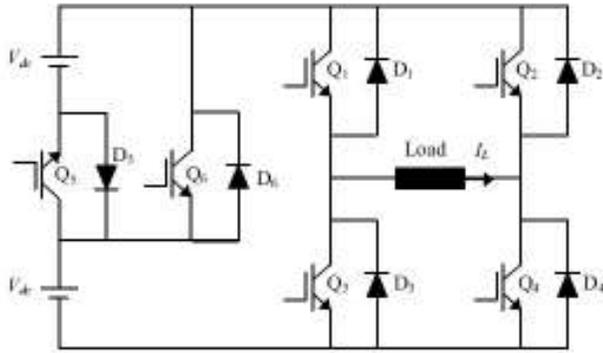


Fig 1: The 5-level inverter of the new topology

Powering Mode This occurs when both the load current and voltage have the same polarity. In the positive half cycle, when the output voltage is V_{dc} , the current pass comprises; the lower supply, D6, Q1, load, Q4, and back to the lower supply. When the output voltage is $2V_{dc}$, current pass is; the lower source, Q5, the upper source, Q1, load, Q4, and back to the lower source. In the negative half cycle, Q1 and Q4 are replaced by Q2 and Q3 respectively.

Free-Wheeling Mode Free-wheeling modes exist when one of the main witches is turned-off while the load current needs to continue its pass due to load inductance. This is achieved with the help of the anti-parallel diodes of the switches, and the load circuit is disconnected from the source terminals. In this mode, the positive half cycle current pass comprises; Q1, load, and D2 or Q4, load, and D3, while in the negative half cycle the current pass includes Q3, load, and D4 or Q2, load, and D1.

Regenerating Mode In this mode, part of the energy stored in the load inductance is returned back to the source. This happens during the intervals when the load current is negative during the positive half cycle and vice-versa, where the output voltage is zero. The positive current pass comprises; load, D2, Q6, the lower source, and D3, while the negative current pass comprises; load, D1, Q6, the lower source, and D4

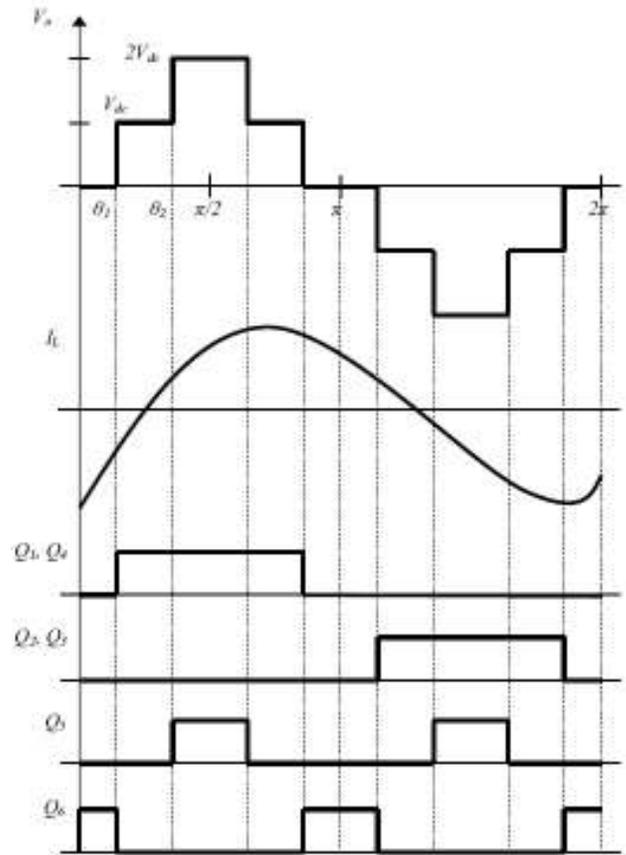


Fig 2: Waveforms of the proposed 5-level inverter

The 7-level version of the proposed topology is shown in Fig.3, where another dc supply, and two auxiliary switches, Q7 and Q8, are added while keeping the four main switches, Q1~Q4, unchanged. The corresponding output voltage waveform, load current, and gating signals are shown in Fig.4, where the abovementioned modes of operation can also be realized.

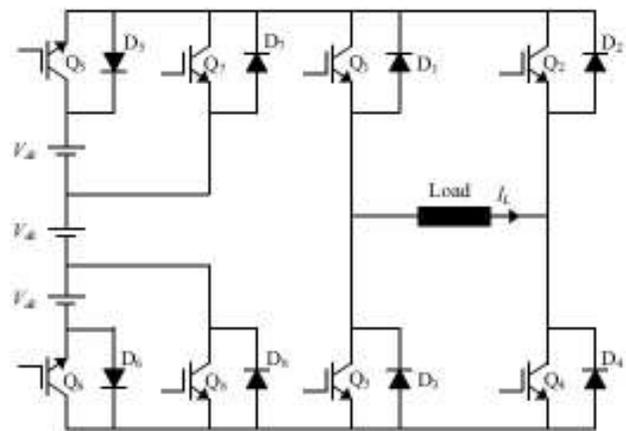


Fig 3: The 7-level inverter of the new topology

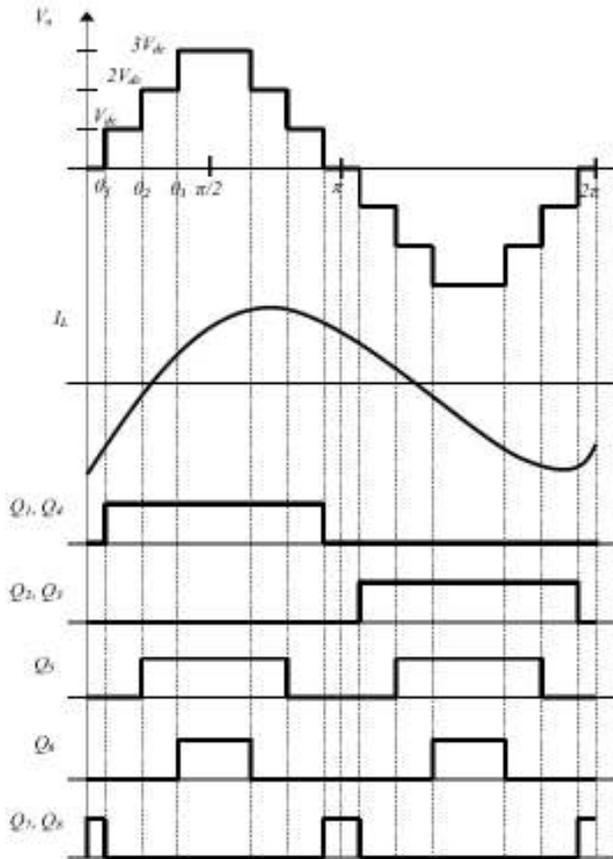


Fig. 4: Waveforms of the proposed 7-level inverter

A generalized circuit configuration of the new topology is shown in Fig.5. The proposed topology has the advantage of the reduced number of power switching devices, but on the expense of the high rating of the main four switches. Therefore, it is recommended for medium power applications

The percentage reduction in the number of power switches compared to conventional H-bridge multilevel inverter is shown in Table 1.

Table 1: Percentage reduction in switching devices

Inverter Type	Number of Switches			
	5- level	7- level	9- level	11- level
Cascaded H Bridge	8	12	16	20
Proposed Topology	6	8	10	12
% Reduction	25 %	33.3%	37.5%	40%

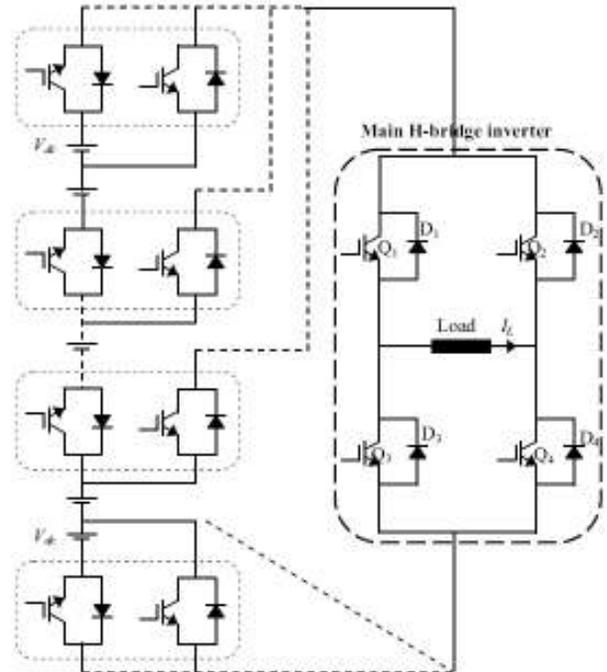


Fig. 5: Generalized multilevel inverter configuration of the new topology

III. MATHEMATICAL METHOD OF SWITCHING

In order to verify the ability of the proposed multilevel inverter topology to synthesize an output voltage with a desired amplitude and better harmonic spectrum, programmed PWM technique is applied to determine the required switching angles. It has been proved that in order to control the fundamental output voltage and eliminate n harmonics, therefore n+1 equations are needed. Therefore, 7-level inverter, for example, can provide the control of the fundamental component beside the ability to eliminate or control the amplitudes of two harmonics, not necessarily to be consecutive. The method of elimination will be presented for 7-level inverter such that the solution for three angles is achieved. The Fourier series expansion of the output voltage waveform using fundamental frequency switching scheme shown in Fig.2 is as follows:

$$V(\omega t) = \left(\frac{4V_{dc}}{\pi} \right) \sum [\cos(n\theta_1) + \cos(n\theta_2) + \dots + \cos(n\theta_s)] \sin(n\omega t)$$

where n = 1, 3, 5, 7, ... (4)

Where s is the number of dc sources in the multilevel inverter. Ideally, given a desired fundamental voltage V1, one wants to determine the switching angles $\theta_1, \theta_2, \theta_3, \dots, \theta_s$ so that $V_o(t) = V_1 \sin(\omega t)$, and a specific higher harmonics of $V_n(t)$ are equal to zero.

To eliminate 5th, 7th, and 9th order harmonics, the firing angles for each level is found by solving the following equations

The switching angles can be found by solving the following equations:

$$\cos(\theta_1) + \cos(\theta_2) + \cos(\theta_3) + \cos(\theta_4) = 3m_a$$

$$\cos(5\theta_1) + \cos(5\theta_2) + \cos(5\theta_3) + \cos(5\theta_4) = 0$$

$$\cos(7\theta_1) + \cos(7\theta_2) + \cos(7\theta_3) + \cos(7\theta_4) = 0$$

Where $m = V1/(4V_{dc}/\pi)$, and the modulation index m_a is given by $m_a = m/s$, where $0 \leq m_a \leq 1$

Where $\theta_1, \theta_2, \theta_3, \theta_4$ are the firing angles in degrees. The switching pulses are obtained by carrying out the above calculation.

Polynomial systems were considered to compute the solutions of the harmonic elimination equations by iterative numerical methods which give only one solution [8]. In contrast, this system of polynomial equations will be solved using resultant such that all possible solution of (4) can be found. A systematic procedure to do this is known as elimination theory and uses the notion of

resultants. The details of this procedure can be found in [9]. One approach to solving the set of nonlinear transcendental equations (4), is to use an iterative method such as the Newton-Raphson method [6]. In contrast to

iterative methods, the approach here is based on solving polynomial equations using the theory of resultants which produces all possible solutions [7]. The transcendental equations characterizing the harmonic content can be converted into polynomial equations. Then the resultant method is employed to find the solutions when they exist. These sets of solutions have to be examined for its corresponding total harmonic distortion (THD) in order to select the set which generate the lowest harmonic distortion (mostly due to the 11th and 13th harmonics). These sets of solutions have to be examined for its corresponding total harmonic distortion (THD) in order to select the set which generate the lowest harmonic distortion (mostly due to the 11th and 13th harmonics).

IV. SIMULATION RESULTS

The feasibility of the proposed approach is verified using computer simulations. A model of the seven-level inverter is constructed in MATLAB-Simulink software. A new strategy with reduced number of switches is employed. For cascaded H bridge 7 level inverter requires 12 switches to get seven level output voltage and with the proposed topology requires 8 switches. The new topology has the advantage of its reduced number of devices compared to conventional cascaded H-bridge multilevel inverter, and can be extended to any number of levels. The schematic of the cascaded H bridge seven level inverter and proposed new seven level topology built in MATLAB-Simulink is illustrated in Fig. 6 and Fig. 7 respectively

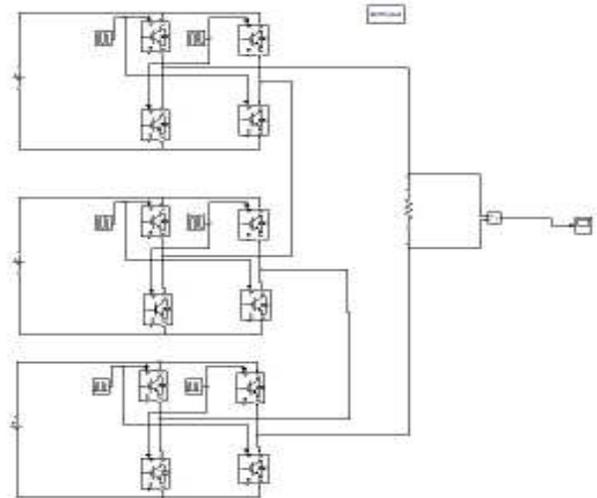


Fig 6: Schematic of Conventional Seven Level Inverter

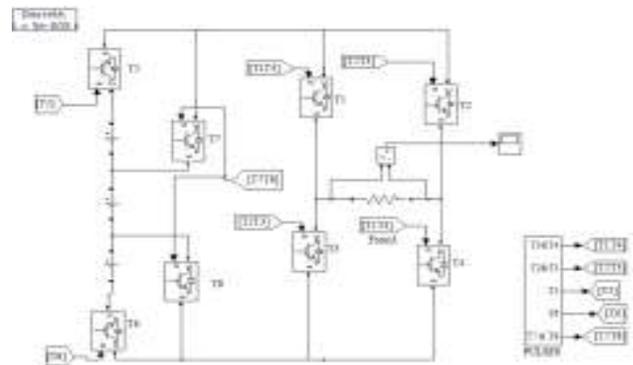


Fig.7 Schematic of Conventional Seven Level Inverter

And similarly for three phase seven level inverter is built as illustrated in the Fig.8. The switching patterns adopted are applied for the proposed topology and switches to generate seven output voltage levels at 0.9 modulation index and the switching pattern are shown in the Fig.9 Simulation results for 7-level inverter at $V_{dc}=50V_s$, $m_a=0.9$ where $s=3$ and corresponding output voltages for proposed seven level inverter are shown in Figs. 10 and similarly for three phase to ground and phase to phase voltages are shown in Fig 11 and Fig.12 respectively.

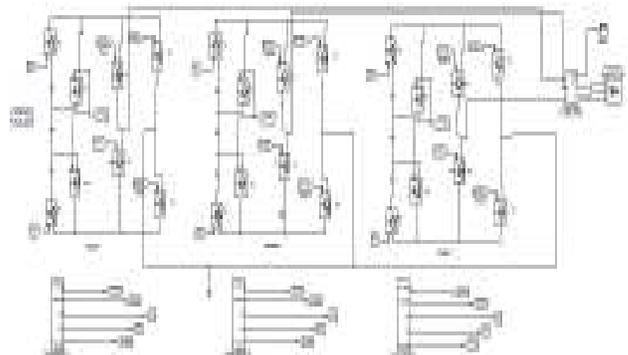


Fig. 8 Schematic of Three Phase Seven Level Inverter



Fig. 9 switching pattern of Single Phase Seven Level Inverter topology

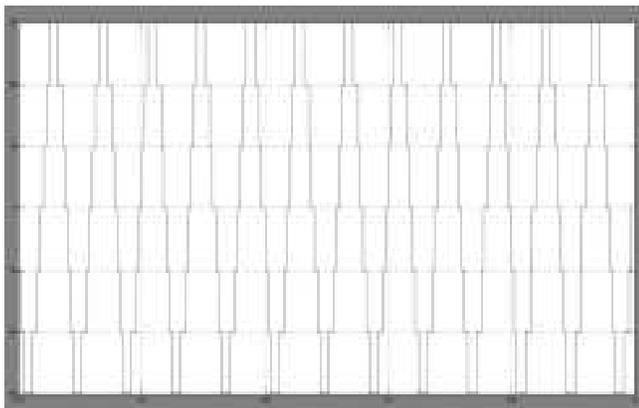


Fig. 10 Output Voltage for Single Phase Seven Level Inverter

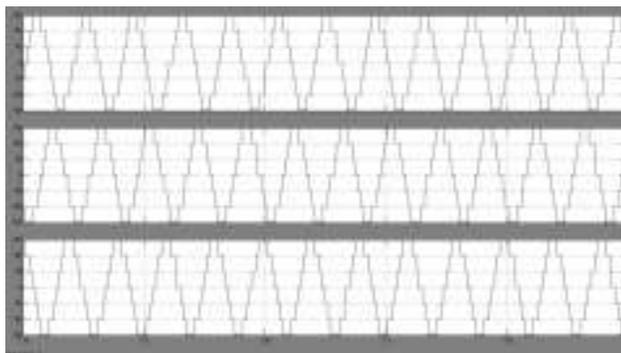


Fig. 11 Phase to ground voltage for Three Phase Seven Level Inverter

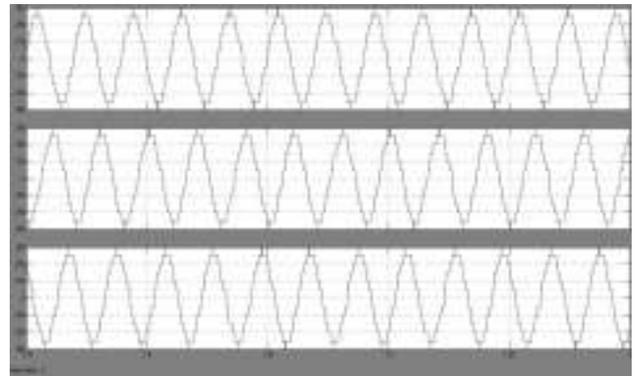


Fig. 12 Phase to Phase voltage for Three Phase Seven Level Inverter

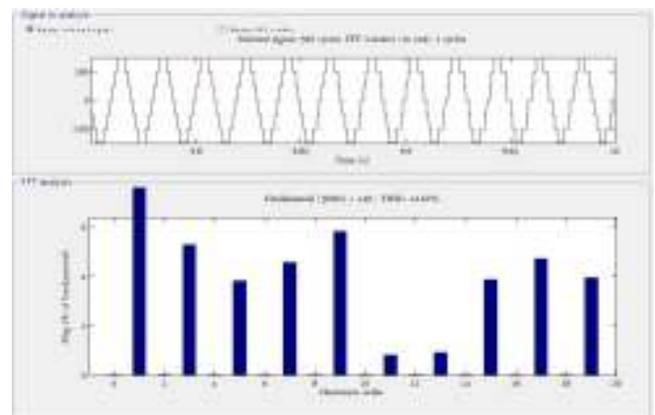


Fig.13 FFT Analysis

The proposed topology has the advantage of its reduced number switches and harmonics are reduced with THD value of 14.62 at 149V is achieved. For proposed harmonic spectrum of the simulation system is as shown in the fig.13, which shows the results are well within the specified limits of IEEE standards. The results of both output voltage and FFT analysis are verified by simulating the main circuit using MATLAB.

V. CONCLUSION

A new family of multilevel inverters has been presented and built in MATLAB-Simulink. It has the advantage of its reduced number of switching switches compared to conventional similar inverters. However, the high rating of its four main switches limits its usage to the medium voltage range. The modes of operation and switching strategy of the new topology are presented. A PWM algorithm is applied with the help of pulse generator and based on the theory of resultant has been applied for harmonic elimination of the new topology. Since the solution algorithm is based on solving polynomial equations, it has the advantage of finding all existed solutions, where the solution produces the lowest THD is selected. Other PWM methods and techniques are also expected to be successively applied to the proposed topology. The simulation results show that the

algorithm can be effectively used to eliminate specific higher order harmonics of the new topology and results in a dramatic decrease in the output voltage THD.

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Design of an Optically Controlled Robotic Arm for Picking and Placing an Object

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Abstract- This paper focuses on design of an optically controlled robotic arm for picking and placing an object. The arm has 2 links and 3 joints. An optical panel is used to control the arm. The panel is made of IR transceivers in the form of an array. The coordinates from which the object is to be picked and placed is selected using panel and the robotic arm uses inverse kinematics to execute the task.

Index Terms- DOF, Inverse kinematics, Optical panel, Robotics, Robotic arm

I. INTRODUCTION

Robot is a machine to execute different task repeatedly with high precision. Thereby many functions like collecting information and studies about the hazardous sites which is too risky to send human inside. Robots are used to reduce the human interference nearly 50 percent. Robots are used in different types like fire fighting robot, metal detecting robot, etc.

The first robotic arm to be used in an automobile industry was "UNIMATE" in GM motors USA in 1950s. From then there has been tremendous improvement in the research and development in robotics. Now robots are an integral part of almost all industries. Robots have to do different tasks including welding, trimming, picking and placing etc. These robots are controlled in different ways like keypads, voice control, etc.

In this paper, we introduce optical control of the robotic arm. The optical panel is made up of IR transceivers in the form of an array. This panel is connected to a PIC microcontroller through multiplexers. The array represents the working environment of the robotic arm. The panel is divided as 4 sectors representing the 4 quadrants. To select the real time object, the corresponding coordinate in the array is selected. The first selection is taken as source and the second selection is taken as destination. Once the robot gets the coordinates, it uses the inverse kinematics to calculate the required rotation.

II. HARDWARE

A. Mechanical

The robotic arm has 2 links and 3 joints. It is mounted on the center of a table or the platform on which it is supposed to deal with the objects. The end point of the second link has an electromagnet and all objects are magnetically attractive.

The range of the arm is the total length of the two links. The length of each link can be designed as per requirement. It can be of equal or different lengths. The arm has 3 degrees of freedom. Each joint has a dc geared motor for the link movement.

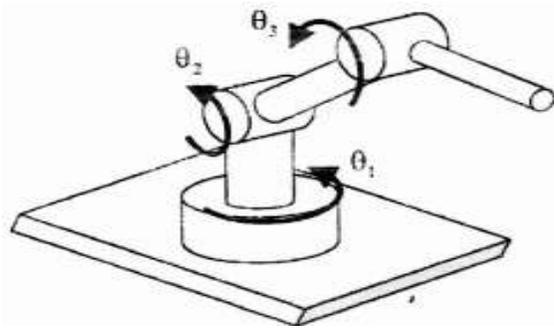


Figure1: Robotic Arm

B. Electronics

The robot electronics consists of a PIC microcontroller, optical panel, motor driving unit and a power supply.

The optical panel is made of IR transceivers in the form of an array. According to the number of coordinates and accuracy required, the number of IR transceivers may be increased.

For instance, if we take 10 units of X and Y coordinates in one quadrant, we use 80 ($10 \times 2 \times 4$) IR transmitters and 80 IR receivers. And if each of these are placed 1cm apart, then a total area of 400cm^2 can be covered with 1cm accuracy.

The optical panel is connected to the PIC microcontroller through multiplexers. The first interpretation is taken by the robot as the source and the second interrupt is taken as the destination. For example, if the first interrupt occurs at (-1,-2) and the second at (1,-5), then the object at (-1,-2) is picked and placed at (1,-5).

The motors used are dc geared motors with appropriate torque and rpm. Solenoid type relay is used as the motor drive unit.

A lead acid battery is used as power source for the entire system.

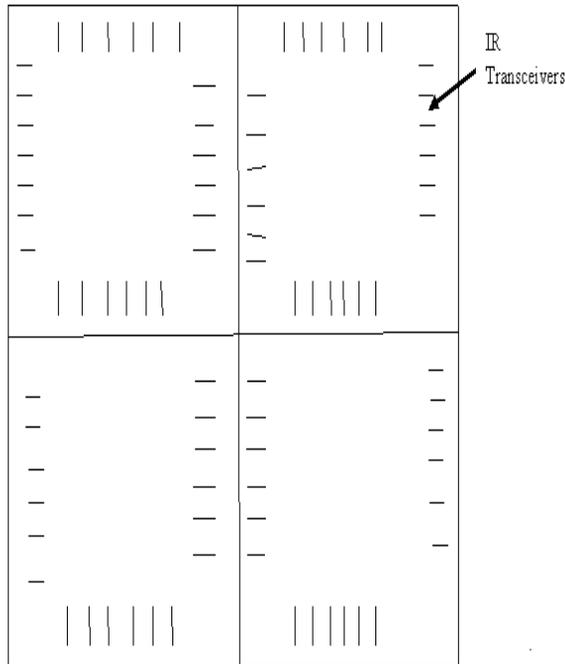


Figure2: Optical panel

III. MATHEMATICAL MODELING

A. Inverse Kinematics

O is the point to be reached.
 'c' and 'a' are lengths of first and second link respectively.

From figure1 and figure3;

$$\begin{aligned} \theta_1 &= \theta \\ \theta_2 &= A \\ \theta_3 &= B \end{aligned}$$

By Pythagoras theorem,

$$\begin{aligned} b^2 &= x^2 + y^2 & (1) \\ \theta &= \tan^{-1}(y/x) & (2) \end{aligned}$$

We know that area of a triangle is given by;

$$\text{Area} = (s \cdot (s-a) \cdot (s-b) \cdot (s-c))^{1/2} \quad (3)$$

$$\text{Where, } s = (a+b+c)/2 \quad (4)$$

We also know that the area of a triangle is given by;

$$\text{Area} = \frac{1}{2} \cdot \text{base} \cdot \text{altitude} \quad (5)$$

From figure (2);

$$\begin{aligned} \text{Area} &= \frac{1}{2} \cdot b \cdot h & (6) \\ \text{But } h &= c \cdot \sin A & (7) \end{aligned}$$

Now, by substituting (7) in (6), we get;

$$\text{Area} = \frac{1}{2} \cdot b \cdot c \cdot \sin A \quad (8)$$

As we know values of a, b and c, the area is calculated as per equations (3) and (4)

Hence, from equation (8);

$$\sin A = \frac{2 \cdot \text{Area}}{b \cdot c}$$

Or

$$A = \sin^{-1} \left(\frac{2 \cdot \text{Area}}{b \cdot c} \right) \quad (9)$$

Similarly,

$$B = \sin^{-1} \left(\frac{2 \cdot \text{Area}}{a \cdot c} \right) \quad (10)$$

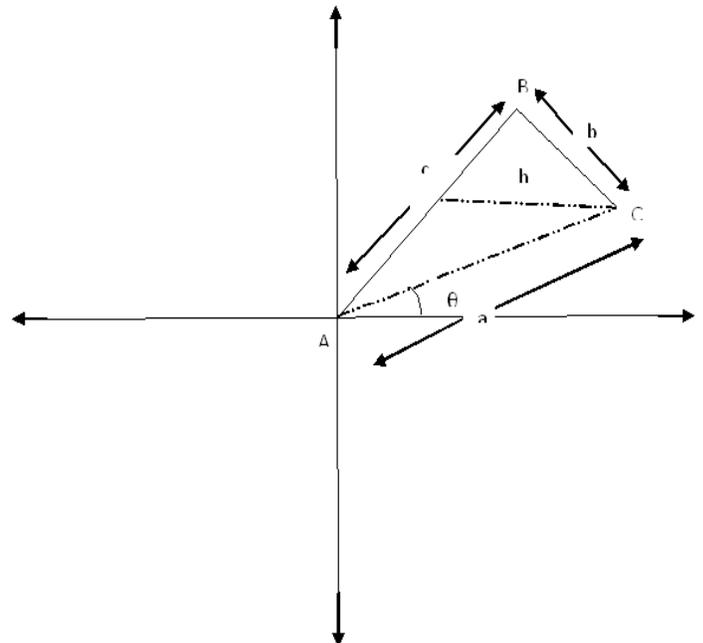


Figure3: Schematic of working environment

B. Motor Rotation

From equations (2), (9) and (10), the values of θ , A and B are obtained.

Θ is the angle of rotation for the base motor. A is the angle of rotation for the motor connecting the first link and B is the angle of rotation for the motor connecting the second link.

Here, we consider that all motors are of 10rpm. And hence, all the motors cover 60° in one second.

To improve accuracy, the motor is turned on only for 1ms in one on loop in the program.

Hence the motor covers an angle of 0.06° in one on loop.

Once the angles are calculated by using the inverse kinematics, the PIC microcontroller decides the number of on loops to be executed for each motor.

For example, if the angle to be covered by the base motor is 24° , then the PIC microcontroller will execute the on loop 400 times.

IV. SOFTWARE

Onboard software is mainly developed with micro C. This software interfaces between the optical array and the robot by receiving interrupts to control all robot functions. Simulations have been executed both in Mat lab and PIC simulator. In Mat lab the approaches were implemented under ideal hypothesis, more realistic settings.

V. SAMPLE WORKING

If we have an object at a coordinate (1, 5), and we have to move it to a coordinate (3,-6), we first touch the corresponding coordinate of (1, 5) and then the coordinate corresponding to (-3,-6) in the optical panel. These data are taken by the PIC microcontroller through multiplexers and the first touch is taken as source point and the second is taken as destination.

Now using the equations (2), (9) and (10), the controller calculates the values of θ , A and B respectively. These values are stored in separate variables and then the number of on loops to be executed are calculated and executed one by one.

When all the motors are rotated accordingly, the tip of the second link is magnetized and this helps in holding the magnetically attractive object. Once the destination coordinate is reached, the tip is demagnetized to place the object.

VI. CONCLUSION

Optically controlled robotic arm for picking and placing an object was successfully designed. The robot control was found to be user friendly. The accuracy and range is improved as more IR transceivers are installed.

In future, instead of using IR array, capacitive or resistive type touch screen may be implemented.

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Enhancing Cloud Capabilities through Web Service

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Abstract- Now-a-days Cloud Computing is popularly known as Internet Computing. It helps in sharing data, computing, and provides services transparently among users of a massive grid. It became widely accepted by the user because of its advantages that involves, reduce costs, increase business flexibility and/or provide business continuity. Cloud Computing is becoming increasingly relevant, as it will enable companies involved in spreading this technology to open the doors to Web 3.0. In this paper the basic features of cloud computing are presented and compared with those of the existing technology of Web 2.0 and Web 1.0. The paper describes the concept of computational resources outsourcing, like applications and services on which they operate referred to a real application and better enhancement of different cloud services.

Index Terms- Cluster based services, grid computing, Service-Oriented Architecture, Web Services.

I. INTRODUCTION

With cloud computing, IT capacity can be adjusted quickly and easily to accommodate changes in demand. While remotely hosted, managed services have long been a part of the IT landscape, a heightened interest in cloud computing is being fueled by ubiquitous networks, maturing standards, the rise of hardware and software virtualization, and the push to make IT costs variable and transparent [1]. Cloud computing is becoming more popular for the means of easy implementation and opening the doors to the use of 3rd generation web services i.e. web 3.0. Where not only the peoples are able to communicate but also collaborate, share their information and may perform user specific applications. However, to build the cloud more powerful and effective, the right network selection is the important consideration within which implementation of cloud computing may be under taken.

For allowing different companies to implement web 3.0, It is important to have knowledge of information regarding portals provided by respective companies support web 3.0. Once said information are gathered, it is easy to go for the comparative study of existing web services provider web1.0 and web2.0. Then we briefly explain which the extra services are provided by web 3.0. and how they can be provided.

II. BRIEF HISTORY

Cloud computing is basically known as computing over internet. It can be enhanced. this means not only user able to use a particular web based application but also he may participate in its computational procedure by either adopting ,demanding or pay per use basis[3][5].

Cloud computing is very new to the market. But somehow its origin and behavior resembles with grid computing, which is a very powerful but not free from complexities. However the basic requirement for implementing cloud computing and grid computing are similar starting from the hardware & software requirement to the different versions of operating system they support. So if one user desire to implement such a new computing application, may require to opted, both of the computing paradigm. Grid computing is something similar to cluster computing, it makes use of several computers connected is some way, to solve a large problems quickly [4]. Till date very few search engines are available which uses both technologies for searching and retrieving information.

Moreover, Cluster computing [8] can also be used as a relatively low-cost form of parallel processing for scientific and other applications that lend themselves to parallel operations which can be used in order to design and implement any such application. On the other hand the cluster based application [9] efficiently deals with cloud based services .So it can taken as one of the better option for cloud based application for homeowner parallel computing .

III. CLUSTER BASED SERVICES VS GRID BASED SERVICES

Some of important features of cluster based services and grid computing based services given below:

Grid computing is focused on the ability to support computation across administrative domains sets it apart from traditional computer clusters or traditional distributed computing. Grids offer a way of using the information technology resources optimally inside an organization. In short, it involves vitalizing computing resources. Grid computing [8][9] is often confused with cluster computing. Functionally, one can classify grids into several types: Computational Grids (including CPU scavenging grids), which focuses primarily on computationally-intensive operations, and Data grids, or the controlled sharing and management of large amounts of distributed data. Cluster computer is a set of CPU nodes that are used to solve any problem over a network. The way in which this cooperation is accomplished among the computers to solve a problem is called Cluster Computing. In Grid computing, the idea is very similar to Cluster Computing however they are used for solving large

problems. Again Clusters are usually homogeneous and Grids are heterogeneous. Homogeneous is where all CPU nodes have the same Hardware configuration and OS. A cluster of clusters is usually a Grid [10]. CPU nodes that are part of a Grid need not be homogeneous and are usually spread across LANs or WANs. such as we can say grid computing is an evolutionary ingredient for cluster preparation. The difference between these two can be studied in terms of their capability of management of geographically distributed computing resources (The recourses used by some computational problems) such as used to describe accessible computing equipment or operation. Another difference between the two is both support different hardware and software as well as support different versions of operating system. So depending on that they provide different applications which will help us to improve the cloud services. So whenever there is a web based application need to be provided, they can adopt the features by the two depending upon its requirement. Though clusters and grid computing are not for web application but help the web application but can reduce the complexity associated with it by their different environment in which individual users can access computers, databases and experimental facilities simply and transparently, without having to consider where those facilities are located.

IV. REQUIREMENT OF CLOUD BASED APPLICATIONS

For the implementation of a new cloud based application which need to better security and productivity than the exiting application for which the new one has been designed with. Again it must ensure the QoS and a optimal system throughput. The new application may have high innovative service say Numerical Weather Forecasting, Oceanography [5] which provided to the end user or customer. The companies that were able to implement grid computing technology, achieve better results. This was one of the reason which lead to the disappearance of small search engines. so here the end users or customers remain faithful to the few main companies which not only provide the text search services in their web pages but also able to provide various other accessory details such as image and video searching. For providing the better enhancement that is enhanced flash services 3D appearance and interactive capacity and all other better capabilities our proposal must be capable of providing the services required which must be given by our application. So we need to for a higher level web service previously we were using web 1.0 and currently we are using web 2.0. Here we are providing an comparative study of both in order to generate the basic requirement for the new generation web application web 3.0.

V. EXISTING WEB SERVICES

A web service is a programmable component that provides a service and is accessible over the Internet. "Web services" is an effort to build a distributed computing platform for the Web. Some existing web services are SOAP [5], WSDL [6], WSIL [5], and UDDI [6]. Web-based applications that dynamically interact with other Web applications using open standards that include XML, UDDI and SOAP.

A Service-Oriented Architecture (SOA) is a collection of services or software agents that communicate freely with each other. Sub-topic definition: Web Services protocols and standards are the technology that promotes the sharing and distribution of information and business data. A protocol is a standard method for transmitting data through a network. There are many different specialized protocols to accommodate the many kinds of data that might be transmitted [2] [3] [4].

A. web 1.0 and web 2.0

The some feature comparison of web 1.0 and web 2.0 as follows:

- 1) Mode of operation: First coming to the mode in which both they operate, where the web 1.0 uses only read mode but web 2.0 uses read, write and contribute mode. That means here not only the end user is able to read but also can write of their own and also can contribute as a comment or suggestion [3].
- 2) Content Page: In case of web 1.0 the primary unit of content is page where as in case of web 2.0 the primary unit of content is either post or record the information.
- 3) State of Application In case of web 1.0 the state of the application is static where as in case of web 2.0 it is dynamic one[3].
- 4) Browser: For viewing an application based on web 1.0 a web browser is needed but the application based on web2.0 can be viewed through browser, RSS reader (read simple syndication) or anything which is suited for internet [3].
- 5) Architecture: Coming on to the architecture point of view the web 1.0 uses client server architecture where as web 2.0 uses web service based architecture.
- 6) Easy operation: For web 1.0 based application content are created by web coders where as the web 2.0 based applications are created by everyone.etc.

Many utilities may require cloud computing applications. It may needs high speed computing and large storage. These are the many services were defined as a hybrid model of exploiting the recourses provided by computer network. it has both computational and sociological implications. In the computational terms these cloud services are described as a subset of grid computing concerned with the use of special shared computing recourses. For which it has been classified as a hybrid model exploiting computer network mainly internet.

B. Web 3.0

In order to avail the facilities of the web 3.0 services to specific application of cloud it must be capable of performing high performance calculations and provide stimulated systems.

Web 3.0 technologies (semantic web) include:

- 1) Artificial intelligence
- 2) Automated reasoning
- 3) Congestive architecture
- 4) Composite application
- 5) Distributed computing
- 6) Knowledge representation
- 7) Ontology(computer science)
- 8) Recombinant text
- 9) Scalable vector graphics

- 10) Semantic web
- 11) Semantic wiki
- 12) Software agent

In order to introduce the advance services of web 3.0 such as a fast broadband connection to the internet, always and everywhere. We first must understand what is the advancement we will get from the implication of web 3.0 in the cloud based application, considering an example, suppose someone is collecting stamp of variety types. After sometime a huge amount of stamps are been gathered. Now from the large amount of stamps suppose it is need to search for a specific one. Then what are the possible ways for searching it? Possibly, First, search may be by its name, which technique is been used in case of web1.0. Second, may search for it by its color say blue, which technique is been used in case of web 2.0. Finally, search for it by its structure which can be possible in case of web 3.0.

Describing the data in a structured way can be best possible using database. Now via using web 3.0 not only the description of data done by database but also different databases can be connected.

Considering another analogy with the databases such as database with stamps, database with different county names, database with different colors, and database with different traders. In this context, web 3.0 have the provision for creates a big collection of databases, may be connected on demand. Now, its can be the arguments that made for the structure of data and the way the data is described.

Linking data is the power of web3.0. So we can well define that web 3.0 uses open source technique and free data, where the data are used as services. By using this advancement into our cloud services, the power of cloud computing increased by enabling the open identities and provide us software as a service(SaaS).for example Google docs.

With the internet dominating the business world, the need to have an effective web 3.0 sites has increased among companies, in today's always on world a company's web site is critical to its ability to compete and succeed [9]. Our top priority is to provide high quality updates on web 2.0 and 3.0 solution around the world. Web 3.0 is defined as the creation of high quality content and services produced by individuals using web 2.0 technologies as an enabling platform.

VI. CONCLUSION

The aim of this to show several types (and levels) of interoperability of applications provided by cloud computing; although driven by proof-of-capability experiments and results therein, there are deeper questions that motivate this work and define the research methodology for redefining the services capabilities. Thus, on the one hand, there is a need to provide a range of applications on developer's disposal. On the other hand, in order to build empirical models or validate existing predictions of performance, it is important to establish and experiment with programming models.

How to understand and use these platforms is a big issue. Choice of appropriate web services is an important consideration while we are using cloud computing. It introduces significant

concerns about data integrity, intellectual property management, audit trails, and other issues have been identified in this work and future directions have been proposed so that advantages of the Cloud can be unleashed.

In this paper, we not also described the definition, styles and characters of cloud computing, but also investigate what benefits the different web services give and bring to the foundation for cloud computing. We also took an example, summed up key techniques, and then cloud computing web services were illustrated and compared.

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Perceptual Study of Behavioral Implications of Usage of ICT for Sustainable e-Governance in Rural India

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Abstract- The e-Governance is growing very speedily in entire world and in our country also. Simply we can say that in near future it will become a part of human life. In the field of 'e-Governance', it includes government, nonprofit, and private-sector entities without distinct boundaries. The model for e-governance is a one-stop portal, where citizens have access to a variety of information and services. The major goal of e-Governance is strengthening good governance and broadening public participation, improving the productivity and efficiency of government agencies, improving the quality of life for disadvantaged communities, creating a better business environment, transparency and openness in accountability. As far as rural sectors of India are concerned, e-Governance has not yet laid its actual needed effect to develop them. Integrated empowerment of rural areas is one of the abiding tasks before the Government of India. India is a country of villages and about 50% of the villages have very poor socio-economic conditions. E-Governance implementation in rural India has "Too many goals but very little reality".

This research paper discusses the behavioral implications of usage of ICT for sustainable e-Governance system in Rural sectors of India so that, the system can influence empowerment of rural sectors and also sway value added citizen-centric approach as citizens' satisfaction, citizens' involvement, citizens' awareness, improved interaction with businesses and industries, increased transparency and reduced corruption with e-Governance services.

Index Terms- e-Governance, information to transformation, Rural India, Sustainability

I. INTRODUCTION

No doubt, India has introduced the global trend of usage of ICT in 1990, but no sincere exercise has been undertaken in the corresponding years to examine the effects of these reformative measures, especially the role of the information technology, in the governance process (Monga, A., 2008).

Mapping with this global trend of usage of Information and Communication Technology and Internet, India has undertaken considerable initiatives to introduce e-Governance at the national, state and local levels. In terms of the total number of government websites, although the advanced industrial countries are in the top of the list, India is ranked seventh in the global list (Norris, 2001). Similar to the previously mentioned common rationales, the top policy-makers in India tend to justify the

adoption and expansion of e-Governance on the grounds that it costs less, reduces waste, promotes transparency, eliminates corruption, generates possibilities to resolve rural poverty and inequality, and guarantees a better future for citizens (Dev, 1999; Schware, 2000; Wadia, 2000; Siliconindia, 200m1).

In short, the government of India tends to expose e-Governance as the solution for all ranges of problems facing up with India. But there are opponents who, in general, suggest that the whole endeavor of ICT may have created a new class of 'untouchables' living in 'information poverty', compromised equal access to government services and grind down accountability and individual privacy (Ghere and Young, 1998; Hariharan, 1999; Upadhyaya, 2000). Unlike developed nations, India is one of the poorest countries in the world with severe problems of poverty, inequality, illiteracy and external dependence, which represent major hindrance to the efficacy of e-Governance in ensuring equal public access to state institutions, empowering ordinary citizens to exercise their basic rights and considerate political and administrative officials to be responsive and accountable. However, before studying the impacts of usage of ICT for sustainable e-Governance in Rural sectors of India, the next section is devoted to an analysis of the major policies, initiatives and computer literacy of the people for sustainability of e-Governance in this country.

A Shared Vision of leveraging the use of Information and Communication Technologies for delivering Good Governance in Rural sectors of India will be evolved through the weighted analysis of computer literacy of the people, help provided by the government to the illiterate people for usage of Information and Communication Technologies for effective e-Governance implementation. Critical gaps in the existing policy framework and priorities set by the Government would be identified. For fulfilling this shared vision a Strategic Policy Framework of Generic nature would be proposed by Indian government. An e-Governance road map for good governance including stepping up social and economic development of rural people, would be grown through a reviewing discussion process with critically evaluating the important parameters like educational status of the people, computer literacy, language barrier, acceptance of new technologies, and awareness of the people for the advantages of involving ICT for good governance, financial viability, training for new technology.

The present research paper would attempt to identify and establish linkages between the factors responsible for creating a favorable environment for effective and sustainable implementation of e-Governance by considering the factors

relating to good governance, demography of narrated issues and challenges, precedence for improving the governmental services through computerization/ use of IT for sustainable e-Governance, economy, geography, culture and other aspects especially in the context of rural India. The study proposes to use both primary and secondary sources of information. The notified reports and published research work would be used in the study as a derivative source of information.

Many of Studies have been conducted in developed countries to review the parameters for good governance.

Richard Heeks (2001) studied the effect of new information and communication technologies and how it can make a significant contribution to the achievement of good governance goals. The paper suggests that there exists wide gaps between the current reality in developing countries and the future of e-Governance systems. However, most e-governance initiatives fail.

Roumeen, Islam (2003) looked at the link between information flows and governance with the objective to scrutinize how the availability of information may affect governance. Specifically, it focused at how the availability of basic economic data affects governance and how the legal framework governing access to information might affect the quality of governance.

Mohammad Shakil Akther (2007) in his study on an e-government project in Bangladesh highlighted that most e-Government projects within developing countries employ high-technology involvement whereas citizens are not ready for this. A few studies have been carried out with respect to Indian Perspective. Koneru, Indira (2007) her study is of the view that e-Governance as a technology-enabled Public Information Services system aids not only in reengineering the structures but also in reorganizing the procedures and processes for speedy delivery of services.

II. OBJECTIVE OF THE STUDY

Thus, it can be inferred from the above, that a good beginning has made e-Governance, a reality in India, but still a lot needs to be done for sustainable e-Governance in Rural sectors of India.

1. To study the key parameters of usage of ICT for sustainable e-Governance in Rural sectors of India.
2. To discuss key issues for sustainable e-Governance in Rural sectors of India.

III. BACKGROUND AND SCOPE OF E-GOVERNANCE

e-Governance covers a wide range of services, we can categorize it in three distinct areas. These areas are (1) government-to-government (G to G), (2) government-to-citizens (G to C), and (3) government to business (G to B). Each of this area has a different combination of stirring services. Though, some common objectives include advancing the efficiency, reliability, and quality of services for the respective parts. In many respects, the government to government (G to G) sector represents the strength of e-Government. It is needed that governments at the lower level like union, state and local level must improve and update their own internal systems and

procedures before electronic transactions with citizens and business are introduced. G to G e-Government involves sharing data and conducting electronic exchanges between various governmental agencies. There are number of advantages with government-to-government initiatives. One benefit of this, is improvement in the management of public resources.

Government to citizen (G to C) provides the facility to the citizens for interacting with government, which fulfills the primary goal of e-Governance. This efforts to make transactions, such as renewing licenses and applying for certain benefits, payment of taxes with less time consuming and easier process to be performed. Government to citizen e-Governance also tries to increase access to public information through the use of websites and kiosks. Further, one of the main goals of implementing this plan is to create a "single window" where citizens can carry out variety of tasks, especially those that involve multiple government departments, without the need of contacting with each government department individually. Thus, G to C type is driven by a support to provide "better government" through improved efficiency and more reliable outcomes.

Government to Business (G to B) sector includes both the getting hold of goods and services by the government as well as the sale of surplus government goods to the public on line. There are some inspiring things behind G to B, the business community prefers to carry out its activities such as sales, procurement, and hiring through electronic means. There are large numbers of software companies, which are producing number of products focusing on performing routine business activities on line. Thus, many companies like to extend the cost savings in the business with union, state and local level governments. In emerging countries, there is great need to minimize costs due to shortage of funds G to B is being encouraged by the governmental agencies.

IV. KEY PARAMETERS AND ISSUES

Adoption of ICT Enabled Information Systems for Rural Development and Rural Viability is a strategic concern worldwide. The following are the features describing sustainable implementation of e-Governance.

Key Parameters of ICT to implement sustainable e-Governance

e-Governance refers to the use of Information Technologies such as Wide Area Networks, Internet and Mobile Computing by government agencies, that have the ability to transform relations with citizens, businesses and other arms of government (Subhajit,2004). e-Governance has the aim to improve access and delivery of governmental services to benefit citizens. More appreciably, it aspires to help strengthening coeorce of government toward effective governance and increased transparency to better manage a country's social and economic resources for development. After studying and reviewing so much of literature, Researcher has ascertained following parameters of ICT which should be taken in account for sustainable e-Governance in Rural India.

1. **Connectivity** : Continuous Internet connectivity is needed to access e-Governance web sites.
2. **Accessibility** : e-Governance services must be easily accessible at the citizens' doorsteps.
3. **Kiosk**: In rural India, people don't have handy computer facility to access e-Governance services. They must access it by the use of Kiosk connected to ISPs to enable private entrepreneurs operate the services profitably and build new services for sustainability.
4. **Way in assistance**: People of rural India need help to perform the e-Governance activities on behalf of them due to illiteracy or lack of knowledge.
5. **Integrated**: All e-Government applications should be integrated with each other, so citizens can have access to the data of various types. It improves the productivity of work and can save time and money.
6. **Single Window System**: To the greatest extent, citizens should be able to do everything they have to do or want to do with their government through one e-Government portal.
7. **Pervasiveness**: Access to an e-Government portal and its connected sites, services and applications should be available to users/citizens from any Internet-capable connection.
8. **Secure**: e-Government systems need to protect the confidentiality of data provided by citizens, the records created and stored by government, and the content and existence of citizen-government transactions performed over the Internet.
9. **Easy to operate** : The design and operation of e-government systems should take into account the special needs of the disabled, and make it possible for them to use these systems as easily as the non-disabled. It should be easy to operate so most novice of computer users can readily find the information they need to have.
10. **Interoperable**: An excellent e-Government site is one that provides appropriate and up-to-date links to other e-Government sites, at its own and other levels in the government hierarchy. All e-Government sites need to work together seamlessly.

Critical issues to get success

ICT can be a considerable and cost-effective way of responding to the needs of disadvantaged people of the Rural Indian population. Unfortunately, such hopes are built almost entirely on an empirical vacuum. Almost nothing is known about factors that make for effectiveness or ineffectiveness of ICT in

developing nations. No state in the Indian union is without a plan for bringing ICT to the masses; every major NGO has its IT projects. But unfortunately, the hopes so widely expressed are built almost entirely on an empirical vacuum (Kenneth Keniston, 2002).

After studying and reviewing so much of literature, Researcher has ascertained some key issues that would play a critical role and can be considered as yet unsolved problems of development that overwhelms large sections of the population of Rural India for effective usage of ICT for sustainable e-Governance.

1. **Educational level of the people and computer literacy**: There is wide inequality in literacy rate between the rural and urban areas – urban literacy rate is 80.06 % compared to rural rate of 59.21%. (Planning Commission, 2002). R. Chandrashekhar, Secretary, Department of Information Technology, The Government of India has stated during an interaction with media on the sidelines of Apex Committee on National e-Governance Program (NeGP), that an investment between Rs. 30,000 to Rs. 40,000 crores over period of 4 years for e-Governance services by 2014. This investment will cover the cost of all kinds of hardware and software that will be required for capacity building. (CyberMedia News). The Government of India is investing heavily in e-Governance with each passing year registering an increase of almost 23% in e-Governance spending (Figure 1).

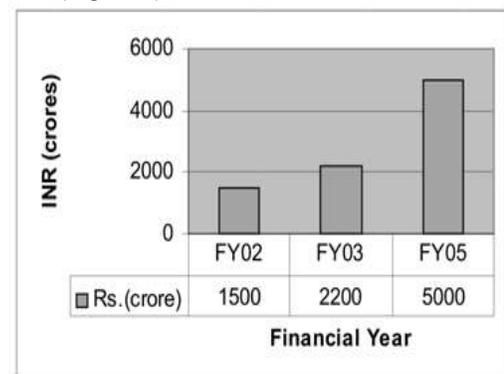


Figure 1: e-Governance spending by Govt. of India (2002-2005)

But with 70% of Indians living in 6 lakhs villages and 95 percent not speaking English, e-Governance models which do not support the rural delivery system will not contribute much to good governance.

2. **Language barrier**: There is non-availability of software in regional tongue languages for rural folks. The rural community can take the best advantage of the information content only if it is presented in the local language.
3. **Acceptance of new technology**: Another challenge in India seems to be change management.

There is confrontation from government employees due to the perceived negative impact of technology on their jobs and career and adapting to a new technical environment (Gartner, 2005).

4. **Awareness of the people for the advantages of involving ICT for good governance :** Generally, as far as people of rural areas are concern, they cannot change their traditional beliefs and working styles easily. Initially, e-Governance may seem like another option but in the face of rising demands ensuing from demographic, economic, social, and global trends, e-Governance no longer appears to be a matter of choice but will become a compulsion for any country, wishing to sustain in the 21st century as a competitive nation in the world arena. So people of rural sectors should be updated about the advantages of ICT for good governance, then only they can be switched over towards the acceptance of new technology and trend of ICT.
5. **Financial viability of the people:** With the rapid growth in population and consequent growth in the population of poor people, lives of the rural people are tough. Even after more than 50 years of independence India still has the world's largest number of poor people in a single country. Of its nearly 1 billion inhabitants, an estimated 260.3 million are below the poverty line, of which 193.2 million are in the rural areas and 67.1 million are in urban areas. More than 75% of poor people reside in villages (Azad India Foundation). To give more benefits to the people below poverty line (BPL), Indian government has to take more facilitating actions and plan accordingly to provide benefits of ICT by considering financial viability of poor people.
6. **Training for new technology:** It is essential for the e-Governance projects to sustain themselves. The Information kiosks, especially those run by NGOs and the private sector need to employ villagers to run the kiosks after providing pertinent training. The income generated by collection of user charges can be used to pay the kiosk operators in a self-sustaining model. These would not only be the income source for the men but also to women who are traditionally confined to their homes. MSSRF's Embalam Knowledge center is a case in point where the kiosk operators are women. More girls and women visit kiosks manned by women and almost no women visit kiosks run by men due to the cultural barriers in rural India. (Toyama, 2005)
7. **Quick and reliable access to internet :** Presently, less than 10, 000 Indian villages out of a total of 6 lakhs have seen the presence of internet (One World South Asia , 2004). To give broadband connectivity to 48% of the rural population, an

estimated 100,000 broadband and kiosks still needs to be set up. (CII National Broadband Economy Committee: Vision 2010).

8. **Government policy and efforts to promote e-Governance in particular sector :** Local Government policy and efforts to promote e-Governance are very important factors for successful and sustainable e-Governance in that particular sector.
9. **Properly audited technical standards :** Government of India and a majority of State Governments have created Departments of IT, however, there is a need for clear distinction of the duties and responsibilities between the respective DIT and the other Ministries/Organizations. There is no standardized technique even among the departments of the central government in implementing e-Governance projects. Such standardization would help shunning repetition of the same mistakes committed in a previous project. There is a need to address such divergences so that successes are replicated across States and failures are eliminated. This calls for formulation of norms for standardization and inter-operability at the national level.
10. **Continuous power supply:** There is practically no village with 24 hours power supply.

V. CONCLUSION

Governance in India and other developing and under-developed countries continues in its classical style with its ever increasing inability to deliver and to come up to the expectations of the masses. From the above discussion, it is evident that there are various key parameters for testing behavioral implications of ICT for sustainable e-Governance system in rural sectors of India. There are some key issues like people continue to deal with state and central functionaries in traditional manner and waste efforts and time as well as resources in getting the routine e-Governance jobs done. There are some sporadic efforts at modernization and automation of processes but a complete transformation does not appear to be contemplated.

At the centre of all e-Governance activities is the citizen. Therefore, on account of the diversity in languages across the country, e-Governance initiatives have to be built on a platform which supports interface in local languages in order to reach out to those living in Rural areas.

Some other strategies/action plans for a successful implementation of an e-Governance system for one billion people of India are suggested as creating literacy/awareness and commitment to e-Governance at high level, conducting usability surveys for assessment of existing e-Governance projects and act upon the results of such assessments with clearly defined objectives and interoperability policies to achieve such

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Standing carbon in an urban green space and its contribution to the reduction of the thermal discomfort index: a case study in the City of Banjarbaru, Indonesia

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Abstract- The ecological benefit of trees in an urban green space in the city of Banjarbaru was investigated during the long dry season of 2011. About 19 ha of homogenous green space, consisting of approximately 3770 *Pinus merkusii* trees, was studied in order to assess the trees' biomass, carbon stock, carbon sequestration and ability to reduce human thermal discomfort. Above ground fresh and total dry biomass was calculated using an allometric equation of the DBH (Diameter Breast Height) of 404 trees. Carbon storage and sequestration were calculated as a portion of total carbon by considering the pine growth factor. These figures were supplemented by calculation of balanced CO₂ for and O₂ produced by photosynthesis. The result reveals that the DBH of the trees is distributed into 9 classes, mostly with an interval of approximately 35.5 – 41.4 and 41.5 - 47.4 cm, with others distributed from 23.9 cm to 76.4 cm. Biomass consisted of 0.032 Ggha⁻¹ total carbon and of 0.025 Ggha⁻¹ carbon storage. There were also 2,216,915 tons or 883.441 kggha⁻¹ balanced CO₂, and 21,134.064 ty⁻¹ potential carbon sequestration. Also, local people can benefit from additional oxygen of 56,357.505 ty⁻¹, which is enough to supply the needs of about 5 % of the local district population. Pine Park provides a cooling effect by giving a reduction on THI of 6 °C to 7 °C from exterior value of 32 °C. Thus, this study concludes that Pine Park in the city of Banjarbaru is effective in mitigating the effects of climate change and situations of extreme heat.

Index Terms: Diameter Breast Height (DBH), Temperature Humidity Index (THI),

I. INTRODUCTION

The benefit of trees in an urban green space was investigated from a different point of view to that in developed countries. Urban populations derive either direct or indirect benefits from green space. These include carbon sequestration, reduction of storm risk and mitigation of the effects of storms, absorption of urban emissions and production of oxygen, purification of air and water, noise reduction, microclimate regulation, promotion of urban health, conservation of biodiversity and soil-water protection (Cicea and Pirlogea, 2011; Seaman et.al., 2010; Burl et.al., 2007; Baris, et.al. 2009; Davies, et.al., 2008; Abkar, et.al., 2010; Akbari et.al., 2001).

Economic benefits, such as local income generation and the increase of home prices, and social benefits, including social

relationships, can influence several health outcomes; the current research has shown trends in urban cohesiveness and democracy. Furthermore, there is increasing evidence for a positive relation between green space and health and there are indications of a positive relation between the amount of green space in the living environment and social relationships (Maas, et.al., 2006, 2009; Szumacher, 2011; Altunkasa and Uslu, 2004; McPherson et.al., 2005)

City is dependent of urban internal capability and other factors beyond the city limit. Locally generated ecosystem services have a substantial effect on quality-of-life in urban area and should be addressed to land use planning, such as green open space and city gardens. Green space improves the urban environment and contributes to public health and the quality of urban life (Zhou et.al., 2011; Gabor and Jombach, 2009; Taib, et.al., 2007; Yilmaz and Toy, 2007)

Green space is very important in supporting sustainable development in the City of Banjarbaru, a small metropolitan area with a population of about 170,000. The City of Banjarbaru is a newly emerging and fast growing city under autonomic regulation and has great potential for becoming a metropolitan region, named "Banjar Bakula," through the acquisition of services from four other cities. Currently, the City of Banjarbaru is a Provincial Administrative City of South Kalimantan Province. Thus, quantity and quality of green space will become obviously important in the regional response to climate change.

The biggest green space in the City of Banjarbaru is Pine Park, a homogenous *Pinus merkusii* forest of about 19 ha. It is very close to a residential settlement and serves people from a few yards to several kilometers. The users of this forest are families, teenagers and school children, and it is used for walking, cycling or camping and picnics or family gatherings. Most people recognize the benefit of Pine Park, but there is has been little scientific evaluation of these benefits.

The City of Banjarbaru is also threatened by urbanization, and the proven gradual deterioration of urban ecosystems due to poorly planned urban industrial development, low level management and over exploitation of natural resources, especially water and land resources, presents a challenge for sustainable social and economic development in the emerging city. The principle of ecological balance can be used to plan the amount of urban green space. The element threshold method is very useful in developing countries, where many habitats have been disturbed by human activities. In Banjarbaru, this method is

more relevant than are some others, such as the ecological factor plat method and the recreation space ratio method (Zhang, et.al., 2007)

This research is aimed both at identifying ecological elements, including the carbon-oxygen balance and thermal comfort, that are potentially relevant in relation to reducing the negative impacts of climate change and at assessing ecological benefits, such as biomass, carbon storage and sequestration and balanced carbon for and oxygen produced from photosynthesis. In addition, the local humidity and temperature in the interior of Pine Park were measured in order to calculate the thermal discomfort index.

II. METHOD

About 404 trees were sampled from 21 sample plots in 19 ha of green space. Plots were set up following three replicated transect lines, with 7 (20 x 20 m) plots in each line, which were positioned opposite to each other. The DBH (Diameter Breast Height) of trees was calculated from the circumference, measured using a meter band at 1.37 cm from the ground. A clinometer was used to estimate tree height. Dead trees were not measured, because about 169 dying and dead trees were cut in early 2011 for safety reasons, at the suggestion of park users. As there are no data for those removed trees, the total carbon storage with the dying or dead trees was not taken into account (Nowak, 1993; Nowak et.al., 2003).

Data were arranged statistically in 9 classes based on class intervals of DBH. Although maximum and minimum population range intervals were not assessed statistically, frequency of class interval was used for multiplying the proportion of the population when calculating the total number of the population, about 3770 trees (Velle, 1995).

Measurement and prediction of carbon content by destructive methods can not be used for urban trees. Therefore, fresh biomass was calculated using the allometric equation,

$$Y = 0.1 (\text{DBH})^{2.29} \dots\dots\dots(1),$$

where Y is above ground fresh biomass in kg, DBH is the diameter breast height (cm) and 0.1 is a species specific coefficient. Nowak and Crane (2002) suggest using factor conversions of 0.48, for calculating a proportion of dry biomass from fresh biomass, and of 0.46, for converting dry biomass to above ground carbon. In addition, total carbon also was calculated from above carbon by considering a root-shoot ratio of 0.26. Total carbon was multiplied by a conversion factor of 3.666 to find out the amount of balanced CO₂ for photosynthesis. Potential carbon sequestration was calculated as the difference of total carbon in the next year, by considering a *Pinus merkusii* growth factor of 0.26 cm DBH per year. Oxygen production was determined by multiplying carbon sequestration by a conversion factor of 1.2 (Ritson and Sochachi, 2003; Siregar, 2007, 2011; Wang et.al., 2004; Nowak et.al., 2000, 2007).

Human respiration consumes about 800 g and for biochemical oxygen consumption is about 40 g per person each day. Annual oxygen consumption is approximately Total population x 0.000840 x 365 days = Total population x 0.3066 ty⁻¹ (tons per year). The Indonesian gasoline emission factor is 69,300 kg TJ⁻¹

CO₂, so the fuel emits about 2.223 kg CO₂/l (Wong and Gong, 2002; Hill et.al., 2011).

Air temperature and relative humidity (Rh) were measured using a digital thermometer and hygrometer (Kestrel 4500, Nilesen-Kellerman, NS:626643, USA). The human thermal discomfort index, was calculated from the air temperature and Rh from the interior and the exterior of the forest Park using the equation,

$$\text{THI} = 0.8 T_a + (\text{Rh} \times T_a)/500 \dots\dots\dots(2),$$

where THI is the Temperature Humidity Index, T_a is the air temperature at 1.5 m from the ground (°C) and Rh is the relative humidity at 1.5 m from the ground. Empirical testing of the THI value using human subjects enabled the comfort limit to be defined as follows:

21 ≤ THI ≤ 24 is 100% of subject felt comfort,

24 ≤ THI ≤ 26 is 50 % of subject felt comfort,

THI > 26 is 100% of subjects felt discomfort.

Temperature and Rh were measured in each plot at 06:00 am, 11:00 and 03:00 pm four times within the long dry season, from July to September 2011. THIs from the interior and exterior of Pine Park were compared to reveal the role of these trees in the reduction of thermal discomfort, as this has been investigated in many developed countries (Tahbaz, 2011; Poupkou, et.al., 2011; Kakon, et.al. 2010; Georgi and Zafriadis, 2006; Wang, 2004; Kamoutsis, et.al., 2010)

III. RESULT AND DISCUSSION

The geographical location and topography positions of the City of Banjarbaru are favorable in relation to it becoming the center of urban regional development. There are transitions of land use from green space to built environment, such as urban settlement, market blocks, industrial and mining facilities. Pine Park has been reduced from 24 ha to just 19 ha due to urban settlement development. There is some dispute about further uses of Pine Park, and there is insufficient research about the benefits of Pine Park to support decisions over whether to hold or to convert its function.

All of the pine trees were planted in 1968 for reforestation; the park was initially a nursery for pine in South Kalimantan. The ages of the trees are not less than 45 years. The project was discontinued because *P. merkusii* produces resin that is easily fired during the dry season, and this nursery was overlooked for years. Now, the City government needs it to maintain a balance between green and built areas.

Above carbon

Trees in Pine Park were planted about 3 m from each other, and the average density is 198 trees/ha⁻¹. Individual tree canopies overlap, but there some gaps in the overall canopy that allow sunlight to reach the forest floor. Although some plant species grow under the canopy, carbon from the litters and under storey plants was not measured because, in this dry season, all of them have been slashed and burned for annual maintenance.

Calculation of carbon may become an indicator of a sustainable urban response to climate change, in term of local climate mitigation.. Multiplying 0.48 with the fresh biomass of 404 sample trees resulted in 2824.5 kg above ground dry biomass, and multiplying this amount of dry biomass by a

conversion factor of 0.46 and a 0.26 root-shoot ratio equals to 1637.1 kg of total carbon storage (Nowak 2004, 2008).

DBH was distributed into 9 classes of stem. Most trees had a DBH of approximately 35.5-41.4 and 47.5-53.4 cm , while others ranged from 23.9 cm to 76.4 cm. The dry biomass maximum, minimum, average weight and standard deviation were calculated and are presented in Table 1. Wide variation of DBH are expressed by high value of it's standard deviation. As McPherson (1998) found in Sacramento urban forest, carbon storage reflected in differences in tree size and diameter may be related to competitive responses to the need for light and the crowding of plants and those competition is dynamic in climatic condition and disturbance by anthropogenic activities (Sanchez-Gomez, 2008; Comes and Allen, 2007; Canham, et.al., 2004; Hartmann and Messier, 2011).

Extrapolating values from samples to total trees in 19 ha Pine park produced a result of 0.021151 Ggha⁻¹ and 0.016786 Ggha⁻¹ of total carbon and carbon storage, respectively. This equates to 77.538 tons of CO₂ absorbed and potential carbon sequestration of 588.538 ty⁻¹. According to the Indonesian Country Study Ministry of Environment Republic of Indonesia (1999), this amount of balanced carbon of 77.538 ty⁻¹ is equal to 46 524.58 liter burned gasoline or about 3 877 048 km journey for a small car with a fuel consumption of 12 km/l (Djajadilaga et.al., 2009; Zhang et.al., 2007).

Table 1. Dry Biomass, Carbon content and Oxygen production

Class of DBH	n	Dry Biomass			Carbon (extrapolated for 19 ha park)				Oxygen produced (ty ⁻¹)
		Maximum tones	Minimum tones	Average +/- tones	Total (Gg)	Storage (Gg)	Balanced CO ₂ (ty ⁻¹)	Sequestration (ty ⁻¹)	
23.5-29.4	18	68.732578	109.7353285	90.61 +/- 20.29	0.009	0.007	32.345	517.082	1,378.885
29.5-35.4	61	112.48595	165.2196099	142.60 +/- 20.10	0.047	0.037	172.409	2,255.123	6,013.661
35.5-41.4	133	172.17957	242.2158041	214.80 +/- 22.80	0.155	0.123	566.409	6,184.982	16,493.285
41.5-47.4	76	250.83414	325.9655259	285.47 +/- 29.97	0.117	0.093	430.060	4,145.349	11,054.264
47.5-53.4	60	336.14088	429.8263761	370.77 +/- 50.44	0.120	0.096	441.184	3,788.344	10,102.250
53.5-59.4	45	435.74318	543.3693905	471.16 +/- 70.90	0.115	0.091	420.471	3,249.947	8,666.526
59.5-65.4	6	566.51003	586.5991052	578.00 +/- 216.67	0.019	0.015	68.895	486.612	1,237.631
65.5-71.4	3	1563.2213	1707.469984	1629.06 +/- 815.21	0.013	0.010	46.522	287.883	767.689
71.5-77.4	2	928.08105	985.2014186	956.64 +/- 551.90	0.010	0.008	38.621	218.743	583.314
Total	404				0.605	0.480	2,216.915	21,134.064	56,357.505

Pine Park can be potentially conserved as an urban green space under urban regulation and local people can benefit from fresh air containing as much as 56,357.505 ty⁻¹ which is enough to support about 1 902 people in a year: approximately 5 % of the population of the local district. This equates to two trees serving each person.

Thermal discomfort index.

Despite the complexity of issues involved in outdoor thermal comfort, it is necessary to increase our understanding of these issues to provide better guidance in sustainable urban development. This study investigated the effects of the temperature and humidity in order to determine thermal discomfort index and assess the possibility of revitalizing parts of the city and improving the quality of life provided by Pine Park.

Pine trees contribute to the reduction of the thermal discomfort index, a THI (thermal hygrometric index). In the forest interior, the average THI from all sample plots was smaller than was the average THI from the forest exterior, with differences of about 6°C to 7°C in the maximum THI value and of 11°C to 12 °C in the minimum THI value. Average THI values in the forest interior were about 25°C to 26°C, while those in outside areas were about 32 – 33°C. These figures are shown in Table 2,

Table 2. THI values (°C) from both the interior and the exterior of the Park.

	Location	Maximum	Minimum	Average +/- stdv
Forest Interior	Station 1	28	18	25 +/- 2
	Station 2	28	21	26 +/- 2
	Station 3	29	21	25 +/- 2
Forest Exterior	North	32	29	31 +/- 1
	South	33	30	32 +/- 1
	East	32	30	31 +/- 1
	West	32	26	31 +/- 1

Average THI values were similar to the maximum and minimum THI values, and exterior park THI values were consistently higher than were the interior values. These values were positively related to the temperature, with change in temperature being directly reflected by fluctuation in THI. This finding also reveals that the interior park temperature is lower than are exterior park temperatures observed by Shashua-Bar and Hoffman (2004) and Yu and Hien (2006) who studied the cooling effect of trees in vegetated areas. Under foliage, the cooling effect reached 1.5 °C and 3.5 °C in the hot dry city and was about 1.7°C - 3.3°C lower than in areas where there were no trees. Thus, the differences of temperature will be expressed on different THI values (Ali-Toudert and Mayer, 2005 and 2007; Taha; 2006).

Generally, THI values were between 23.2 °C and 25.6 °C under windless conditions. Average THI values were less than 26 °C only in the interior of the Pine Park. According to the references, the value of 26 °C is critical because below this value, less than 50% of the population feels discomfort, and beyond this value, more than 50% of the population feels discomfort. However, most people in the City of Banjarbaru felt comfort at 28 °C. In hot humid countries, like Malaysia and Indonesia, most people can accept 22 °C to 28 °C as the range of comfort. (Unger, 1999; Karyono, 2001; Charalampopoulos, and Chronopoulou-Sereli, 2005).

This finding shows that almost all interior Pine Park sites had values that were either lower than or similar to the critical THI value. Conversely, all of the THI values from the exterior of Pine Park exceeded the critical value. This shows that the vegetation in Pine Park has a beneficial effect in lowering THI, with a cooling effect reaching 6-7 °C. The average THI of the south site represented the highest value; all of these data were obtained along an asphalt road surrounded by a dense human settlement. The west site was a grass field, while the north and east sites were close to the irrigation channel and surrounded by rice fields. The findings reveal that temperature fluctuation is positively correlated with THI and that THI variation is determined by temperature change. The Pearson coefficient correlation (r) of temperature and THI relation was 0.999 (r-square: 0.998), while the r of temperature was -0.952 (r-square: 0.906). Also, the r of Rh and THI was 0.951 (r-square: 0.904). These figures are comparable to the values provided in the literature and reveal that trees in the forest interior provide a cooling effect that is superior to that at exterior sites, which consist of grass, soil and asphalt and cement ground (Yilmaz et.al., 2008; Thorsson, 2007; Streiling and Matzarakis, 2003)

The volume of greenery has a beneficial influence on the bioclimate of the whole interior of the park. The canopy volume,

temperature, Rh and THI of 84 under foliage sites were quantitatively calculated, and the results are shown in Table 3.

Table 3. Canopy volume, temperature, Rh and THI from selected sites

Variabel	Unit	n	Min	Max	Average +/- Std
Canopy volume	m ³	84	12.9	49.8	24.1 +/- 11.1
Temperature	°C	84	23.0	35.0	23.2 +/- 6.4
Humidity relative	%	84	39.5	82.7	52.5 +/- 13.4
THI	°C	84	18.4	28.0	25.0 +/- 6.83

The r values between canopy volume and interior park temperature, canopy volume and THI and canopy volume and humidity were 0.956, 0.956 and 0.886, respectively. This finding suggests that the volume of vegetation volume contributes to the overall cooling effect in the forest environment.

Pine trees are beneficial in lowering air temperatures, in providing shade and in improving thermal comfort. The average temperature in the park interior was 25.2°C, with a minimum of 23.0°C; those figures were considerably lower than were those in exterior sites of Pine Park, where the average temperature was generally 32°C, with a minimum of 30°C. Similarly, Rh values from the interior of Pine Park value were lower, with an average of 52.5% and a maximum of 82.7% than in the exterior sites, where the average was about 78.5%, with a maximum of 92.4%. The Pine Park was particularly cool (in relative terms) under very hot weather conditions (mean local temperature at 35°C during the day time), when difference of extreme condition exceeds 7 °C. This observation supports the idea that the green space plays an important role in mitigating situations of extreme heat. Thus, the findings promote the idea of changing the green space across the different seasons, especially for the purpose of anticipating heat stress effects and, thereby, mitigating such effects for the user and providing greater accessibility to the green space (Andrade and Vieira, 2007; Laforteza et.al., 2009; Potchter et.al., 2006; Spangenberg et.al., 2008; Nowak, 2000)

IV. CONCLUSION

Pine Park in the City of Banjarbaru provides ecological benefits, such as carbon storage, balanced carbon, carbon sequestration and oxygen production, which benefit local inhabitants. In addition, trees have other beneficial effects, such as the cooling effect that reduces human thermal discomfort. High and wide-canopy trees have a maximum cooling effect during the day time and have a positive effect on human climatic comfort. Spaces without trees and canopy are warmer than are other places inside the park. The results of this study suggest that the most useful type of urban park in a tropical area, from the climatic point of view, is a park with high and wide-canopied trees. Furthermore, the results suggest that steps should be taken to avoid parks with grass coverage and without trees, and promote the idea that green space in the City of Banjarbaru can be adapted for climate change by providing access to shade. Thus, the existence of Pine Park should be preserved to balance the growth of the built in environment in the City of Banjarbaru.

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Secure File Transfer Using USB

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Abstract- Universal Serial Bus (USB) devices are high transmission speed external devices. USB is the speediest external device available today. The access to USB is very simple, convenient and fast compared to other external devices such as CD, DVD, Floppy drive etc. Thus USB have become most popular interface standard for hardware connection. But from security point of view, USB devices lacks security as no user is restricted to access USB device. If we restrict the use of USB devices, then the data access through external devices would be as chaotic as before. Thus a system which would provide fast access as well as security is required. In this paper, we propose a system which deals with mutual authentication and key agreement in order to provide security for access through USB devices.

Index Terms- Authentication, USB, Cryptography

I. INTRODUCTION

USB devices are well known for the speed they provide while accessing data through them. The USB devices are easy to connect. Thus USB devices provides with speed as well as easiness. This high transmission speed devices are more convenient than any other external devices. But USB device lacks security. There is no authentication process provided by USB. Thus USB devices are very insecure.

USB can be considered as an unprotected gate, through which any data can be transferred without authentication. This is a serious problem when it comes to security of important data stored in the computers. One way to avoid this is to block all USB ports. But then no user will be able to access the information through USB ports. This will again cause the data transfer to be slow as it was in earlier days. Even we cannot ignore the security issues of USB. In many applications such as business or bank applications, the data should be securely stored in PC's and should be accessible to valid users only. Also the system should be fast enough to cope with today's competitive world.

Thus system should provide USB access to valid users but should also restrict unauthorised users to transfer the files stored in PC's by providing mutual authentication. The data stored in USB devices is first encrypted and then stored in USB devices. This is useful to secure files in case the USB device is lost or stolen malevolently. The data is thus secure due to encryption. For key agreement, we used the key exchange agreement proposed by Rivest, Shamir and Adleman. The objective of using RSA for key exchange is that the key generated by the

Authentication server (AS) must be transferred to client safely when the two sides try to communicate. Subsequently, the keys generated by RSA algorithm can be used for encrypting a message for transmission. However, this protocol is subject to man-in-the-middle attacks. Suppose an attacker exists between the sending end and the receiving end. The attacker poses as the sending end to transmit a public key exponent and modulus to the receiving end; without identity confirmation, the receiving end cannot ensure that this message is sent from the sending end. Many scholars have recently presented solutions to this problem. The most widely adopted of these is that of using a user password for identity confirmation on the two sides. We developed a system based on password verification that combined Schnorr's digital signature scheme and the RSA algorithm to realize system security and convenience. Section II explains about the current trends and practices in providing security which is followed by section III which provides general description about various cryptographic algorithms. Section IV contains System design and parameters used and section V contains Security analysis which explains security of system with respect to some general attacks.

II. SYSTEM OVERVIEW

In this proposed system, we have designed a control protocol which would provide security to USB devices along with speed. The proposed system implements user authentication and key exchange agreement.

User authentication is done by providing username and password to the user during registration phase of the system. Thus each user should be first registered to the system before any access to the USB devices. Thus user needs username and password to achieve mutual authentication with the system. Every time, the USB device is connected to the system, the user is first verified to check whether the user is valid or not. If he is a valid user then he is able to access the USB device. All files stored on the USB device are first encrypted using a key which is generated every time in verification process. The user has to acquire same session key at the time of decryption of the files stored on the USB devices so as to open or read the files. For each file a unique session key is generated based on username, password, filename and private key of AS.

The proposed system is very secure as only valid users can access the USB devices. This is provided by using username and password to valid users during registration phase. Even if the USB device is lost, then the files stored in USB devices are encrypted and thus cannot be decrypted without keys used at the time of encryption. The legal user, if wants to distribute files to

other peoples malevolently, then also the file is secure, as legal file owner cannot obtain agreement key used for decryption until authentication server suspends his account.

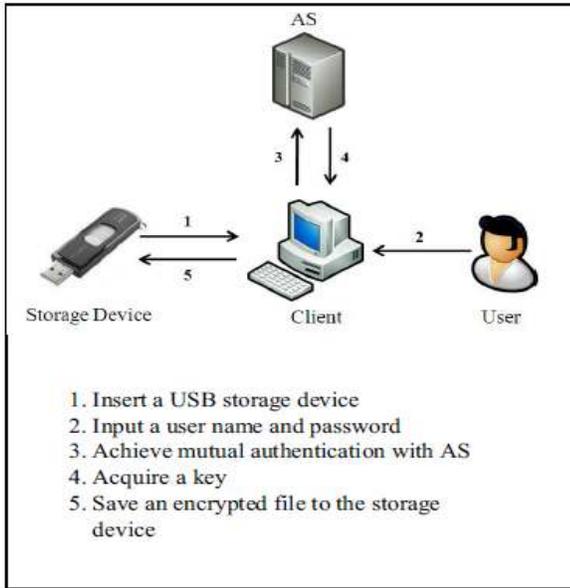


Figure 1: Overview of System

The operational flow of the system is as shown in figure 1. User first inserts a USB device. The system then forces user to pass through authentication process in order to access USB device. The user is thus forced to input username and password. This username and password is verified by authentication server called as AS. If the username and password is matches, then the person is valid user and thus AS provides him with the session key. If username and password does not match, then the user is invalid and is restricted to access USB device. The session key which is acquired by the valid user is used to encrypt the file to be stored in USB devices. This file is then stored on USB device securely. In order to decrypt the file, user has to go through the same verification process mentioned above.

III. CRYPTOGRAPHIC ALGORITHMS

Encryption algorithm is used to encrypt/decrypt the files in order to save them on USB devices. This provides security to files in case the USB device is lost. In general, there are two types of encryption algorithms used in cryptography. They are symmetric and asymmetric algorithms.

Symmetric encryption algorithm includes AES(Advanced Encryption Standards), DES(Data Encryption Standards), IDEA(International Data Encryption Algorithm), Triple-DES etc whereas Asymmetric encryption algorithm includes Diffie-Hellman, RSA(Rivest, Shamir and Adleman), DSA(Digital Signature Algorithm) etc. Hybrid algorithm is formed by combining Symmetric and Asymmetric algorithms depending on their pros and cons. [1]

The difference between Symmetric and Asymmetric algorithms is listed below in Table 1. [2]

CHARACTERISTIC	SYMMETRIC KEY CRYPTOGRAPHY	ASYMMETRIC KEY CRYPTOGRAPHY
Key Used	Public	Public and Private
Speed	Very Fast	Slow
Size of Resulting Ciphertext	Same/Less than Plain text	More than Plain text
Key Agreement	Big Problem	No problem at all
Used for	Encryption/Decryption	Encryption/Decryption and digital signature

Table 1: Difference between Symmetric and Asymmetric Cryptography

In this proposed system, we will be using asymmetric cryptography as it provides secure key exchange agreement. The differences among various asymmetric algorithms are given in Table 2. [2]

CHARACTERISTIC	DIFFIE-HELLMAN	RSA	DSA
Proposed By	Whitfield Diffie and Martin Hellman	Rivest, Shamir and Adleman	NIST
Speed	Fast in Key Generation and slow in verification	Slow in Key Generation and fast in verification	Fast in Key Generation and very slow in verification
Primarily used for	Key Generation and Encryption/Decryption	Key Generation and Encryption/Decryption	Key Generation

Table 2: Difference among Diffie-Hellman, RSA and DSA Algorithm

In this proposed system, we will be using RSA algorithm which was developed in MIT by Rivest, Shamir and Adleman in 1977 and first published in 1978. It will be used for only key exchange agreement. For mutual authentication, we will be using Digital Signature proposed by Schnorr in 1989.

A. RSA Algorithm

- Key Generation
 1. Choose two distinct large prime numbers p and q .
 2. Compute $n = pq$ where n is used as modulus.
 3. Compute $\phi(n) = (p - 1)(q - 1)$, where ϕ is Euler's totient function.
 4. Choose an integer e such that $1 < e < \phi(n)$ and e and $\phi(n)$ are co-prime.
 - e is released as the public key exponent.

5. Determine $d = e^{-1} \text{ mod } \phi(n)$ i.e. compute d given $(d \cdot e) \text{ mod } \phi(n) = 1$.
 - d is kept as the private key exponent.
6. The public key consists of the modulus n and the public (or encryption) exponent e . The private key consists of the modulus n and the private (or decryption) exponent d which must be kept secret.

• *Encryption*

1. Message M is to be transmitted.
2. Convert M into an integer m , such that $0 < m < n$ by padding scheme then computes the ciphertext c corresponding to

$$c = m^e \text{ (mod } n\text{)}.$$

3. Then transmits c .

• *Decryption*

1. Recover m from c by using private key exponent d via computing

$$m = c^d \text{ (mod } n\text{)}.$$

2. Given m , we can recover the original message M by reversing the padding scheme.

B. Digital Signature

Schnorr signature scheme is used to limit the number of signatures. Schnorr signature scheme employs a subgroup of order q in Z^*p , where p is some large prime number. The method also requires a hash function $H : \{0, 1\}^* \rightarrow Zq$.

• *Key Generation Algorithm*

1. Select prime numbers q and p with the property that q divides $(p - 1)$.
2. Select a random integer x such that $1 \leq x \leq q - 1$.
3. Compute $y = g^x \text{ mod } p$.
4. A's public key is (p, q, α, y) , and A's secret key is x .

• *Signature Algorithm*

1. Select a random secret integer k , $1 \leq k \leq q - 1$
2. Compute $r = g^k \text{ mod } p$, $e = H(m||r)$, and $s = x \cdot e + k \text{ mod } q$
3. A's signature for m is the pair (s, e) .

• *Signature Verification*

1. Compute $v = g^s \cdot y^{-e} \text{ mod } p$, and $\bar{e} = H(m||v)$
2. Accept the signature if and only if $e = \bar{e}$ [3][4].

IV. SYSTEM DESIGN

User has to first register to the system. After registration phase, when user connects USB device and have to go through verification and data encryption phase where session key will be generated which is used to encrypt/decrypt file.

A. Parameters and Symbols

1. p, q : Two large primes p and q , where $q | p-1$.
2. g, G : g is an element chosen from Z^*p and having an order of q ; G is the cyclic group generated by g .

3. id, pw : User account (user name) and password.
4. x, Y : Server's private key and public key; $Y = gx \text{ mod } p$.
5. $h(\cdot), H(\cdot)$: One way collision-resistant hash functions; $h(\cdot)$ maps arbitrarily long strings to strings of fixed length, and $H(\cdot)$ maps to elements of the cyclic group G .
6. $||$: Concatenate operate.
7. Fn : Filename for encryption.
8. $File$: File for encryption.
9. $EK[\cdot]$: Symmetric encryption function with respect to a key K .
10. $DK[\cdot]$: Symmetric decryption function with respect to a key K .

B. Registration Phase

A user needs to register with the system before accessing the USB device. During the registration phase, the user first inserts a USB storage device and then chooses one set of id and pw . The pw is substituted into the one way hash function to calculate $h_{pw} = H(pw)$, and then id and h_{pw} are sent to the authentication server. When receiving this registration message, the server will choose a random number k and generate $r = h_{pw}^k \text{ mod } p$ and $r_1 = g^k \text{ mod } p$. It then computes $e = h(id || r || r_1)$, use its private key x to calculate $s = (k - e \cdot x) \text{ mod } q$, and save (e, s) to the user's storage device. After receiving the triplet (e, r, s) , the user checks whether e is equal to $h(id || r || g^s \cdot y^e \text{ mod } p)$ [5]. A valid check concludes the registration phase. Data transmission in this phase is done under a secure channel. In addition, in order to avoid password guessing attacks, the protocol will force the user to choose password with sufficient complexity.

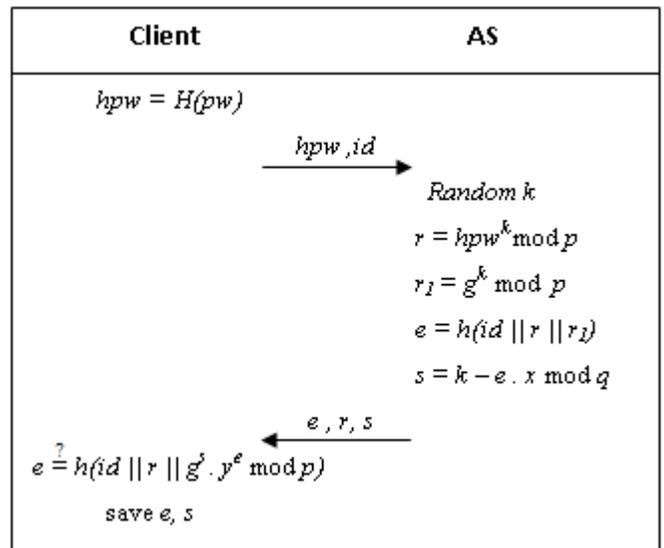


Figure 3: Registration Phase

C. Verification and Data Encryption Phase

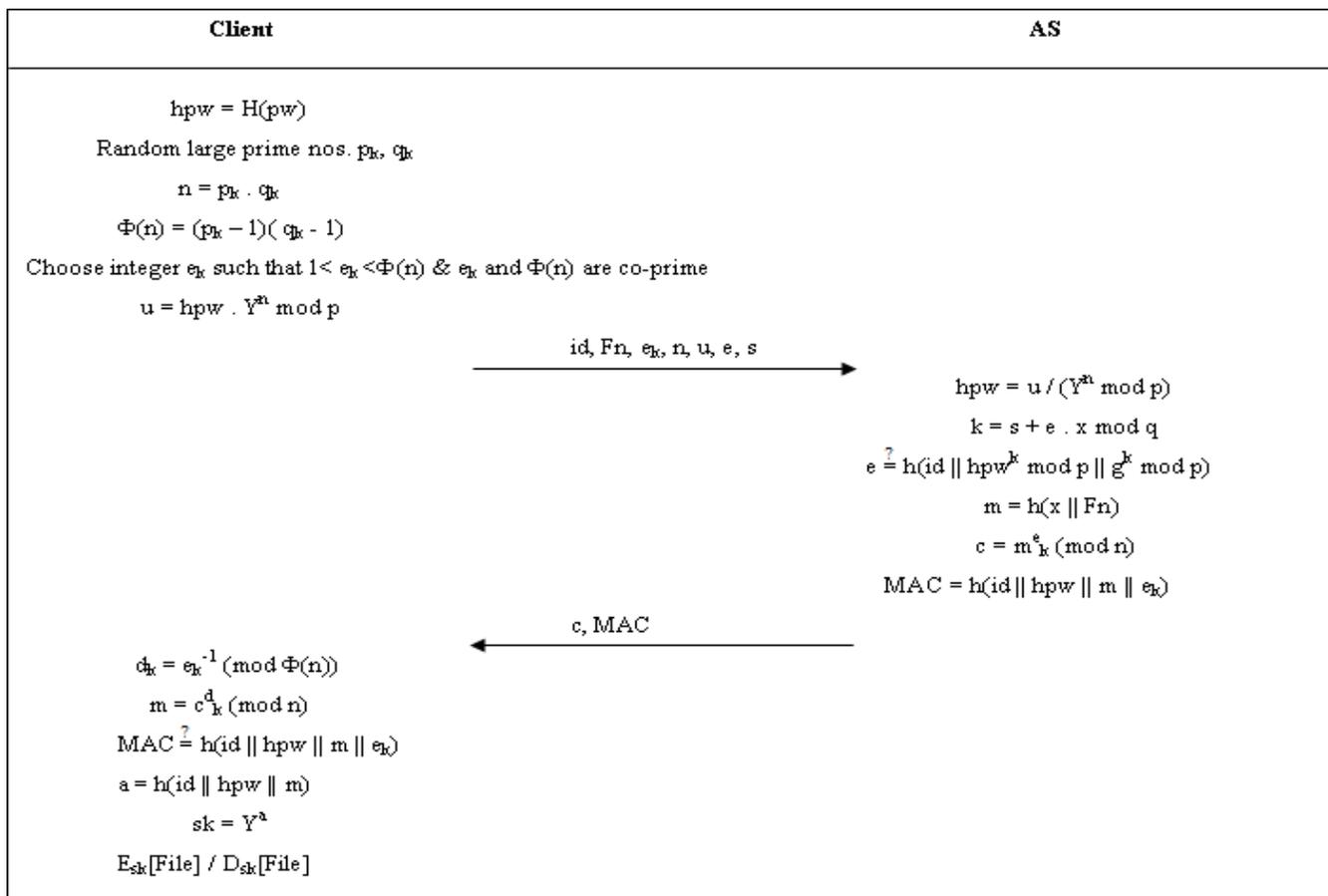


Figure 4: Verification and Data Encryption Phase

After completing the registration phase, and when accessing the USB storage device, the user needs to achieve mutual authentication with the authentication server using the id and pwd, which generates an encryption key. The communication procedure is described in detail below

Figure 4 shows the full procedure of verification and data encryption phase.

• Step 1:

The user attaches the USB storage device to a computer through a normal procedure and inputs the correct id and pw. At this moment, the user (client) will use pw to calculate hpw using the one way hash function H(.). Then the user chooses a random large prime numbers pk and qk and calculate modulus $n=p_k \cdot q_k$. Euler's totient function $\Phi(n)=(p_k-1)(q_k-1)$ is also calculated. Public key exponent e_k co-prime with $\Phi(n)$ is chosen such that $1 < e_k < \Phi(n)$. Calculates $u = hpw \cdot y_n \text{ mod } p$. Finally, the user will send messages of $\{id, Fn, e_k, n, u, e, s\}$ to the authentication server.

• Step 2:

After receiving $\{id, Fn, e_k, n, u, e, s\}$, the AS will use its long term private key x to calculate $hpw = u / (y_n \text{ mod } p)$ and $k = s +$

$e \cdot x \text{ mod } q$. Then, the authentication server will employ parameters it generated to verify whether $e = h(id \parallel hpw^k \text{ mod } p \parallel g^k \text{ mod } p)$. If yes, then the user in this communication is legal. If not, the communication is terminated. Subsequently, the authentication server will use the received file name Fn and the long-term private key x to calculate $m = h(x \parallel Fn)$, and perform encryption on m, to generate ciphertext $c = m^{e_k} \text{ mod } n$. Finally, the authentication server calculates a message authentication code $MAC = h(id \parallel hpw \parallel m \parallel e_k)$ and sends the generated message $\{c, MAC\}$ to the user.

• Step 3:

After receiving the message $\{c, MAC\}$, the user uses the public key exponent e_k and $\Phi(n)$ to calculate private key exponent d_k . m is retrieved by decrypting c using d to calculate a used in generation of session key sk, Next the user will verify whether $MAC = h(id \parallel hpw \parallel m \parallel e_k)$. If yes, then mutual authentication is achieved between the

user and the authentication server, and the user will calculate $a = h(id \parallel hpw \parallel m)$ and generate an encryption key sk using the equation $sk = (Y)^a = g^x \cdot a \text{ mod } p$.

• Step 4:

After the user and the authentication server complete these steps, the session key sk can be calculated by $sk = gx \cdot a \text{ mod } p$. When a user wants to access the storage device via the USB interface, this encryption key, can be used to encrypt the File, i.e., as $E sk$ [File], to protect the file and provide private and secure access to the USB device. For file decryption, the user needs to undergo the same verification steps and obtain the same key sk to decrypt the file ($D sk [E sk [File]]$) when accessing it on the USB device.

V. SECURITY ANALYSIS

System Analysis means determining whether the project is economically, socially, technologically and organizationally feasible.

- *Correctness*

Our protocol will prevent any confidential file loss via USB removal storage device. In our protocol design file transfer via USB interface is blocked till the user does not passes through authentication procedure. If the user is valid then the required files are transferred to peripheral device (USB) in encrypted format. The key used for encryption is computed using Username, Password and filename. After encryption if user want to read that file he has to first decrypt it. For decryption, user has to go through same authentication procedure and have to obtain same key used for encryption.

- *Offline password guessing*

If the USB is lost or stolen, yet USB access is restricted as for decryption, username and password is required. Thus preventing confidential data stored in USB device. If user tries to guess password, it will be hard to him as it includes solving Discrete Logarithmic Problem [6].

- *Discrete Logarithmic problem*

1. In verification and data encryption phase if attacker tries to guess the value of parameter for that he has to pass through Discrete Logarithmic Problem.

2. Discrete Logarithmic problem where variable have number of solution.

3. eg: $X\%2=1$; to get answer as 1, X having number of value ($X=3,5,7, \dots$)

Session Key is generated for each verification message in our protocol. Without knowing p_k and q_k and private key x , attacker cannot decrypt the file. So our protocol resists offline password attack [7].

- *Replay attack and Stolen verifier attack*

If attacker tries to use a captured wiretap login message and he get some parameter but he don't know p_k and q_k , means he don't know m used to calculate session key sk . Even though he finds session key still password is required, therefore our protocol can resist the stolen verifier attack [8].

VI. CONCLUSION

The Proposed System has a secure and efficient control protocol for USB ports. The protocol employs a remote authentication server to verify legal users and uses the Cryptographic algorithm to implement key exchange agreement to protect the privacy of a file transmitted to a storage device. Also the proposed system can resist some general attacks. In terms of protocol communication costs, realizing mutual authentication requires only two rounds of communication sessions. Therefore, the proposed system provides an effective control protocol for USB storage devices which is both secure and efficient.

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Minimum Shannon Entropy for two specified Moments

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Abstract- Entropy optimization includes maximization and minimization. Maximization of entropy is easy and it can be done by using Lagrange’s method since entropy is concave function. Due to the concavity minimization of entropy is not so simple. But calculation of minimum entropy probability distribution is necessary because knowledge of both maximum and minimum entropy probability distribution gives complete information about probability distribution. In this paper we obtain analytical expressions for minimum Shannon entropy for given r^{th} & s^{th} order moments.

Index Terms- Switching point, consistent, minimum entropy.

I. INTRODUCTION

Maximum entropy probability distribution has various applications in Science and Engineering. Various measures have been used to obtain maximum entropy probability distribution. It has been studied in detail [3, 4, 5, 7, 8]. But these measures have not been used to obtain minimum entropy probability distribution so much.

Maximum entropy probability distribution is most unbiased, most uniform and most random while minimum entropy probability distribution is most biased, least uniform and least random. Entropy is concave function so minimization of entropy is complicated than maximization.

When information is least we get maximum entropy probability distribution. As we add information consistent with initial information in the form of moments, entropy decreases. When we reach S_{min} , we need not search for additional constraints because we have completed information. Need to obtain minimum entropy lies in the fact that true distribution lies in between maximum & minimum entropy probability distribution and to know the information contained in moments, we need both S_{max} and S_{min} . Knowing the S_{min} we can recognize the pattern.

A good progress to obtain S_{min} was done by Kapur [6]. Anju Rani [2] continued the work and obtained minimum Shannon entropy as well as Havrda – Charvat entropy when one moment is prescribed.

In the present paper, we obtain minimum Shannon entropy when two moments are prescribed. We shall obtain analytical expressions for minimum Shannon entropy S_{min} when r^{th} and s^{th} order moments are prescribed.

II. ANALYTICAL EXPRESSIONS FOR MINIMUM SHANNON ENTROPY WHEN r^{th} AND s^{th} ORDER MOMENTS ARE PRESCRIBED

Let x be a discrete variate which takes all values from 1 to n with probabilities p_1, p_2, \dots, p_n . The r^{th} and s^{th} order moments of this probability distribution are prescribed as $(\mu_r')^{1/r}$ and $(\mu_s')^{1/s}$. There will be many distributions having these particular values of r^{th} order and s^{th} order moments and each of these distributions will have a particular value of entropy. Out of these entropies our aim is to find minimum value of entropy say S_{min} . Mathematically we have to minimize

$$S = - \sum_{i=1}^n p_i \ln p_i \tag{1}$$

subject to

$$\sum_{i=1}^n p_i = 1, \sum_{i=1}^n p_i i^r = \mu_r', \sum_{i=1}^n p_i i^s = \mu_s' \tag{2}$$

Since there are three linear constraints, the minimum entropy probability distribution will have at most three non zero components. Let these be p_r, p_k and p_l . Then

$$\begin{aligned} p_r + p_k + p_l &= 1, h^r p_r + k^r p_k + l^r p_l = \mu_r', \\ h^s p_r + k^s p_k + l^s p_l &= \mu_s' \end{aligned} \tag{3}$$

simplifying these equations, we get

$$p_r = \frac{\mu_s' (l^r - k^r) - \mu_r' (l^s - k^s) + l^s k^r - l^r k^s}{(l^r - h^r)(l^s - k^s) - (l^s - h^s)(l^r - k^r)} \tag{4}$$

$$p_k = \frac{\mu_r' (l^s - h^s) - \mu_s' (l^r - h^r) + h^s l^r - l^s h^r}{(l^r - h^r)(l^s - k^s) - (l^s - h^s)(l^r - k^r)} \tag{5}$$

$$p_l = \frac{\mu_s' (k^r - h^r) - \mu_r' (k^s - h^s) + h^r k^s - h^s k^r}{(l^r - h^r)(l^s - k^s) - (l^s - h^s)(l^r - k^r)} \tag{6}$$

To calculate p_r, p_k & p_l we take set of consistent values of r^{th} & s^{th} order moments. Here s^{th} order moment is greater than r^{th} order moment but it does not mean that all values of s^{th} order moment are possible for given value of r^{th} order moment. In fact there is a range for feasible values of s^{th} order moment for given r^{th} order moment (Anju Rani [1]). These values are given by

(i) If $(\mu_r')^{1/r}$ is an integer, then

$$(\mu_s')_{min} = (\mu_r')^{s/r} \tag{7}$$

If $(\mu_r')^{1/r}$ is not an integer, let $(\mu_r')^{1/r} = [(\mu_r')^{1/r}] + L$, $0 < L < 1$, where $[(\mu_r')^{1/r}]$ represents integral part of $(\mu_r')^{1/r}$. Then

$$(\mu_s')_{\min} = \frac{[(\mu_r')^{1/r} + 1]^r - \mu_r'}{[(\mu_r')^{1/r} + 1] - [(\mu_r')^{1/r}]^r} [(\mu_r')^{1/r}]^s + \frac{\mu_r' - [(\mu_r')^{1/r}]^r}{[(\mu_r')^{1/r} + 1]^r - [(\mu_r')^{1/r}]^r} [(\mu_r')^{1/r} + 1]^s \quad \text{--(8)}$$

(ii) The expression for maximum value of s^{th} order moment is given as

$$(\mu_s')_{\max} = \frac{\mu_r' \{n^s - 1\} + n^r - n^s}{\{n^r - 1\}} \quad \text{--(9)}$$

For the given values of r^{th} order moment and $(\mu_s')_{\min}^{1/s}$ probability p_h is zero at point $(1, A, A+1)$ or p_l is zero at point $(A, A+1, n)$ & for the given values of r^{th} order moment and $(\mu_s')_{\max}^{1/s}$, probability $p_h = 0$ at point $(1, n-1, n)$. Probability $p_h = 0$ for $\{1 \leq h < k < (\mu_r')^{1/r} \leq l \leq n\}$ or $\{1 \leq h < k \leq (\mu_r')^{1/r} < l \leq n\}$ and $p_l = 0$ for $\{1 \leq h \leq (\mu_r')^{1/r} < k < l \leq n\}$ or $\{1 \leq h < (\mu_r')^{1/r} \leq k < l \leq n\}$. As we go on increasing the values of p_h & p_l probability p_h tends to zero. For the given values of r^{th} order moment and $(\mu_s')_{\min}^{1/s}$, the values of entropies are same at all existing points and similarly for the given values of r^{th} order moment and $(\mu_s')_{\max}^{1/s}$, the values of entropies are the same at all existing points.

Every interval is divided into many subintervals such that at common values of s^{th} order moment, the values of minimum entropy for any two subintervals are same. These values of s^{th} order moment are called switching points. At these values, we switch over entropy from one set of values of (h, k, l) to another set of values of (h, k, l) .

Let $(\mu_r')^{1/r} \in (A, A+1]$, $1 \leq A < n$, where A is an integer. h can take values $1, 2, \dots, A$; k can take values $h+1, \dots, n-1$; l can take values $A+1, \dots, n$. We calculate probability distributions in each possible interval for different values of r^{th} & s^{th} order moments.

For calculating minimum entropy, we consider four types of points. These points are:

- (1) $(A+\alpha, A+\beta, n)$
- (2) $(1, A+\alpha, A+\gamma)$
- (3) $(A+\alpha, A+\delta, A+\xi)$
- (4) $(1, A+\alpha, n)$

Before considering these points, we calculate minimum and maximum values of s^{th} order moment from equations (7), (8) and (9).

For some value of s^{th} order moment which is slightly greater than minimum value of s^{th} order moment, we calculate entropies at points $(A+\alpha, A+\beta, n)$ and $(1, A+\alpha, A+\gamma)$. By doing this we can obtain that point at which entropy is minimum for given r^{th} order moment. Initially $\alpha = 0, \beta = \alpha+1$.

Now, we are considering points as prescribed above-

(1) WHEN MINIMUM ENTROPY OCCURS AT POINT

$(A+\alpha, A+\beta, n)$: While calculating minimum entropy, we observe that minimum entropy shifts from point $(A+\alpha, A+\beta, n)$ to one of these points $(A+\alpha, A+\lambda, A+\beta+1)$, $(1, A+\alpha, A+\gamma)$, $(A+\alpha, A+\mu, n)$ or $(1, A+\alpha, n)$. Here $\beta > \alpha, A+\gamma < n, \alpha < \lambda < \beta+1, \mu \neq \beta$. To observe shifting of minimum entropy from point $(A+\alpha, A+\beta, n)$ to any of above points, first we equate entropy at point $(A+\alpha, A+\beta, n)$ with entropies at points $(1, A+\lambda, A+\beta+1)$ and $(1, A+\alpha, A+\gamma)$. By equating entropies we obtain some values of s^{th} order moment. Then we check the existence of s^{th} order moment and the minimum value out of these two s^{th} order moments is called switching point. If both calculated values of s^{th} order moments do not lie in the feasible subinterval, we equate entropies at point $(A+\alpha, A+\beta, n)$ with points $(A+\alpha, A+\mu, n)$ and $(1, A+\alpha, n)$. When we get any switching point by equating entropies at points $(A+\alpha, A+\beta, n)$ & $(A+\alpha, A+\mu, n)$, minimum entropy shifts from point $(A+\alpha, A+\beta, n)$ to point $(A+\alpha, A+\mu, n)$. Further minimum entropy shifts from point $(A+\alpha, A+\mu, n)$ to point $(1, A+\alpha, n)$ and when we do not get any switching point by equating entropies at points $(A+\alpha, A+\beta, n)$ & $(A+\alpha, A+\mu, n)$ then minimum entropy shifts from point $(A+\alpha, A+\beta, n)$ to point $(1, A+\alpha, n)$.

Hence, mathematically we equate entropies as following:

$$S(A+\alpha, A+\beta, n) = S(A+\alpha, A+\lambda, A+\beta+1)$$

from equations (1),(4),(5),(6)

$$p_1 \ln p_1 + q_1 \ln q_1 + r_1 \ln r_1 = p_2 \ln p_2 + q_2 \ln q_2 + r_2 \ln r_2 \quad \text{--(10)}$$

We get values of p_1, q_1, r_1 for $h=A+\alpha, k=A+\beta, l=n$ and values of p_2, q_2, r_2 for $h=A+\alpha, k=A+\lambda, l=A+\beta+1$ from equations (4), (5), (6) respectively.

By solving equation (10), we obtain the value of μ_s' say $(\mu_s')_A$.

The value of $(\mu_s')_A$ can be obtained numerically.

Again

$$S(A+\alpha, A+\beta, n) = S(1, A+\alpha, A+\gamma)$$

from equations (1),(4),(5),(6)

$$p_1 \ln p_1 + q_1 \ln q_1 + r_1 \ln r_1 = p_3 \ln p_3 + q_3 \ln q_3 + r_3 \ln r_3 \quad \text{--(11)}$$

equation (11) can be solved for value of μ_s' say $(\mu_s')_B$

We check whether $(\mu_s')_A$ and $(\mu_s')_B$ lie in the feasible region or not. When both values lie in the feasible region, then minimum value out of $(\mu_s')_A$ and $(\mu_s')_B$ is considered as switching point and if only one value out of these lies in the feasible region, then that value is considered as switching point.

When $(\mu'_s)_A$ lies in the feasible region and is minimum, then minimum entropy shifts from point $(A+\alpha, A+\beta, n)$ to point $(A+\alpha, A+\lambda, A+\beta+1)$, hence

$$S_{\min} = -p_1 \ln p_1 - q_1 \ln q_1 - r_1 \ln r_1, \text{ for } \mu'_s \leq (\mu'_s)_A$$

$$S_{\min} = -p_2 \ln p_2 - q_2 \ln q_2 - r_2 \ln r_2, \text{ for } (\mu'_s)_A \leq \mu'_s$$

When $(\mu'_s)_B$ lies in the feasible region and is minimum. Then minimum entropy shifts from point $(A+\alpha, A+\beta, n)$ to point $(1, A+\alpha, A+\gamma)$, so

$$S_{\min} = -p_1 \ln p_1 - q_1 \ln q_1 - r_1 \ln r_1, \text{ for } \mu'_s \leq (\mu'_s)_B$$

$$S_{\min} = -p_2 \ln p_2 - q_2 \ln q_2 - r_2 \ln r_2, \text{ for } (\mu'_s)_B \leq \mu'_s$$

If both values of s^{th} order moments do not lie in the feasible region then we equate entropies as:

$$S(A+\alpha, A+\beta, n) = S(A+\alpha, A+\mu, n)$$

$$p_1 \ln p_1 + q_1 \ln q_1 + r_1 \ln r_1 = p_4 \ln p_4 + q_4 \ln q_4 + r_4 \ln r_4 \quad \text{-- (12)}$$

by solving equation (12), we can get value $(\mu'_s)_C$ (say)

Again, we are equating entropies as:

$$S(A+\alpha, A+\beta, n) = S(1, A+\alpha, n)$$

$$p_1 \ln p_1 + q_1 \ln q_1 + r_1 \ln r_1 = p_5 \ln p_5 + q_5 \ln q_5 + r_5 \ln r_5 \quad \text{-- (13)}$$

by solving equation (13), we get value $(\mu'_s)_D$ (say). This value is given as:

$$(\mu'_s)_D = \frac{\mu'_s \{n^s - (A+\alpha)^s\} - n^s (A+\alpha)^r + n^r (A+\alpha)^s}{\{n^r - (A+\alpha)^r\}} \quad \text{-- (14)}$$

This value can also be obtained by equating $q_1 = 0$.

When condition $(\mu'_s)_p < (\mu'_s)_c < (\mu'_s)_D$ holds, then minimum entropy shifts from point $(A+\alpha, A+\beta, n)$ to point $(A+\alpha, A+\mu, n)$, where $(\mu'_s)_p$ is previous switching point and further from point $(A+\alpha, A+\mu, n)$ minimum entropy shifts to point $(1, A+\alpha, n)$. If above condition is not satisfied then minimum entropy shifts from point $(A+\alpha, A+\beta, n)$ to point $(1, A+\alpha, n)$. Since for $(\mu'_s)_c > (\mu'_s)_D$ i.e. $(\mu'_s)_c$ does not lie in the feasible region, it can not be considered as switching point. When minimum entropy shifts from point $(A+\alpha, A+\beta, n)$ to point $(A+\alpha, A+\mu, n)$. Then,

$$S_{\min} = -p_1 \ln p_1 - q_1 \ln q_1 - r_1 \ln r_1, \text{ for } \mu'_s \leq (\mu'_s)_c$$

$$S_{\min} = -p_4 \ln p_4 - q_4 \ln q_4 - r_4 \ln r_4, \text{ for } (\mu'_s)_c \leq \mu'_s$$

Now, minimum entropy shifts from point $(A+\alpha, A+\mu, n)$ to point $(1, A+\alpha, n)$, so

$$S_{\min} = -p_4 \ln p_4 - q_4 \ln q_4 - r_4 \ln r_4, \text{ for } (\mu'_s)_c \leq \mu'_s \leq (\mu'_s)_D$$

$$S_{\min} = -p_5 \ln p_5 - q_5 \ln q_5 - r_5 \ln r_5, \text{ for } (\mu'_s)_D \leq \mu'_s$$

When minimum entropy shifts from point $(A+\alpha, A+\beta, n)$ to point $(1, A+\alpha, n)$ and in this situation,

$$S_{\min} = -p_1 \ln p_1 - q_1 \ln q_1 - r_1 \ln r_1, \text{ for } \mu'_s \leq (\mu'_s)_D$$

$$S_{\min} = -p_5 \ln p_5 - q_5 \ln q_5 - r_5 \ln r_5, \text{ for } (\mu'_s)_D \leq \mu'_s$$

(2) WHEN MINIMUM ENTROPY OCCURS AT POINT

(1, A+α, A+γ): From calculation we observe minimum entropy shifts from point $(1, A+\alpha, A+\gamma)$ to one of these points $(A+\alpha, A+\delta, A+\xi)$, $(A+\alpha-1, A+v, A+\gamma)$, $(1, A+\alpha, A+\Phi)$, $(1, A+\Psi, A+\gamma)$, $(1, A+\gamma, n)$. Here $A+\gamma < n, A+\xi < n, A+\Phi < n, \alpha < \delta < \xi, \alpha-1 < v < \gamma, \alpha \neq \Psi$ First we equate entropies at point $(1, A+\alpha, A+\gamma)$ with points $(A+\alpha, A+\delta, A+\xi)$, $(A+\alpha-1, A+v, A+\gamma)$ and $(1, A+\alpha, A+\Phi)$. By doing this three values of s^{th} order moment are obtained. It is not necessary that three values lie in the feasible region. When all values lie in the feasible region then minimum value out of these is considered as switching point and minimum entropy shifts to the corresponding point. When any one value of s^{th} order moment lies in the feasible region then that value is considered as switching point. So, here we equate entropies as:

$$S(1, A+\alpha, A+\gamma) = S(A+\alpha, A+\delta, A+\xi)$$

$$p_2 \ln p_2 + q_2 \ln q_2 + r_2 \ln r_2 = p_6 \ln p_6 + q_6 \ln q_6 + r_6 \ln r_6 \quad \text{-- (15)}$$

by solving equation (15), we get value of μ'_s say $(\mu'_s)_E$.

Again, we equate entropies as:

$$S(1, A+\alpha, A+\gamma) = S(A+\alpha-1, A+v, A+\gamma)$$

$$p_2 \ln p_2 + q_2 \ln q_2 + r_2 \ln r_2 = p_7 \ln p_7 + q_7 \ln q_7 + r_7 \ln r_7 \quad \text{-- (16)}$$

by solving equation (16) we get value of μ'_s say $(\mu'_s)_F$.

Again, we equate entropies as:

$$S(1, A+\alpha, A+\gamma) = S(1, A+\alpha, A+\Phi)$$

$$p_2 \ln p_2 + q_2 \ln q_2 + r_2 \ln r_2 = p_8 \ln p_8 + q_8 \ln q_8 + r_8 \ln r_8 \quad \text{-- (17)}$$

by solving equation (17), we get value $(\mu'_s)_G$ (say)

Now, we check the existence of $(\mu'_s)_E, (\mu'_s)_F$ and $(\mu'_s)_G$ in the feasible region. If three values lie in the feasible region then minimum value out of these is considered as switching point.

If $(\mu'_s)_E$ lies in the feasible region and is minimum then minimum entropy shifts from point $(1, A+\alpha, A+\gamma)$ to point $(A+\alpha, A+\delta, A+\xi)$. So, in this case

$$S_{\min} = -p_2 \ln p_2 - q_2 \ln q_2 - r_2 \ln r_2, \text{ for } \mu'_s \leq (\mu'_s)_E$$

$$S_{\min} = -p_6 \ln p_6 - q_6 \ln q_6 - r_6 \ln r_6, \text{ for } (\mu'_s)_E \leq \mu'_s$$

Again, if $(\mu'_s)_F$ lies in the feasible region and is minimum then minimum entropy shifts from point $(1, A+\alpha, A+\gamma)$ to point $(A+\alpha-1, A+v, A+\gamma)$. Then,

$$S_{\min} = -p_2 \ln p_2 - q_2 \ln q_2 - r_2 \ln r_2, \text{ for } \mu'_s \leq (\mu'_s)_F$$

$$S_{\min} = -p_7 \ln p_7 - q_7 \ln q_7 - r_7 \ln r_7, \text{ for } (\mu'_s)_F \leq \mu'_s$$

And, if $(\mu'_s)_G$ lies in the feasible region and is minimum then minimum entropy shifts from point (1, A+α, A+γ) to point (1, A+α, A+Φ). Then,

$$S_{\min} = -p_3 \ln p_3 - q_3 \ln q_3 - r_3 \ln r_3, \text{ for } \mu'_s \leq (\mu'_s)_G$$

$$S_{\min} = -p_3 \ln p_3 - q_3 \ln q_3 - r_3 \ln r_3, \text{ for } (\mu'_s)_G \leq \mu'_s$$

When all values $(\mu'_s)_E$, $(\mu'_s)_F$ and $(\mu'_s)_G$ do not lie in the feasible region, then we equate entropies at point (1, A+α, A+γ) with points (1, A+Ψ, A+γ) & (1, A+γ, n) and obtain values of switching points. So, entropies are equated as follow:

$$S(1, A+\alpha, A+\gamma) = S(1, A+\Psi, A+\gamma)$$

$$p_3 \ln p_3 + q_3 \ln q_3 + r_3 \ln r_3 = p_9 \ln p_9 + q_9 \ln q_9 + r_9 \ln r_9 \quad \text{-- (18)}$$

by solving equation (18), we get value $(\mu'_s)_H$ (say)

Again, entropies are equated as follow :

$$S(1, A+\alpha, A+\gamma) = S(1, A+\gamma, n)$$

$$p_3 \ln p_3 + q_3 \ln q_3 + r_3 \ln r_3 = p_{10} \ln p_{10} + q_{10} \ln q_{10} + r_{10} \ln r_{10} \quad \text{-- (19)}$$

by solving equation (19), we get value $(\mu'_s)_I$ (say). This value can be given as

$$(\mu'_s)_I = \frac{\mu'_s \{ (A+\gamma)^S - 1 \} + (A+\gamma)^r - (A+\gamma)^S}{\{ (A+\gamma)^r - 1 \}} \quad \text{-- (20)}$$

above expression can also be obtained by equating $q_3 = 0$.

When condition $(\mu'_s)_P < (\mu'_s)_H < (\mu'_s)_I$ holds, minimum entropy shifts from point (1, A+α, A+γ) to point (1, A+Ψ, A+γ) and further from point (1, A+Ψ, A+γ) to point (1, A+γ, n). So,

$$S_{\min} = -p_3 \ln p_3 - q_3 \ln q_3 - r_3 \ln r_3, \text{ for } \mu'_s \leq (\mu'_s)_H$$

$$S_{\min} = -p_3 \ln p_3 - q_3 \ln q_3 - r_3 \ln r_3, \text{ for } (\mu'_s)_H \leq \mu'_s \leq (\mu'_s)_I$$

$$S_{\min} = -p_9 \ln p_9 - q_9 \ln q_9 - r_9 \ln r_9, \text{ for } (\mu'_s)_I \leq \mu'_s$$

If condition $(\mu'_s)_P < (\mu'_s)_H < (\mu'_s)_I$ does not hold, then minimum entropy shifts from point (1, A+α, A+γ) to point (1, A+γ, n). In this situation,

$$S_{\min} = -p_3 \ln p_3 - q_3 \ln q_3 - r_3 \ln r_3, \text{ for } \mu'_s \leq (\mu'_s)_I$$

$$S_{\min} = -p_{10} \ln p_{10} - q_{10} \ln q_{10} - r_{10} \ln r_{10}, \text{ for } (\mu'_s)_I \leq \mu'_s$$

(3) WHEN MINIMUM ENTROPY OCCURS AT POINT

(A+α, A+δ, A+ξ): We observe that minimum entropy shifts from point (A+α, A+δ, A+ξ) to one of these points (A+α, A+σ, A+ξ), (A+α, A+ξ, n) and (1, A+α, A+ξ). Here δ ≠ σ. So, we equate

entropies at point (A+α, A+δ, A+ξ) with points (A+α, A+σ, A+ξ), (A+α, A+ξ, n) and (1, A+α, A+ξ). By doing this we get two values of sth order moment. Since the values of sth order moment are same by equating entropies at point (A+α, A+δ, A+ξ) with points (A+α, A+ξ, n) and (1, A+α, A+ξ).

Minimum value out of these two values of sth order moment is considered as switching point. When any one value lies in the feasible region then that value is considered as switching point.

Further we are equating entropies as follow:

$$S(A+\alpha, A+\delta, A+\xi) = S(A+\alpha, A+\sigma, A+\xi)$$

$$p_6 \ln p_6 + q_6 \ln q_6 + r_6 \ln r_6 = p_{11} \ln p_{11} + q_{11} \ln q_{11} + r_{11} \ln r_{11} \quad \text{-- (21)}$$

by solving equation (21), we get value $(\mu'_s)_J$ (say)

Again, entropies are equated as:

$$S(A+\alpha, A+\delta, A+\xi) = S(A+\alpha, A+\xi, n)$$

$$p_6 \ln p_6 + q_6 \ln q_6 + r_6 \ln r_6 = p_{12} \ln p_{12} + q_{12} \ln q_{12} + r_{12} \ln r_{12} \quad \text{-- (22)}$$

And, entropies are equated as:

$$S(A+\alpha, A+\delta, A+\xi) = S(1, A+\alpha, A+\xi)$$

$$p_6 \ln p_6 + q_6 \ln q_6 + r_6 \ln r_6 = p_{13} \ln p_{13} + q_{13} \ln q_{13} + r_{13} \ln r_{13} \quad \text{-- (23)}$$

equations (22) and (23) can be solved to get value $(\mu'_s)_K$ (say).

This value can be given as-

$$(\mu'_s)_K = \frac{\mu'_s \{ (A+\xi)^S - (A+\alpha)^S \} - (A+\alpha)^r (A+\xi)^S + (A+\alpha)^S (A+\xi)^r}{\{ (A+\xi)^r - (A+\alpha)^r \}} \quad \text{-- (24)}$$

The expression for $(\mu'_s)_K$ can be obtained by equating $q_6 = 0$.

When condition $(\mu'_s)_P < (\mu'_s)_J < (\mu'_s)_K$ holds, minimum entropy shifts from point (A+α, A+δ, A+ξ) to point (A+α, A+σ, A+ξ) and from this point it shifts to point (1, A+α, A+ξ). Here $(\mu'_s)_P$ is previous switching point. In this situation,

$$S_{\min} = -p_6 \ln p_6 - q_6 \ln q_6 - r_6 \ln r_6, \text{ for } \mu'_s \leq (\mu'_s)_J$$

$$S_{\min} = -p_{11} \ln p_{11} - q_{11} \ln q_{11} - r_{11} \ln r_{11}, \text{ for } (\mu'_s)_J \leq \mu'_s \leq (\mu'_s)_K$$

$$S_{\min} = -p_{12} \ln p_{12} - q_{12} \ln q_{12} - r_{12} \ln r_{12} \text{ or}$$

$$S_{\min} = -p_{13} \ln p_{13} - q_{13} \ln q_{13} - r_{13} \ln r_{13}, \text{ for } (\mu'_s)_K \leq \mu'_s$$

If condition $(\mu'_s)_P < (\mu'_s)_J < (\mu'_s)_K$ does not hold, then minimum entropy shifts from point (A+α, A+δ, A+ξ) to point (A+α, A+ξ, n) or point (1, A+α, A+ξ). In this situation,

$$S_{\min} = -p_{11} \ln p_{11} - q_{11} \ln q_{11} - r_{11} \ln r_{11}, \text{ for } \mu'_s \leq (\mu'_s)_K$$

$$S_{\min} = -p_{12} \ln p_{12} - q_{12} \ln q_{12} - r_{12} \ln r_{12} \text{ or}$$

$$S_{\min} = -p_{13} \ln p_{13} - q_{13} \ln q_{13} - r_{13} \ln r_{13}, \text{ for } (\mu'_s)_K \leq \mu'_s$$

Now, we calculate entropies at point (A+α, A+ξ, n) & (1, A+α, A+ξ) for $\mu'_s \geq (\mu'_s)_K$. If entropy is minimum at point (A+α, A+ξ, n), then entropy shifts from point (A+α, A+δ, A+ξ) to point (A+α, A+ξ, n) and if entropy is minimum at point (1, A+α, A+ξ) then minimum entropy shifts from point (A+α, A+δ, A+ξ) to point (1, A+α, A+ξ).

$$\frac{\mu'_p \{n^s - 2^s\} + 2^s n^r - n^s 2^r}{\{n^r - 2^r\}} < \mu'_s < \frac{\mu'_p \{n^s - 1\} + n^r - n^s}{\{n^r - 1\}} \quad \text{-- (33)}$$

and

$$\frac{\mu'_p \{(n-1)^s - 1\} + (n-1)^r - (n-1)^s}{\{(n-1)^r - 1\}} < \mu'_s < \frac{\mu'_p \{n^s - 1\} + n^r - n^s}{\{n^r - 1\}} \quad \text{-- (34)}$$

If these two conditions hold then minimum entropy shifts from point (1, A+α, n) to point (1, A+τ, n), where α ≠ τ.

$$S(1, A+\alpha, n) = S(1, A+\tau, n)$$

$$p_2 \ln p_2 + q_2 \ln q_2 + r_2 \ln r_2 = p_{21} \ln p_{21} + q_{21} \ln q_{21} + r_{21} \ln r_{21} \quad \text{-- (35)}$$

by solving equation (35), we get value of μ'_s say $(\mu'_s)_T$.

$$S_{\min} = -p_2 \ln p_2 - q_2 \ln q_2 - r_2 \ln r_2, \text{ for } \mu'_s \leq (\mu'_s)_T$$

$$S_{\min} = -p_{21} \ln p_{21} - q_{21} \ln q_{21} - r_{21} \ln r_{21}, \text{ for } (\mu'_s)_T \leq \mu'_s$$

We get expressions for p_i, q_i, r_i from equations (4), (5), (6).

So, in this way we can observe the shifting of minimum entropy and obtain the expressions for minimum entropy and switching points. Minimum entropy can be obtained by giving different values to r, s & t for special cases.

III. CONCLUDING REMARKS

We have obtained the expressions of minimum Shannon entropy for the given values of rth and sth order moments. So, we observe that

(1) For given values of $(\mu'_p)^{1/r}$ & $(\mu'_{s \min})^{1/s}$, entropies are same

for all existing points and similarly for given values of $(\mu'_p)^{1/r}$ &

$(\mu'_{s \max})^{1/s}$, entropies are same for all existing points.

(2) When both moments take discrete and equal values, S_{\min} is zero.

(3) Number of switching points are small when $(\mu'_p)^{1/r}$ is near to

1 & n and number of switching point are large when $(\mu'_p)^{1/r}$ is

far away from 1 & n.

(4) S_{\min} is a piecewise concave function.

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Role of Nature in Self-Exploration in Margaret Atwood's *Surfacing*

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Abstract- This paper focuses on human interaction with nature. The protagonist of the novel, *Surfacing* returns to the undeveloped island where she grew up on to search for her missing father. In the process, she unmask the dualities and inconsistencies in both her personal life and her patriarchal society. Through the struggle to reclaim her identity and roots, the protagonist begins a psychological journey that leads her directly into the natural world. Like the journey itself, the language, events and characters in Margaret Atwood's novel reflect a world that oppresses and dominates both femininity and nature.

Index Terms- Nature, Femininity, Identity, Duality, Exploitation

I. RESEARCH

Colonialism and patriarchy are seen as power structures that exploit. In Canada, colonial exploitation is seen as a kind of exploitation of both Nature and women. Colonial power structures have gone deep into the collective unconsciousness of Canada and have become metaphor for feminine and nature exploitation for women writers in that country. This gives rise to Eco-feminism.

Eco-feminism or ecological feminism is a term coined in 1974 by Françoise d'Eaubonne. It is a philosophy and movement born from the union of feminist and ecological thinking and the belief that the social mentality that leads to the domination and oppression of women is directly connected to the social mentality that leads to the abuse of the natural environment. Joyce Nelson says, "Eco-feminism bridges the gap between ecology and feminism: strands of analysis which have existed side by side over past decades without necessarily intertwining. By making explicit the connection between a misogynist society and a society which has exploited 'mother earth' to the point of environmental crisis, Eco-feminism has helped to highlight the deep splits in patriarchal paradigm."

Eco-feminist theory links the oppression of women with the oppression of nature. More specifically, "ecological feminism is the position that there are important connections—historical,

symbolic, and theoretical— between the domination of women and the domination of nature, an understanding which is crucial to both feminism and environmental ethics"^(warren, p.235).

Eco-feminism is dealt in Margaret Atwood's novel *Surfacing* (1972). Margaret Atwood is a leading novelist of Canada. She is best known for her feminist novels around the world. *Surfacing* is one of the best novels of Atwood which projects the story of an invisibly visible character without name in form of narrator of the story. The title of the novel is very significant because it reveals the efforts of an individual's self exploration which undergoes many phases of physical troubles and mental traumas. All the efforts of an individual in the novel for self exploration clearly come up on the surface in midst of the nature from deep conflict between self and society and gives a new power of re-thinking and insight to the nameless heroine of the novel for further process of life.

The protagonist grows up in a masculine world where it was worse for a girl to ask questions than for a boy. If a boy asked a question the other boys would make derisive sucking noises with their mouths but if a girl asked one the other girls would say "Think you're so great" in the washroom afterwards.

Thus growing up in a culture saturated with male bias, women remain reconciled to their own inferiority. Margaret Atwood draws attention to the fact that "the world is masculine on the whole; those who fashioned it ruled it, and still dominate it today, are men."^(Beauvoir, p.557)

In *Surfacing* the narrator of the story remains nameless throughout the novel. Commenting on the namelessness of the heroine Nancy A. Walker says that the narrator "lacks a clearly defined 'self' that can be named". Being nameless the protagonist says to her friend Anna, "I no longer have a name. I tried for all those years to be civilized but I'm not and I'm through pretending."^(Atwood, p.162)

It can be said that by depriving her protagonist of a name, Margaret Atwood has been able to suggest that *Surfacing* is not a story of a particular woman but of the millions of women all over the world who may identify themselves with her. The protagonist loves her art teacher who uses all his skill to seduce her. He gave a wedding ring and almost succeeds in creating the image of himself as her husband. When she is pregnant, he uses all tricks

to abort the child. For him it is “simple like getting a wart removed.” (Atwood, p.138)

The protagonist discovers that after marriage women’s exploitation, oppression and victimization gets sharpened. According to her marriage is nothing but a surrendering of values and distortion of the identity of a woman. Thus the protagonist’s journey into the interior provides her, “a means for tapping emotions that would otherwise remain inexpressible, and reveals aspects of her personality hitherto hidden.” (Stewart, p.156) In an interview Margaret Atwood says, “It seemed to me that getting married would be a kind of death.” (Valerie, p.16) According to Margaret Atwood, marriage should follow love. A marriage which is not based on mutual love is meaningless. The narrator says she was fool to enter into the bond of marriage. But in reality she never got married. Her lover was a “middle aged”, “second hand” and “selfish” man. He has refused to marry her because he is married. The narrator feels shattered when he shows the photographs of his wife and children, “they had names, he said I should be mature.” (Atwood, p.143)

She is betrayed by selfish lover but says, “for him I could have been anyone but for me he was unique, the first, that’s where I learned. I worshipped him...I kept scraps of his handwriting like saints’ relics...” (Atwood, p.142) The narrator cannot forget the misery abortion has caused her. She says: “I couldn’t accept it, that mutilation, ruin I’d made” (Atwood, p.137)

The unnatural act of her abortion and the continual struggle for her to feel comfortable with words and language illustrate the extent to which society or man oppressed and consumed the surface. Both empowering and dominating nature of her ex lover shows, “The unborn child was my husband’s, he imposed it on me, all the time it was growing in me I felt like an incubator. He measured everything he would let me eat, he was feeding it on me, he wanted a replica of himself.” (Atwood, p.28)

Margaret Atwood is emphasizing the fact that men exploit the bodies of women for their needs. They have controlled the process of childbirth which nature has assigned only to women. Men want women to remain powerless victim. She refuses Joe’s marriage proposal, “The finality; and he’d got the order wrong, he’d never asked whether I loved him, which was supposed to come first. I would have been prepared for that.” (Atwood, p.80)

Joe does not realize the need for it because men expect women to be absolutely passive and also because they think marriage is a woman’s destiny. The relationship between the protagonist and Joe, offers an interesting insight into male-female dichotomy. The protagonist’s acceptance of the partnership is almost fatalistic. She realizes that for Joe sexual need is primary and he wants to dominate and control her. She perceives a killer and victimizer in him.

We can notice the split between the narrator’s feminine self that is peace and harmony in married life and her feminist self which suggests Anna to walk out of marriage instead of suffering. Her imaginary divorce caused her tremendous pain and suffering. Remembering her parent’s reaction on her divorce she says:

“They never forgave me, they didn’t understand and divorce, I don’t think they even understood the marriage, which wasn’t surprising since I didn’t understand it myself. What upset them was the way I did it, so suddenly, and then running off and

leaving my husband and child, my attractive full-colour magazine illustrations, suitable for framing.” (Atwood, p.23)

Margaret Atwood’s “*Surfacing* takes woman as an existential condition, the condition of being powerless and manipulatable.” (Jaidev, p.54) Since power is centralized in the hands of man, they feel nothing wrong in destroying her dignity or creativity. According to them, a woman has no right to have a baby without a husband. When the pregnancy of the protagonist concluded not in childbirth but in abortion she feels emptied, amputated.

Margaret Atwood displays a superb, penetrating awareness of the traumatic experiences of abortion in the life of sensitive woman. Sushila Singh, an exponent of feminism in India thinks that, “the trauma of abortion has never been dealt with such an extraordinary understanding before in fiction”. The protagonist undergoes emotional and artistic death at the hands of her teacher. It is a “planted death in her”. As Malashri Lal says, “...the pain of aborting life unhinges the minds to a degree that it creates an alternate ‘truth’ to the event.”

The protagonist suffers from a guilt complex and in the end of the story, she decides to conceive a baby and resolved that, “this time I won’t let them.” (Atwood, p.187) The narrator wants to prove that the process of childbirth is women’s power not men’s and a woman can deliver the baby the natural way. She says:

“This time I will do it myself... The baby will slip out easily as an egg, a kitten and I’ll lick it off and bite the cord, the blood retiring to the ground where it belongs; the moon will be full, pulling. In the morning I will be able to see it: it will be covered with shining fur, a God.” (Atwood, p.156)

After her abortion, the protagonist comes to develop deep sympathy for the flora and fauna of the Quebec Island. She finds that the beauty of Nature is being destroyed by the Americans. The relationship between nature and Americans is relationship of exploitation and the entire landscape has been mutilated, raped:

“Further in the trees they didn’t cut before, the flood are marooned, broken and gray white tipped on their sides, their giant contorted roots bleached and skinless; on the sodden trunks are colonies of plants, feeding on disintegration; laurel, sundew the insect eater, its toe nail- sized leaves sticky with red hairs. Out of the leaf nests the flowers rise, pure white, flesh of gnats and midges petals now, metamorphosis.” (Atwood, p.161)

Within *Surfacing*, power and domination directly oppress both the feminine world and the natural world. From the human driven need to control the dam to the destruction of older trees. . The protagonist looks with disgust on the disrespect of her companions and others towards the natural world. When she sees a dead heron, obviously killed by a human and on display to reveal the killer’s ego, she is sickened and becomes more sickened when David wants to film it because it looks suitable for a film titles “Random Samples”. She opposes to eating animals, saying she had no right to it and even suggests that killing a fish is worse than starting a war because there are always reason for killing a living creatures.

Eco-feminists argue that two very defined, contradictory, and dualistic worlds exist in the patriarchal society the feminine and the masculine; on the one hand, the feminine principle represents Mother Nature, the body, irrationality, emotion and mysticism. On the other hand, the masculine principle represents rationality logic, separation from nature, the head, intellectualism, language

and concrete reality. The protagonist tries to re-unite these two dualities:

“The trouble is all in the knob at the top of our bodies. I’m not against the head or the body either: only the neck that creates the illusion that they are separate.... If the head extended directly into the shoulders like a worm’s or a frog’s without that constriction, that lie, they wouldn’t be able to look down at their bodies and move them around as if they were robots or puppets; they would have to realize that if the head is detached from the body both of them will die.” (Atwood, p.75)

The surface struggles with the notion that the head (a masculine element) should be remotely separated from the body (a feminine element). In order for each to prosper to the fullest extent, they must work together. The narrator, in the last few pages, sees the natural world as her equal, refuses to fall into the same patriarchal trap that initially destroyed her, and reclaims her ability to trust. Though she does not return to society, she does so as a changed person. She realizes, “that human beings are not radically separate from nature: that the fulfilment of our humanity is profoundly linked with learning to appreciate the nature within us and without” (Atwood, p.43) standing there, with, “the trees [surrounding her]...asking and giving nothing”, she has embraced the eco-feminist ideal.

Narrator’s journey ends off discovering about herself. She discovers about herself and her relation with the world. She explores the power-politics in interpersonal relationship and relates the women’s crisis of identity not only to the patriarchal structures of power and domination but also to the women’s passivity and complicity in the power structures that subject and subjugate them.

Despite her fear of the consequences, her search for her missing father and her search for self increasingly offers her the power to resist the oppression inherent in their relationship and to reassess her own need. Margaret Atwood seems to be questioning the existing power politics, the traditional notions of male superiority, and the mutilation of women by men. She is trying to assert that women can refuse victimization and can gain transcendence from the male defined world and can hope to breathe freely in a world defined by them. Emma Parker says:

“Her rejection of, and return to [nature] society is reflected by what she eats. When she rejects culture and retreats into the wilderness to become a “natural” woman, she gives up eating processed food. Such food is contaminated in the same way that society is contaminated by patriarchal ideology. Both are unnatural constructed man made and both threaten to poison her. Instead, the narrator eats only the raw food that nature provides.” *Surfacing* represents the feminine consciousness and shows a woman’s struggle to free herself. Her association with the people and Nature raises her consciousness of victimization of woman. When her feminist consciousness reaches its climax, the protagonist makes ready the ground for revolt against exploitation oppression. As Carol Christ says, narrator awakens, “from a male-defined world, to the greater terror and risk, and also the great potential healing and joy, of a world defined by the heroine’s own feeling and judgment”.

In order to attain her identity she feels, she must avoid every association with the “metal” killer society and go back into the remotest forest. In course of this impassioned, desperate search she takes her plunge literally in the ancient lake, mentally in the

memory of her parents and mystically in the vision of their continued existence in Nature. She also tries to attain some unknown but ancient wisdom, which might have been behind the rock paintings. At the end she reverses the mirror in order “not to see myself but to see”, and alone resumes her journey which finally brings her through extreme hardship to the symbolic plunge and to resurface—this time with the defiance never to be a victim any more. The protagonist moves from struggling with the oppression and domination of the male world to associating with various feminine principles and motifs to eventually embracing and returning to the natural world as an equal, unassuming member. Margaret Atwood shows men’s misuse and women’s use of nature in *Surfacing*. Women’s association with fertility and men’s with environment abuse specifically as a metaphor of the violation of women by men.

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IMPLEMENTATION OF CREDIT RATING FOR SMEs (Small & Medium Enterprises)-HOW IS BENEFICIAL TO INDIAN SMEs?

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Abstract- SMEs are integral part of India's growth story. SMEs contribute not only to the domestic market but also to exports significantly, thus earning foreign exchange revenue for the country, thereby making the sector emerge as very strong pillar in India both in terms of GDP and in terms of employment. Today SMEs are contributing more than 16-18% of Indian GDP and if this sector is getting more support, the sector can easily contribute more than 30% to the GDP. The biggest challenge for SMEs in India is, effective financial management both for running of the organization as well as for expansion activities taking in to consideration the global competition. Raising funds from financial institutions like banks, NBFCs for SMEs are till date a big challenge. It is estimated that only 16% of Indian SME sector have been given bank /institutions support and the rest of the sector is unable to get support. The main reason for these lacunae is, not having efficient management tools in place, lack of knowledge of banking guidelines, ineffective mechanism to weigh the credit worthiness of the company.

The current scenario of Indian economy is pushing RBI, to bring in a strict lending policy due to slowdown in growth, which has affected the lending policy to be more conservative with very high interest rate, which is very clearly disturbing the bottom line in the balance sheets of SMEs. This eventually become more difficult for SMEs, not only for their expansion plan but also to make the company to run in difficult situation, when the economy is in slow down mode, thus compelling this enterprise to stay in on even keel in terms of growth or even perform lower than previous years, unlike other bigger corporate which grows rapidly because of their strong measures and support from the banking sector.

Other part of the story is, Bankers are far behind in lending guidelines laid down by RBI, in relation to SME sector, the biggest challenge for Banking sector is, there is no proper mechanism, unlike bigger corporates to measure the quality of the organization in terms of asset quality, IP(intellectual properties) and the business through acclaimed private agencies. In order to ensure that the banking system penetrates the SME space more and at the same time, applies caution in terms of asset quality, the system of SME rating got introduced. In this article, we are going to analyze all the information related to SME rating, Why it is necessary?, benefits of rating for SMEs and banking sector, Industry growth opportunities due to rating system, challenges faced by SMEs due to rating system, future growth of SME sector etc.

Index Terms- rating of SMEs, credit rating for SMEs, benefits of credit rating for SMEs, importance of credit rating in SME sector

I. INTRODUCTION

In 2007, Chennai based businessman Mr Kandhasamy, who is in automobile components accessories manufacturer was tired, his bank refused to extend the support for further capital for expanding his business,. "My banker couldn't understand the model of my business and I was also finding it difficult to explain in banking terms.'

Fortuitously, just around this time, he came across newspaper reports of lot small organizations in Coimbatore and Chennai being provided rating certificates. This was very promising. He immediately approached a credit rating agency and the feedback helped him improve his company's efficiency, resulting in a better turnover and profit. The agency provided him with key parameters they gauge the company and its health. He worked on improving certain critical factors in key areas and succeeded in getting a good rating and thereby a bank loan. The debt infused helped the company grow manifold

The above message is a very clear indicator as far as SMEs status today. Most of the SMEs are finding it difficult in approaching the banks and requesting for loan, as the formalities to be complied with banking system is cumbersome and this kills most of their time, leaving very minimal time to concentrate on their business. The resultant factor is non growth in their existing business and they are not in a position to either sustain or expand their business. In a report from MSME, it is informed that only 16% of SMEs have access to bank facilities and other people are finding it difficult in getting the support from the banking sector. To create the uniformity in treating the SME sector as whole, lot of initiatives have been taken up by Government of India and one such strong initiative is credit rating for SMEs. Corporates are required to get rating done for their company to avail any additional borrowing from the banks and this sector has used this as mandatory procedure for getting all kind of support from banking sector. But for SMEs, no such criteria have been there in the past and this resulted in abnormal delay in both sanction and disbursement. The rating mechanism introduced by India, will certainly have its own benefit to SME sector. Let us understand how this rating system has been formed and who are all eligible

to rate the company, rating process, rating fee, and the benefits for SMEs due to the newly introduced rating system.

II. WHAT IS CREDIT RATING?

Ratings on small and medium enterprises (SMEs) reflect the rated entities’ overall creditworthiness, adjudged in relation to other SMEs. These ratings are entity-specific, and not specific to debt issuances.

The company will be analyzed internally and awarded rating according to the particular company’s credit worthiness, its management team, and effective relationship with customers and suppliers.

The SME sector has its own unique features: unlike the large corporate, the SME sector has no organized information on industries, their functional details, market shares, competition dynamics, and promoter or management track record. The creditworthiness of entities in the sector, therefore, needs to be assessed using tools and methods that are different from those traditionally used for large corporate. SME Ratings agencies in India have evolved a very unique and new tool in rating the sector. This rating reflects the rated entities’ overall credit worthiness, adjudged in relation to other SMEs. These ratings are entity-specific, and not specific to debt issuances. The company will be rated according to the strength and weakness of that company only and will be compared to the sector as whole, which will give increased leverage for the company to work on better platform.

What does a credit rating agency do?

Approaching a credit rating agency is a good option for small and medium enterprises (SMEs) given the problems they face in seeking finance. According to an RBI report on trends and progress in banking 2010, only 13% of the registered SMEs have

access to finance from formal sources. This clearly indicate the need for SMEs to rate their company to have wide access to the banking sector. Practically speaking, lot of SMEs are finding it difficult in reaching the sector, because of their lack of knowledge in the formalities to be complied to avail bank funding for their expansion activities.

Rating agencies assess a firm's financial viability by way of taking all the necessary documents about the company, its management team and the business model etc, analyze the same in terms of their capability to repay the debt in case of going for borrowing from the banking sector. And capability to honour business obligations, provides an insight into its sales, operational and financial composition, there by assessing the risk element, and highlights the overall health of the enterprise. They also benchmark its performance within the industry. The company will be rated according to their industry and how they are positioned in the peer group, how comfortable their business model to make the company to repay the borrowing etc.

There are more than 5-6 rating agencies who are now actively involving in to the rating of SMEs. CARE, ICRA, SMERA, CRISIL are some of the agencies who are in to the rating of SMEs.

Different rating agencies are adopting different style in rating the company. For ex. SMERA has got the rating system for different sector and each sector has got some unique difference in their rating. Some of the rating scales are given below.

III. SME RATING MECHANISM

SME rating scale consists of two parts, a composite appraisal/condition indicator and a size indicator. Normally, rating agency has got the indicator of scale 1 to scale 8, which carries its own weight. Rating categories SMEs based on size, so as to enable fair evaluation of each SME amongst its peers. The SME rating scale is specified below:

SMERA RATING	RATING APPRAISAL INDICATOR
SME 1	Highest
SME 2	High
SME 3	Above Average
SME 4	Average
SME 5	Below Average
SME 6	Inadequate
SME 7	Low
SME 8	Lowest

Source-SMERA

HOW THE PROCESS WORKED IN RATING SMEs?

Rating is a comprehensive assessment of the enterprise, taking into consideration the overall financial performance. Management competence, industry overview, peer group performance, relationship with customer/vendor etc and strong management competence in maintaining the disciplined finance model.

Profitability

The company to be rated will be first analyzed for their past performance and how they generated profit and whether they could able to sustain their profitability amidst their competition and any hitting on profit due to economy slowdown etc. Company with consistently good profit will always have fairly a reasonable rating then those companies with lesser profit in

comparison with peer group. If the industry has generated good profit, than the company which is getting rated, then the rating for that company will definitely have small dent in their quality of repayment. Because, any company which gets reasonably good profit, then only they may start repay their loan with the profit. This is the best and important factor which is considered by the rating agency for good credit rating.

Growth rate of the organization

Growth of the organization will be compared with the industry and this determines the capability of the management to take the company in the upward direction. If the growth of the organization is at least in par with the industry growth, the rating will be good and if it is less than the industry average growth, then the rating will be lower with respect to the particular objective. If the company has performed well ahead of the industry average, rated company can expect definitely better scale in the rating.

Scalability and speed of the organization,

Though the above mentioned parameters are playing vital role, it is imperative to ensure the industry’s potential for growth in the coming years and how fast the company is able to achieve the milestone set by them to reach and how the company is persistently doing the growth. If the industry is not having enough opportunities for any future growth rapidly in the coming years then their past performance, then the rating will be lowered. Forex; certain industries will have automatic saturation level, and normally the promoter tend to apply their past performance activity for their scaling, which most of the time, due to the new systems and tools in place by their competitor fails. Since the industry is not capable enough to accept that fast growth beyond its saturation level, it is generally to be turn in to negative growth, which may detoriate the liquidity of the company and profitability. This may make the company to enter in to debt trap and it may even lead to the level of closure. Rating agency normally looks on the scalability of the company and industry, its future potential etc to determine the rating.

FINANCIAL PERFORMANCE OF THE COMPANY

Past performance of any company is the mirror for their future activity. Though this is not to be applied strictly to understand any business, in particular with SME, it is also taken in to consideration to analyze the company. The books of the company is very clearly scrutinized by the rating agency and ask for any clarification with the management and after getting satisfied with the details provided by the management, they also tend to verify the authentication of the documents submitted by the management with the concerned authorities if necessary to have double clarity.

If the past performance of the company and its all necessary ratios to be calculated is not up to the mark, then the rating agency may downgrade the rating with respect to the financial performance of the company and may provide good rating if the performance is good.

INDUSTRY & OPPORTUNITIES

As explained in the previous column, rating agency will also have look in the industry as whole and they tend to compare the company to whom rating to be provided along with the other companies in the same sector and if necessary in the same size

and analyze, how the other companies have performed in the same sector. If the company to whom rating to be provided has performed well in compare to the industry, then they will start analyze, how this company has performed well and provide the rating accordingly.

OTHER PARAMETERS

Apart from the parameters which will be analyzed, the rating agency will also look in to the efficiency of the management, customer’s longevity and customer satisfaction, raw material supplier’s satisfaction level and the bank account management. Rating may vary, if poor bank management is done the company and all the banking institutions are expecting their customer to keep their commitments to maintain fair practice. They are strongly recommended to maintain good relationship with all the people responsible for the growth of the organization and it is always better to ensure that payment history is the primary factor; any company should have in mind as, this will have direct effect on the rating. Companies with certification like ISO etc, will certainly have better rating opportunity and any company which has violated the statutory liabilities like PF, ESI etc will definitely have rating in the down ward level. A very strong asset base created by the company in terms of infrastructure, machinery for the development of the company with the profit accumulated in the past, reinvested in the business again will certainly add mileage

IV. IPO PROCESS RATING MECHANISM FOR SMES

For example, SMEs when they want to go for Initial public offering (IPO) grading is a five point grading scale. The issuers with strong fundamental relative to its peers are assigned highest score "SME IPO Grade 5" and the issuers with poor fundamentals relative to its peers are assigned lowest score i.e. "SME IPO Grade 1". In IPO process, the same formula and process with increased diligence process will be done by the rating agency.

SMERA IPO GRADE	EVALUATION
SMERA IPO Grade 5	Strong fundamentals
SMERA IPO Grade 4	Above Average Fundamentals
SMERA IPO Grade 3	Average Fundamentals
SMERA IPO Grade 2	Below Average Fundamentals
SMERA IPO Grade 1	Poor Fundamentals

V. PROCESS OF RATING

The six stage rating process is the key factor for the company. As this involves comprehensive analysis of the company which can be used by the management, as parameter for the company to strengthen their weakness highlighted by the rating agency and this can be used as tool to have healthy relationship with the banker. The rating process are as follows.

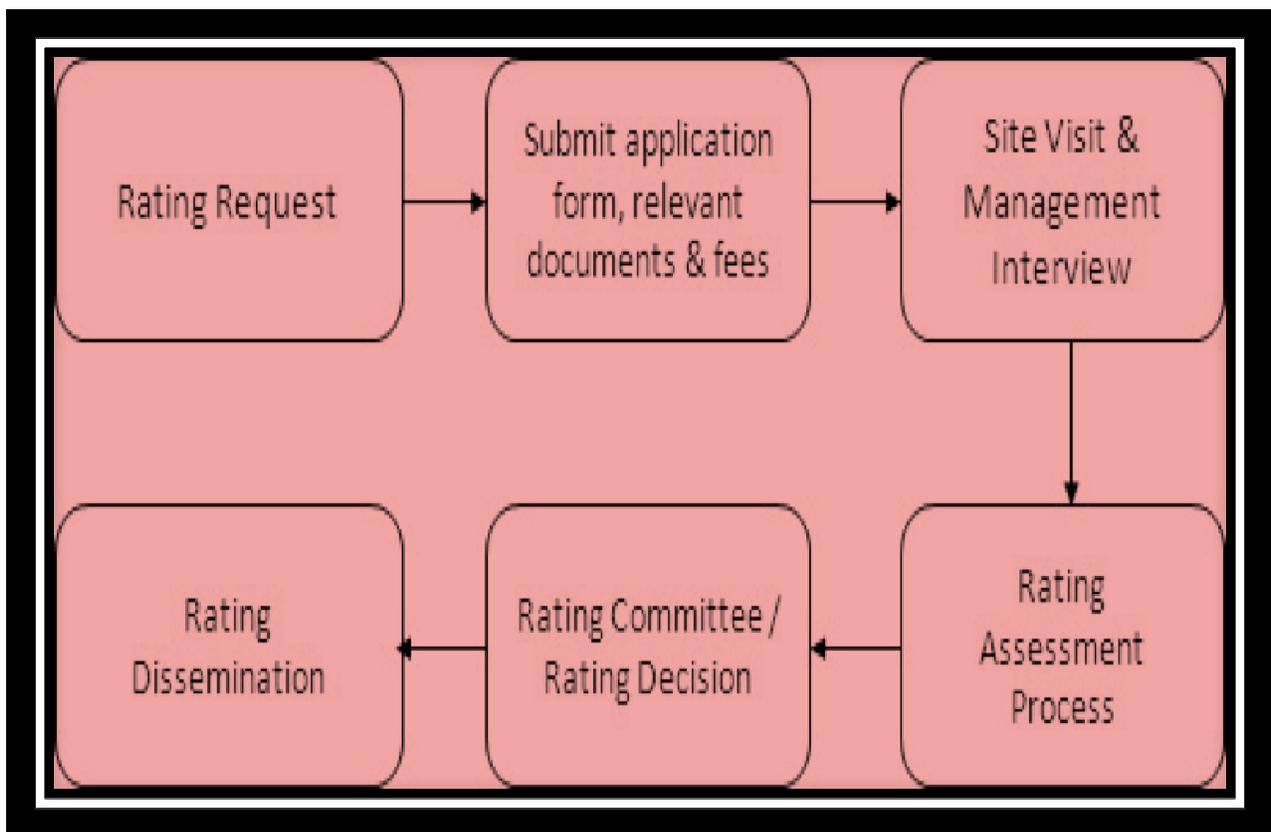
- The Rating process starts from getting the request from the company which need to be rated. The rating agency has got the definite idea of transparent, reliable, time bound and customer friendly. The Rating process begins with the receipt of rating mandate along with the application form and ends with the dispatch of the Rating report and Rating certificate. The Rating process in brief is enumerated below:
- After getting the request from the company, the company has to file the necessary application along with list of documents required for the rating agency to conduct the research about the organization along with the necessary fee. After submitting the documents, the rating agency team will have direct site visit to the company and they will have detailed discussion with the management about their vision, problems, benefits etc to have an over sight about the company. They also will talk to their supplier, customers, bankers about the performance of the company in terms of timely delivery of finished goods and inventory management.
- After their discussion, the rating agency will start do the rating process with the preset conditions laid down for SME with their rating scale.
- Once the rating team has finished the rating module, it will be transferred to the rating committee which will consist of eminent team with industry expertise and they will analyze the rating formula and the company's

documents. Once they have verified all the documents, then the rating committee will decide what scal can be allotted to the company. Once that is decided, then the rating agency will complete the rating and send the rating report to the company.

- The company will have rights to accept all the conditions laid down in the rating report or they can provide additional information to prove their company to be upgraded. Once the submitted documents are satisfying the committee, then they will upgrade or maintain the same standard to the company and submit the same to the company.

Once the rating mechanism is over and rating has been done, then the management of SME can take the same to the banker for getting the facility for their business improvement.

PROCESS FLOW CHART IN RATING THE SMEs



Source-SMERA

After rating agency completed the formalities and submitted the final report, the company can approach the banker with the rating

report and the banker will keep this rating as key document to extend the facility to the company.

The interest rate at which the company borrows basically relies upon the rating scale. If the company has go rating as 1, then very attractive interest rate will be extended by the banker to the company and vice versa. Not only that, very good rating for any particular company will have more chance for getting the facility from the banker as this document gives a kind of comfort level to the banker about the asset quality.

Rating agencies usually have eight grades, ranging from SME 1-8, with rating 1 denoting the highest rating and 8 the lowest.

VI. FEE STRUCTURE

Rating agency unlike charging for bigger corporate, for SMEs they charge very nominal fee ranging between INR 30,000-INR 1,20,000/ per report and this report will be accepted by all the bankers in India, if the rating agency is approved by the banker. The fee structure is normally flexible depends on the size and requirement of the company.

These ratings are valid for a year and can be renewed by paying an appropriate fee. It is money well spent. For, a good rating means a higher chance of bagging a loan and chances for getting the loan at very attractive interest rate.

SIDBI has welcomed the rating system introduced and they are very happy that SME sector will have extra mileage due to the rating system since banks will extend their support to this sector against current utilization of 16% to touch more than 30% in other 16-24 months.

"There is a lot of information asymmetry in the market. A good credit rating provides us with the initial confidence for the project. It also acts as a final confirmation," says Sunil Munhot, chairman and managing director, Small Industries Developmental Bank of India (SIDBI).

Support extended by NSIC for getting SMEs rated;

The extension of facility by Government Of India through one of its arm, NSIC(National Small Industries Corporation), which provides support for those companies with the turnover of less than 2 crores has been given reimbursement of money spent by SMEs for getting their company rated in the below mentioned manner, which certainly gives an opportunity for this sector to get their company rated at relatively minimal cost.

Turn Over of SSI	Reimbursement of Fee through NSIC
Upto Rs 50 Lacs	75% of the fee or Rs 25000/- (Whichever is less)
Above Rs 50 to 200 lacs	75% of the fee or Rs 30000/- (Whichever is less)
More than Rs 200 lacs	75% of the fee or Rs 40000/- (Whichever is less)

Approved list of credit rating agency in India

Banks have approved certain credit rating agency to act in SME sector and the report generated by the approved agency will be given due credit for extending the facility to the customer.

Some of the rating agencies who have been approved are mentioned below.

1. CRISIL;Crisil has already tied with more than 32 banks for rating their customers for speedy process of loan.

2. SMERA- Has tied with more than 30 banks for rating and in the process of adding more banks in their list

3. ICRA-Already started adding banks in their list and very aggressively started promoting this model in their revenue portfolio.

4. CARE-Credit analysis & Research

5. ONICRA

6. Fitch

VII. BENEFITS FOR SME SECTOR DUE TO RATING MODEL

"If a firm gets a good rating, They can even approach other banks to get a better rate bargain than the one provided by his existing banker," says Munhot. Director SIDBI

- The rating scale places very imminent role in determining the quantum of loan to be provided to the company. For ex; if the company is doing in par with the industry and they want to rapidly expand, the banker may have their discretion to sanction the amount taking in to consideration the industry, management, capability of the company etc and banker may sanction full money requested for expansion or they may ask the management to slow down in their expansion by reducing the capex(Capital Expenditure) investment.
- Very high rating for the company will definitely have an upside benefit of interest rate reduction from anywhere between .5% -1.5%, which may give substantial benefit for the company and it may increase the company's profitability.(An reduction of 1% interest rate for the loan of 2 crores may give the benefit of close to 2 lacs benefit for the company, which will be directly adding to the bottom line of the company(PAT-Profit after Tax))
- High rated company means strong confidence in their entire operation, thus gives the company to attract good talent pool from the big corporate to strengthen their operational viability and retention of employees are possible due to the strong image created by way of high rating.
- Rating also helps the company to push their business very aggressively since the rating agency not only appraises the financial quality, but also it's other performance. This gives to the company an upper edge by way of showing the rating to the other new customers and export also possible, as this will create confidence in the mind of the customer about their delivery capability and financial stability. Very strong rating will definitely make the company to show this rating as their credit worthiness in terms of financial and non financial performance, which will definitely

increase the top line & bottom line of the company.

- Normally, any loan proposal may take more time with bankers, and some time, this may hamper the growth of the company. In some cases, loan status information from bank takes more than 3-6 months and due to this delay, SME may be denied for their organic growth. When the company is rated by the listed rating agency, then this gives the comfort level for the banker to speed the process and loan sanction and disbursement time will be reduced substantially. In an analysis, it has been reported that more than 35% of the companies who got the rating certification claims that, processing time for the loan sanction from the banker has come down drastically, and they saved lot of time and money and their growth was thus guaranteed due to timely release of loan.
- More interesting fact is, instead of SMEs approaching banks for getting loan for their expansion activity, high rated SMEs will be approached by the banker directly and they come forward voluntarily for extending the credit facility, since bankers want to have good asset quality. With good rating, this becomes easy for the banker to understand the credit worthiness of the customer and they are optimistic on their repayment capacity.
- Good credit rating will give confidence to the company (SMEs) to compete with bigger players in terms of quality, better price and they tend to grow in some cases in par with bigger corporate. This will certainly boost the employment opportunities and increase the per capita in India.
- An increase of 7-10% increase in SME sector getting bank support (Currently only 15-17% of SMEs are accessible to the bank funding and other are not getting the benefit from the banking institutions), may increase the GDP growth to the level of anywhere between 1-2% growth. Currently SME sector contribution to GDP is almost close to 16-18% and this can easily touch more than 20-22% if the sector gets recognition due to the rating mechanism.
- Saving in cost of borrowing by way of 100-150 bps may add huge profit to the company when the company gets very high rating, good interest rate will be offered by the banker, thus enables the company to increase profitability, which may be helpful for the company to meet their obligation of bank to meet well in time and some times ahead of time.
- Good and high rating may give an edge to the SME to negotiate with the banker for further reduction in interest rate. If more banks are approached for funding, then reduction in interest rate is highly possible since, no banker will be interested to lose top rated customer. Competition between banks for attracting and retaining the top rated SME may give more gain in bargain and lowest interest rate is almost guaranteed if the company is very strongly negotiating with the banker.
- High rating may attract lot of private equity/venture capital investor as the confidence in company's growth story is certified by the third party rating agency will make the investor more comfortable in looking in the company and there by the company will grow rapidly.
- Better business opportunities: The independent risk evaluation of SMEs by an unbiased third party lends credibility to them and opens doors for them, while dealing with MNCs and corporate. "You can submit credit rating for tenders and make yourself more credible to get bigger orders. The government also favours rated SMEs, restricting certain contracts for such firms. It also operates a performance and credit rating scheme through various credit rating agencies via the National Small Industries Corporation. The scheme provides a one-time subsidy to SMEs to get rated. "The rating agencies have by far done a good job as external ratings have been coinciding with our internal risk evaluation mechanism. This is a very important benchmark while giving loans," says Munhot.
- A regular renewal of ratings not only helps improve a firm's performance, but also builds confidence within the lender fraternity and trading channel.
- It is like a report card for SMEs. The analysis helps them to continuously evolve based on the changing regulation, business requirements and economic scenario," says Patki.
- SMEs are usually deterred by the rigor of rating discipline and fear of low rating, but the latter may not necessarily be the result of weak financials and can be attributed to various reasons. "The issues can be easily pointed out in the rating report. The SMEs that want to run a sustainable business take the feedback positively and try to improvise. It is an opportunity to implement best business practices," says Pai.

In general, rating system introduced by India will definitely give additional boost to SME sector and it is estimated that more and more SMEs will start approaching the rating agency and this will stand as very important miles stone for the SMEs to grow and prosper.

VIII. CONCLUSION

In addition to various measure taken by Government of India to encourage the SME sector and by various other agencies like SME exchange, subsidy by NABARD to boost this sector & Lot of state government owned financial institutions like TIIC, APIIC, KIIC etc to extend lot of benefits to SMEs, rating system is also going to add quality in terms of performance of SMEs and make them to fight for their eligibility, with their Indian banking sector in par with other bigger corporate. SMEs will also start thinking to transform their company from the existing stage to high range to get good rating if the banking system starts insisting on rating as 'MUST' for SMEs. When this becomes compulsion, then the sector will work more professionally and increase their revenue. By making the company internally,

structured qualitatively and keep systems in place with decent financial discipline may make SME, to be perfectly fit in getting good rating and which in turn will increase Indian GDP and if SME sector grows from the current GDP contribution of 16-18% to 20-22% of GDP, then India's growth story against the developing nations will be achieved.

Credit Rating for SME and its benefits, if informed and educated to the SME sector more seriously and meticulously by the concerned authorities and SME related organizations, this will definitely become an eye opener for this sector and every company in this sector will start utilizing this golden opportunity and get the finance at relatively low cost, which will boost the sector as whole and create more employment, more revenue by way of tax to government and more importantly export from this sector will certainly witness huge growth leaving to govt more foreign exchange revenue. Encouraging this sector to work qualitatively and more efficiently will certainly make the sector to gain and create new era in Indian Economy. It is necessary to understand that, in spite of various measures taken by all the agencies to educate the SMEs to go for rating, entrepreneurs of this segment should also come forward voluntarily to work with the rating agency, for getting their company rated, not only for using this for, getting the support from financial institutions, but, to have this rating as self analysis tool for their improvement in terms of performance and to compete with bigger players in terms of financial discipline, quality parameters and making very conducting environment for the employees

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Amelioration of Power Quality in Isolated Power Systems

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Abstract- In Isolated power systems the power quality problem is compounded as the drive converter loads are likely to fluctuate in conjunction with mining or exploration areas. The use of compensators in improving power quality of isolated power systems is considered. The roles of the compensators are to mitigate the effects of momentary voltage sags/swells, and to control the level of harmonic distortions in the networks. A control strategy for both series compensator and shunt compensator is developed to regulate power flow. However series compensator reduces harmonics to an acceptable level when compared to shunt compensator. This is achieved through phase adjustment of load terminal voltage. It leads through an increase in ride through capability of loads to the voltage sags/swells. Validity of the technique is illustrated through simulation. Hence series compensator with LC Filter is used in reducing the harmonic distortions in isolated power systems.

Index Terms- Power Quality, Harmonic power flow, isolated power system, phase shift, series compensation, Shunt compensation

I. INTRODUCTION

Isolated power systems are commonly found in rural and remote areas of the world. These systems represent the alternative to grid connection, where interconnection to a large grid is not viable due to high cost and/or geographical obstacles. Furthermore, power systems such as those onboard of ships, in oil exploration areas and remote mining districts are characterized by limited generating capacity, supplying loads which can consist of significant amount of motor drives and power converters.

The power systems are often considered weak in that they possess relatively low short-circuit ratio, in comparison to a grid. Network voltage control becomes a challenging task as a result. The power-quality (PQ) problem is compounded as the drive-converter loads are likely to fluctuate in conjunction with the mining or exploration activities Fig. 1 shows a typical isolated power system supplying a converter load. The RL load may be used to represent an aggregate of dc motor drives, supplied via the converter. The converter is often a controlled six-pulse rectifier through which the motor torque is regulated by adjusting the firing angle of the rectifier. The motor-drive load is nonlinear and would involve commutation process within the converter. The consequence would be distortions in the voltage/current waveforms in the supply system, the extents of which are likely to fluctuate as the load changes [1], [2]. In addition to the drive load, one can also expect the presence of lower power capacity-

sensitive loads, such as computers or electronic controllers in the power system. The equipment is needed to ensure the proper functioning of the exploration mining activities. The sensitive loads would be connected in parallel with the nonlinear drive. Often such sensitive loads also contain input rectifiers that are capacitive in nature. The combined sensitive loads may be represented by the parallel RC circuit shown in Fig. 1. While the total capacity of the sensitive loads could be much smaller than that of the main drives, the distorted supply voltage is harmful to the sensitive loads. Excessive voltage distortions could cause the sensitive loads to mal-operate. The loads are also sensitive to short-duration disturbances in the form of voltage sags or swells. The disturbances can be due to faults or most likely, the fluctuating load cycles of the main drives. In the latter case, voltage flickers can occur and they can be of major concern. Thus one important consideration in the design and operation of the power system would be to ensure that the quality of supply to the sensitive loads comply with that prescribed under industry standards, such as the ITI curve [3]. A traditional method to achieve improved PQ is to use passive filters connected at the sensitive load terminals [4]. However, this practice has some shortcomings: the effectiveness of the scheme could deteriorate as the source impedance or load condition changes; it can lead to resonance between the filter and the source impedance. For these reasons, active filters such as that described in [5] may be used. Essentially an active filter, connected at the sensitive load terminal, injects harmonic currents of the same magnitude but of opposite polarity to cancel the harmonics present there. However, as noted earlier, harmonic distortions are only part of the problem faced in such a network: the variations in the drive load would result in voltage sag/swell or flickers appearing in the upstream voltage. Thus, the challenge is to regulate the sensitive load terminal voltage so that its magnitude remains constant and any harmonic distortion is reduced to an acceptable level. In a recent study, [6] proposes a series compensation method to mitigate the harmonics problem for the power system shown in Fig. 1. However, compensation for voltage sag/swell or flicker has not been considered. Series voltage compensation methods have been discussed in [7], [8] for the mitigation of short-duration voltages/swells but the presence of harmonic voltages/current in the networks has been ignored. This paper intends to fill this gap. Specifically, the investigation is to develop a method to control the fundamental component of . The control is achieved by regulating power flow via phase angle adjustment. Unlike the previous methods of [6]–[8], the investigation also shows that the voltage-sag ride through capability of the sensitive load can be improved through importing harmonic power from the external system into the SC.

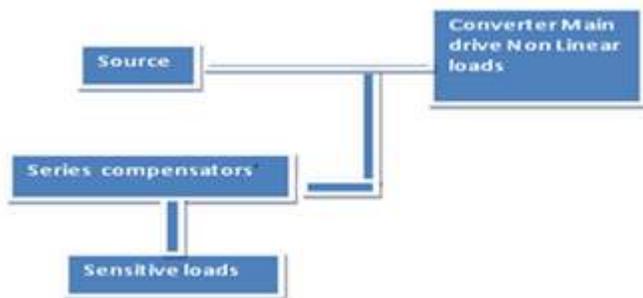


Figure 1: Typical isolated power system installed with a Series compensators.

II. POWER QUALITY

“**POWER QUALITY**” is defined as “the concept of powering and grounding electronic equipment in a manner that is suitable to the operation of the equipment in a manner that is suitable to the operation of that equipment and compatible with the premise wiring system and other connected equipment.

Power quality has become a strategic issue for the following reasons:

1. The economic necessity for businesses to increase their competitiveness.
2. The widespread use of equipment which is sensitive to voltage disturbances and /or generates disturbances itself.
3. The deregulation of the electricity market. In this context, it is essential for the utility and the customers to prevent and detect power quality problems and to have solutions available to fix them.
4. The power quality correction and harmonic filtering system give solution to solve the problems of harmonic disturbances and voltage fluctuations.

Power Quality Glossary:

Although specialists use complex equations for precise descriptions and analysis, the following definitions are adequate for most discussions

with your local utility account managers, distribution engineers, and PQ consultants and vendors.

Harmonic distortion: Continuous or sporadic distortions of the 60-hertz (Hz) voltage sine waveform, usually caused by microprocessor based loads in the building such as computer power supplies, lighting ballasts, and electronic adjustable speed drives. Harmonics can also be transmitted from an energy user down the block. These can cause telecommunications or computer interference; overheating in motors, transformers, or

neutral conductors; decreased motor performance; deterioration of power factor–correction capacitors; or erratic operation of breakers, fuses, and relays.

Interruption, momentary: A very short loss of utility power that lasts up to 2 seconds, usually caused by the utility switching operations to isolate a nearby electrical problem.

Interruption, temporary: A loss of utility power lasting from 2 seconds to 2 minutes, caused by a nearby short circuit due to something like animals, wet insulators, or accidents. Corrected by automated utility switching

Long-term outage: A loss of utility power lasting more than 2 minutes due to major local, area, or regional electrical events.

Noise: Sporadic voltage changes consisting of frequencies higher than the normal 60-Hz power frequency due to any number of causes, including arc welders, loose wiring, and nearby radio and TV transmitters.

Sag: A short-term decrease in voltage lasting anywhere from milliseconds up to a few seconds. Sags starve a machine of the electricity it needs to function, causing computer crashes or equipment lock-ups. Usually caused by equipment start-up—such as elevators, heating and air-conditioning equipment, compressors, and copy machines — or nearby short circuits on the utility system.

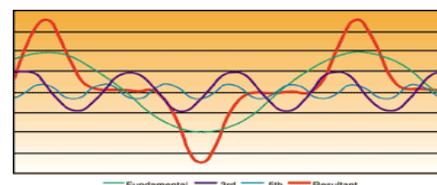
Spike: A very brief (nanoseconds to milliseconds) change in voltage ranging from tens to thousands of volts. Can be produced by utility and customer equipment operations, nearby lightning strikes, falling tree limbs on power lines, and even static discharges.

Surge: A short-term increase in voltage, lasting up to a few seconds. They are due either to customer equipment operation, such as air conditioners or motors switching on and off, or to utility activities, such as capacitor switching.

Transient: A sudden momentary change in voltage. Also called a spike

III. HARMONICS

Harmonics are currents or voltages with frequencies that are integer multiples of the



Fundamental power frequency: The fundamental frequency itself is called as the first Harmonic. The second Harmonic as frequency twice that of the fundamental, the third Harmonic as frequency thrice that of the fundamental and so on. For example

– if the fundamental frequency is 50Hz then the second Harmonic is 100 Hz, the third Harmonic is 150Hz etc.

1. Generation of Harmonics:-

Harmonics are created by non-linear loads that draw currents abrupt pulses rather than in a smooth sinusoidal manner. These pulses cause distorted current wave shapes, which in turn cause harmonic currents to flow, back into other parts of the power system.

2. Consumers Generating Harmonics:

Harmonics are not generated by power generators but are produced by Non-linear loads as under:

Loads that make use of semi conductor devices Like transistor, thyristor i.e., static rectifiers. (AC/DC conversion using SCRs), static frequency converters, static inverters like:

Static Power converters (AC – DC conversion using SCRs)

Static rectifiers

Static frequency converter

Static uninterrupt power supplies

Static induction regulators

Variable impedance loads, using electric arcs, are furnaces, welding units, Fluorescent tubes, discharge lamps, light control, brightness etc.,

Loads using strong magnetizing currents, saturated Transformers, inductance, furnaces, reactors etc. Office automation equipment like computers, UPS, printers and fax machine etc.

IV. VOLTAGE SAG

Voltage sag is a sudden reduction (between 10% and 90%) of the voltage magnitude at a point in the electric System and lasting from 0.5 cycles to few seconds. Either switching operations or any type of faults as well as fault clearing process can cause a voltage dip. Switching like those associated with a temporary disconnection of the supply or flow of heavy currents associated with the starting of large motor loads is the most common. These events maybe originated at the utility side or at the customer site.

V. POWER QUALITY CHARACTERIZATION

Even the most advanced transmission and distribution systems are not able to provide electrical energy with the desired level of reliability for the proper functioning of the loads in modern society. Modern T&D (transmission and distribution) systems are projected for 99,9 to 99,99% availability. This value is highly dependent of redundancy level of the network, which is different according to the geographical location and the voltage level (availability is higher at the HV network). In some remote sites, availability of T&D systems may be as low as 99%. Even with a 99,99% level there is an equivalent interruption time of 52 minutes per year. The most demanding processes in the modern digital economy need electrical energy with 99.9999999% availability (9-nines reliability) to function properly. Between 1992 and 1997, EPRI carried out a study in the US to

characterize the average duration of disturbances. The result for a typical site, during the 6-year period is presented below.

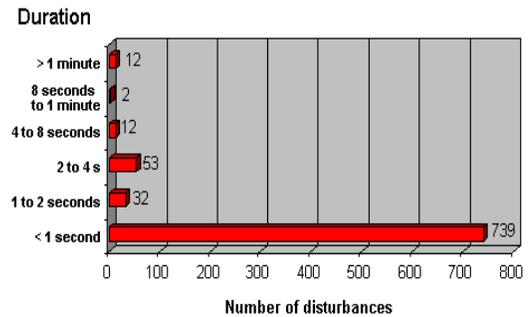


Figure 3: – Typical distribution of PQ disturbances by its duration

VI. SIMULATION RESULTS

A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions.

1. REDUCING HARMONICS USING SHUNT COMPENSATOR:

In the isolated power systems the harmonics are reduced to a small extent due to shunt compensator as shown in fig 4. The 3-phase terminal voltage waveforms due to the shunt compensator at the sensitive load terminal are not completely perfect sinusoidal, and are present with some amount of harmonic disturbances. The voltage waveforms at the sensitive load terminal are shown in below figure 5

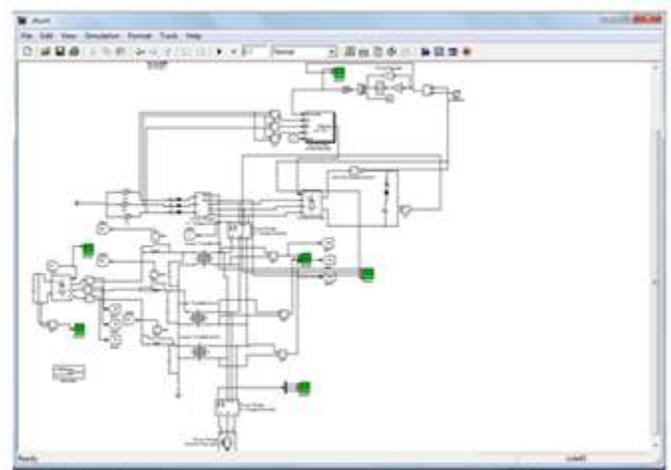


Fig: 4 Shunt Compensators

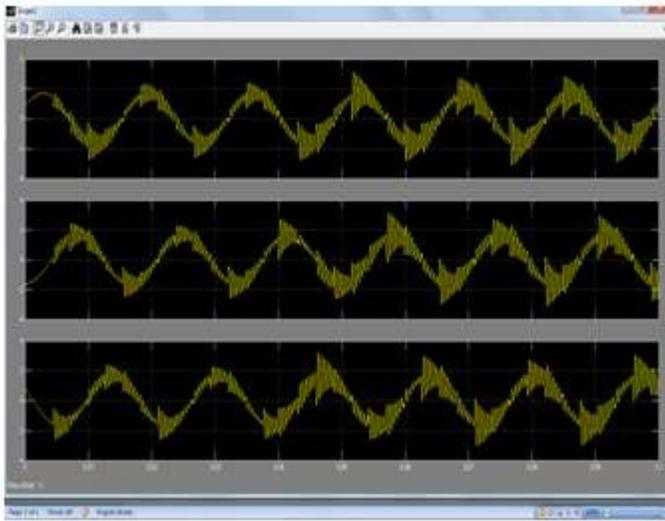


Fig: 5 the voltage waveforms at the sensitive load terminal.

2. REDUCING HARMONICS USING SERIES COMPENSATOR:

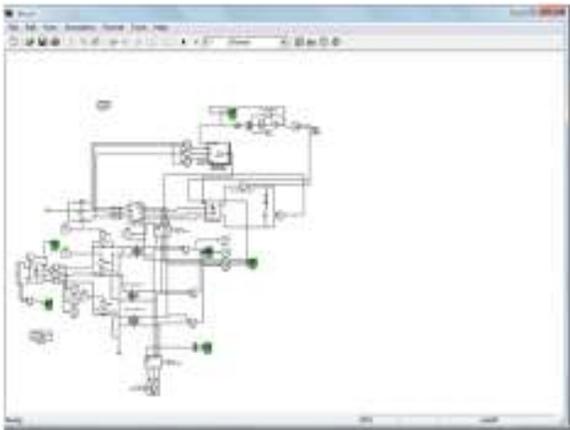


Fig 6.Series Compensator

The use of series compensators as shown in fig 6 reduces harmonics to an acceptable level when compared to a shunt compensator. The voltage waveforms at the sensitive load terminal are shown in below fig7

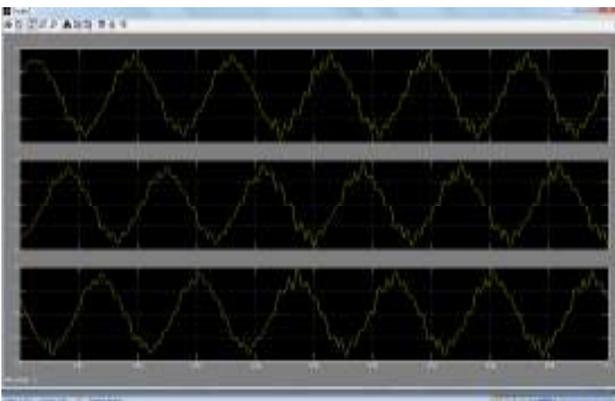


Figure 7: The voltage waveforms at the sensitive load terminal.

From the above wave forms we can analyze that the series compensator reduces the harmonics to a greater extent when compared to shunt compensator. Hence the series compensator is used in the isolated power systems for protection of sensitive loads.

3. USAGE OF LC FILTERS:

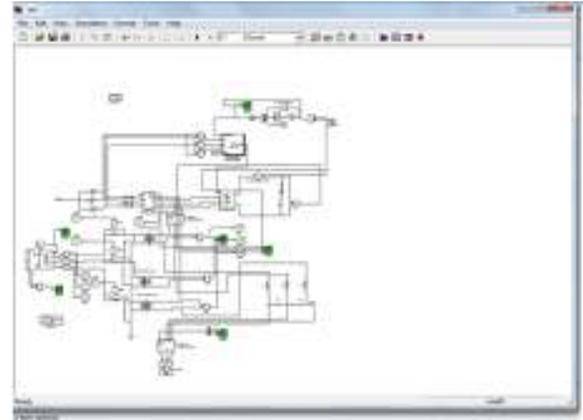
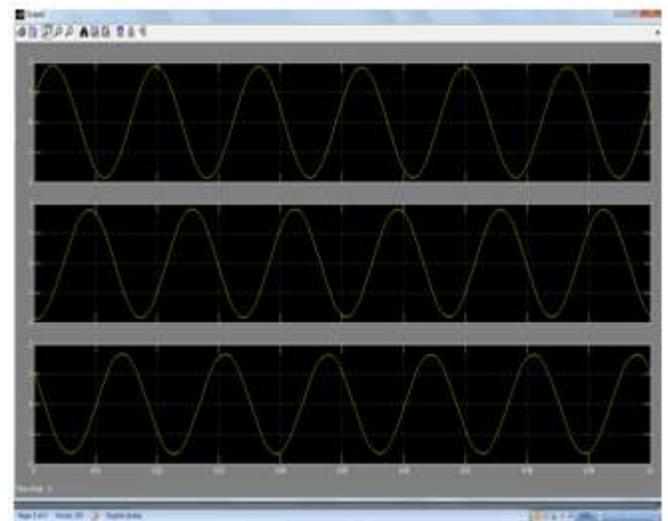


Fig 8.LC filters

The series compensator is used in reducing the harmonics in the isolated power systems for the protection of sensitive loads, but the use of series compensator cannot eliminate the harmonics completely in load terminal voltage.



Hence LC filters as shown in fig 8. is used to eliminate the harmonics completely in addition with series compensator. The voltage waveforms at the sensitive load terminal are shown in below figure 9.

Hence from the above waveforms we can conclude that the use of LC filter in addition with series compensator completely eliminates the harmonics in the load voltage at the sensitive load terminals in isolated power systems.

VII. CONCLUSION

In the isolated power systems the harmonics are reduced to a small extent due to shunt compensator. The 3-phase terminal voltage waveforms due to the shunt compensator at the sensitive load terminal are not completely perfect sinusoidal, and are present with some amount of harmonic disturbances.

The use of series compensators reduces harmonics to an acceptable level when compared to a shunt compensator.

The series compensator is used in reducing the harmonics in the isolated power systems for the protection of sensitive loads, but the use of series compensator cannot eliminate the harmonics completely in load terminal voltage. Hence LC filter is used to eliminate the harmonics completely in addition with series compensator.

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MOBILE APPLICATION WITH CLOUD COMPUTING

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Abstract- Smartphones enable a new, rich user experience in pervasive computing. The major problem with Smartphone is that hardware resources such as CPUs, memory and batteries are still limited. To solve this resource problem, many researchers have proposed architectures to use server resources in the cloud for mobile devices. This paper proposes a conceptual architecture where mobile application platform share the software as a service among multiple users on cloud server via network.

Index Terms- Android, Multi-tenant, Cloud, Virtual Smartphone

I. INTRODUCTION

The architecture for remotely using mobile application on server is called Mobile Application Platform on Cloud Server that intends to handle not only user data but also user applications in a cloud server. This approach changes the application lifecycle as follows. "Write once, run everywhere. Install once, use everywhere." Android is an open-source mobile OS initiated by Google. The main reason to select Android as a server platform is that it is able to run not only for Smartphone but also for x86 processor.

Software as a Service (SaaS) represents a novel paradigm and business model expressing the fact that companies do not have to purchase and maintain their own ICT infrastructure, but instead, acquire the services embodied by software from a third party. Here SaaS service is provided for mobile users. This paper proposes Android as a Server Platform that enables many users to use resources on remote cloud servers. This paper also proposes a multi-tenant architecture of Android on cloud server.

Multi-tenancy, this is defined as a feature where the software running on a server provides services to many users. It is one of the important features for cloud computing. From the viewpoint of both economy and ecology, it is beneficial to share hardware resources among users. Using a mobile OS would be more effective than using a desktop OS because the resource requirements of mobile OSs are smaller.

II. MULTI-TENANCY

Introduction

Multi-tenancy is an organizational approach for SaaS applications. Although SaaS is primarily perceived as a busi-

ness model, its introduction has led to numerous interesting problems and research in software engineering. Despite the growing body of research in this area, multi-tenancy is still relatively unexplored, despite the fact the concept of multi-tenancy first came to light around 2005.

The various definitions focus on what is believed to be the key aspects of multi-tenancy:

- a) The ability of the application to share hardware resources.
- b) The availability of a high degree of configuration of the software.
- c) The architectural approach in which the tenants (or users) make use of a single application and database instance.

Multi-tenant Versus Multi-User

It is necessary to make an important, but subtle distinction between the concepts multi-tenant and multi-user. In a multi-user application it is assumed that all users are using the same application with limited configuration options. In a multi-tenant application, it is assumed that each tenant has the possibility to heavily configure the application. This results in the situation that, although tenants are using the same building blocks in their configuration, the appearance or workflow of the application may be different for two tenants.

Architecture

Multi-tenancy is achieved through different approaches. The first approach is by running multiple users Virtual Machines in a server via a hypervisor. This approach has the advantage of application usability and maintenance. From the viewpoint of application usability, every mobile application that can run on Android-x86 is usable because each Android OS runs only one application.

The second approach implements multi-tenant function in kernel-layer. This approach changes Android OS to run multiple user applications in separate processes. This approach is similar to an ordinary thin client server running multiple user applications in a server. The main challenge is that original Android supports only one display and keypad device since Android is mainly designed to work on a Smartphone.

Another approach is to create a multi-tenant function at framework-layer, similar to existing Java-based multi-tenant

framework. This approach remodels Android the framework and APIs to support multiple user applications. The main challenge is how to run existing Android applications in modified framework.

Implementation

In the functional overview of the architecture two new functions are defined for enabling multi-tenant for Android. The first function is the multiple application controller installed in an Android OS, and the second is the user area manager located in a host OS. The multiple application controller enables running of multiple applications as if each application is running on independent physical Smartphone. It is important requirement to decrease implementation cost for Android OS because of maintenance about OS version up problem. The user area manager controls server resources and act as an interface between a terminal and the multiple application controllers.

When user wants to use an application, the user terminal contacts the user area manager and order to launch application. The user area manager checks the server resources and select which guest OS to run application. The multiple application controller launches the application based on an order from the user area manager. The user area manager returns VNC connection information such as IP address and port.

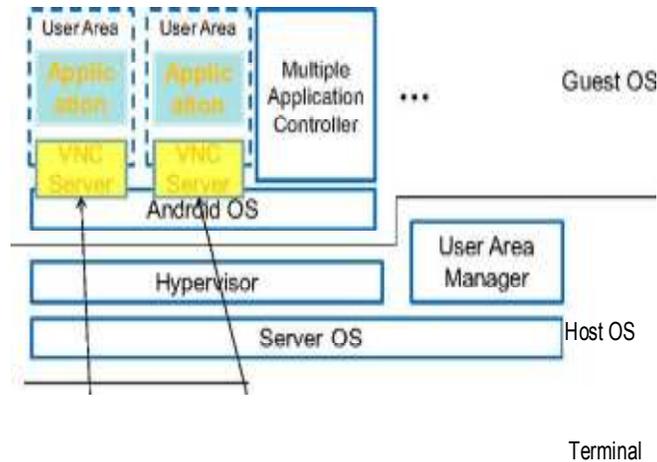


Fig.1: Functional Overview of Multi-Tenancy for Android

Key Characteristics of Multi-Tenancy

Hardware Resource Sharing: The concept of multi-tenancy comes in different flavours, and depending on which flavour is implemented, the utilization rate of the underlying hardware can be maximized.

The following variants of multi-tenancy can be distinguished

- Shared application, separate database.
- Shared application, shared database, separate table.
- Shared application, shared table (pure multi-tenancy)

High Degree of Configurability: In a single-tenant environment, every tenant has his own, (possibly) customized application instance. In contrast, in a multi-tenant setup, all tenants share the

same application instance, although it must appear to them as if they are using a dedicated one. Because of this, a key requirement of multi-tenant applications is the possibility to configure and/or customize the application to a tenant’s need, just like in single-tenancy .

Shared Application and Database Instance: A single-tenant application may have many running instances and they may all be different from each other because of customization. In multi-tenancy, these divergences no longer exist as the application is runtime configurable. This entails that in multi-tenancy the overall number of instances will clearly be much lower (ideally it will be one, but the application may be replicated for scalability purposes). As a consequence, deployment is much easier and cheaper.

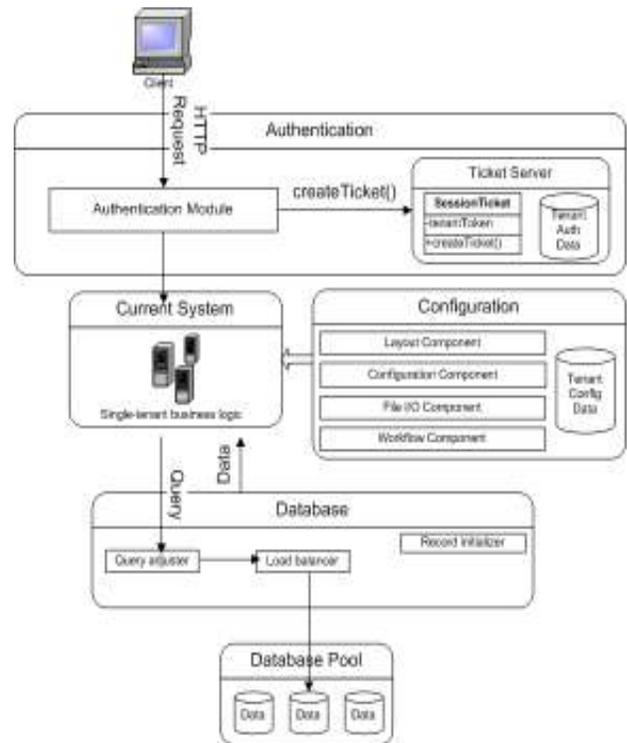


Fig.2: Architectural Overview of Multi-tenancy

III. USING MOBILE DEVICES AS A VIRTUAL CLOUD COMPUTING PROVIDER

Motivation and Scenario

While considering the case of offloading to devices with similar characteristics, in which the performance will be similar to the source node, the overall performance of the task will be worse than running it on a single device due to the migration overhead. Therefore it is needed to explore what makes the offloading to similar devices beneficial.

On an economical basis, accessing cloud computing providers is associated with two costs: the cost of networking plus the cost of using the provider’s resources. The latter is not high nowadays – it can be as cheap as 5 USD per month considering the access

of a small on-demand server 2 hours per day 2 - but is expected to increase to reach higher levels of uptime and better support .

On the other hand, wireless data fee is still very high. As an example, in South Korea the subscription plans for the i-phone 3GS (32GB) are near 70 USD per month, and if the user wants to download 1 GB of data he has to pay more than 200 USD. Besides, using 3G connectivity consumes more battery and is slower than network interactions with nearby devices using other interface such as WiFi.

On a technical side, there are several benefits to consider: First, it is necessary to preserve conventional offloading benefits, such as allowing applications that cannot, otherwise, be executed on mobile devices due to a lack of resources. For example, if memory is not enough then creating instances of those objects on any remote device will allow the application to be executed. Second, performance can be enhanced if the execution sequence of an application can be reordered for increasing the level of parallelism.

Architecture

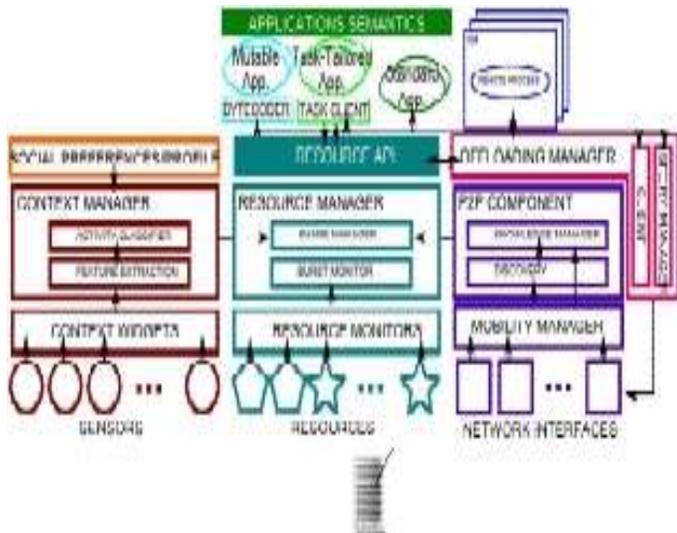


Fig 3: Architecture of Ad Hoc Mobile cloud

The process for the creation and usage of a virtual cloud provider is simple: If a user is at a stable place and wants to execute a task which needs more resources than available at the device, the system listens for nodes in the vicinity. If available, the system intercepts the application loading and modifies the application in order to use the virtual cloud. To support this process, the architecture proposed consists of five main features: Application manager; Resource manager; Context manager; P2P component and; Offloading manager.

Application Manager: It is in charge of launching and intercepting an application at loading time and modifying and application to add features required for offloading – proxy creation, RPC support - according to the current context. Since the idea is to replace calls to infrastructure-based clouds, the interception and modification should focus on modifying the reference to that provider with a reference to the virtual provider.

This process is performed when an application is executed the First time. Once an application is modified, its modified copy is used to avoid further delays.

The Resource Manager: It is in charge of application profiling and resource monitoring on a local device. For each application, a profile is defined in terms of the number of remote devices needed to create a virtual cloud, and sensibility to privacy and amount of resources needed for the migration to happen (in average). This profile is checked by the application manager whenever an application is executed in order to determine whether an instance of the virtual provider should be created or not.

The Context Manager: It wields and synchronizes contextual information from context widgets and makes it available in some way for other processes. It is composed by three subcomponents: context widgets that communicate with the sources of information; a context manager itself that handles the information and extracts new contexts from them; and a social manager that is used to store the knowledge regarding relationship between users.

P2p Component: Two basic contexts are of utter importance are the location and number of nearby devices. The former is used for the mobility traces. The later for the enabling of a cloud from the application manager, and it is given by the P2P component. This component is aware of the status of the devices in the surroundings: it sends events to the context manager in case a new device enters the space, or if an existing device leaves the space. It utilizes an ad hoc discovery mechanism, and then groups the nodes using a P2P scheme, allowing for better scalability and distribution of contents. Once that information is captured, a context aggregator located in the context manager generates high level contexts from the basic contexts. They represent the consolidated information related to the user. It is only defined with one high level context for this framework, which is whether the user is in a stable location or not.

Offloading manager component: It is in charge of sending and managing jobs from the node to other remote devices, plus receiving and processing jobs sent from them. It communicates with the P2P component once a job is issued to the respective node, and waits for the results to be delivered back to the application. This component is the one in charge of detecting failures in the execution and to re-emit them. It also is in charge of creating protected spaces for the execution of the tasks coming from remote nodes. This protected spaces (represented here as a VM), are utilized to block the access to sensitive data located on the devices

Implementation

A prototype is implemented with framework in Java. It was selected because it provides all the needed capabilities in terms of intercepting the loading, modifying the classes and also there were implementations available for cloud computing providers and clients on top of this platform. A main issue was to modify applications in order to intercept and replace references to

infrastructure-based clouds with mobile ones. In Java, code interception can be done using bytcoders in conjunction with a personalized class loader component, built on top of regular JVM loader. A bytecode generator creates and injects the needed code, while the loader allows the interception of the classes before loading them in memory. A personalized version of Javassist[14] was utilized for this purpose.

Communication between devices is based on the Extensible Messaging and Presence Protocol (XMPP). Yaja! I is modified as a XMPP client is implemented in Java. The modifications allow us to be able to execute Yaja! on mobile devices and to incorporate two extensions for XMPP: Serverless Messaging8 and Jabber RPC9. The former is based on mDNS and ZeroConf, and allows for the discovery and messaging among devices without the need of an infrastructure. The latter is a scheme based on XML-RPC using XMPP as the transport protocol, and it is utilized to execute the remote tasks associated with a cloud job.

IV. VIRTUAL SMARTPHONE OVER IP

Virtual Smartphone over IP, which provides cloud computing environment specifically tailored for smartphone users. It allows users to create virtual smartphone images in the cloud and to remotely run their mobile applications in these images as they would locally. The motivation is to allow smartphone users to more easily tap into the power of the cloud and to free themselves from the limit of processing power, memory and battery life of a physical smartphone. Using the system, smartphone users can choose to install their mobile applications either locally or in the cloud.

Running applications remotely in the cloud has a number of advantages, such as avoiding untrusted applications from accessing local data, boosting computing resources, continuing to run applications on the background and opening up new way to use smartphones.

Virtual Smartphone over IP system adopts architecture similar to ones commonly used by server hosting providers. As illustrated, the system is composed of a number of external smartphone clients, a front-end server, a virtual smartphone farm, a management server and a network file system (NFS).

- Virtual smartphone farm is the most important component of the system. It is a virtualization environment that hosts a collection of virtual smartphone images, each of which is dedicated to a smartphone user.
- The front-end server admits service requests from smartphone users across the Internet and establishes remote sessions to the appropriate virtual smartphone images. The front-end server also allows smartphone users to create, configure and destroy virtual smartphone images. Once a remote session is established, the user can install and run mobile applications on one of these images instead own physical smartphone.

- The network file system is used by virtual smartphones for all persistent file storage, in much the same way that an SD card holds data for physical smartphones. Since the NFS is easily scalable, it practically provides each virtual smartphone unlimited file storage.

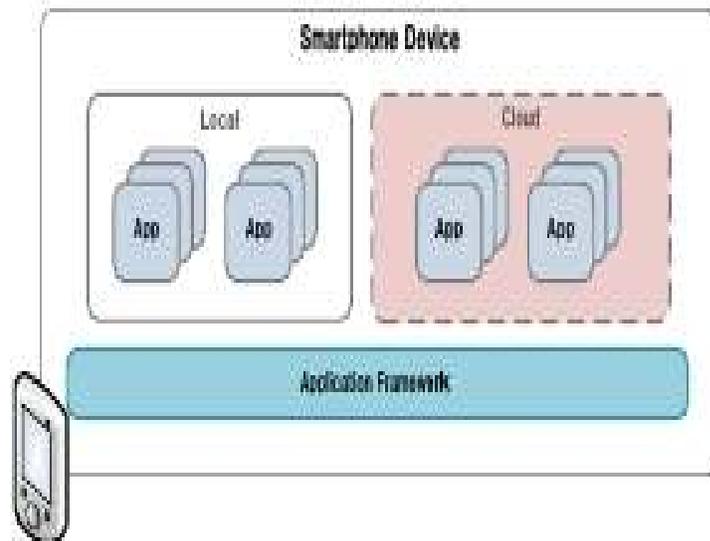


Fig 4: Basic concept of System

- The management server is used to manage the virtual smartphone farm. Typical operations of a management server include the creation of virtual images in bulk and troubleshooting individual images.

Users control their virtual smartphone images through a dedicated client application installed on their smartphones. This client application receives the screen output of a virtual smartphone image and presents the screen locally in the same way as conventional thin-client technology. Since it is expected that most users to access their virtual smartphone images through an unstable network such as 3G, the image must continue to run on the farm and be in the same state when the user is connected again after the user is disconnected in an expected manner.

Implementation

A proof-of-concept prototype is proposed using Android, an open-source mobile OS initiated by Google. The main reason behind the choice is that Android OS is not only designed for smartphone devices with an ARM processor, but also is being ported to the x86 platform [4]. Although Android-x86 is originally intended for netbooks, it gives us an opportunity to create a virtual image of Android using a bare-metal hypervisor. This allows each virtual Android-x86 image to tap into the power of server hardware in a data center. The fact that a CPU emulator is not needed (i.e. x86-to-ARM) to run the virtual image is very important since such emulator always introduces enormous

overhead and may neutralize any performance advantage offered by a data center.

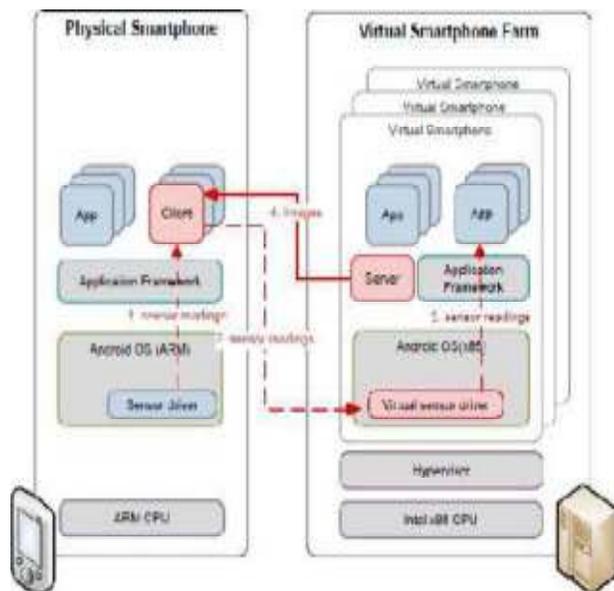


Fig 5: Overview of Virtual Smartphone over IP

A client application can be implemented on an Android smartphone. Although the system does not require the physical and the virtual smartphones to be on the same platform, this particular setting allows us to more tightly integrate both environments.

A pair of VNC-based server can be implemented on client programs. The server program resides in each Android-x86 image that run on top of VMWARE ESXi while the client program is installed in the physical Android device. The client program enables a user to remotely interact and control Android-x86 images. The client program transmits various events from the physical device to the virtual smartphone and receives graphical screen updates from the virtual smartphone.

A virtual sensor driver can also be implemented in the Android-x86 image. Most modern smartphones are equipped with various sensor devices such as GPS, accelerometer and thermometers. While VNC itself supports only keyboard and mouse as the primarily input devices, it can also be extended where client program can transmit sensor readings (accelerometer, orientation, magnetic field and temperature etc) to the virtual sensor driver in the Android-x86 image. The virtual sensor driver is implemented in such a way that the sensor readings from the physical Android device would appear to come from the Android-x86 images itself. This is an important feature as it allows Android applications in an Android-x86 image to obtain sensor readings from the physical smartphone without any modification.

Proposed prototype allows applications running in the cloud to appear like local applications on the physical device, with functions such as copy-and-paste between local and remote applications. The prototype also features remote shortcuts to

remote applications in the virtual smartphone that minimize the number of steps required for users to launch remote applications. Furthermore, each short-cut can point to a different virtual Android-x86 image, and thus allowing users instant access to remote applications residing in multiple Android-x86 images in one single menu.

V. ANDROID OS

The reasons where run Android OS on hypervisor is implemented are as follows:

- *Maintenance:* An OS image is easy to backup, restore, and check the server environment similar to other hypervisor-based virtualization.
- *Application Environment:* The Android OS has backward compatibility regarding application runtime. For example, an application that is made for Android 1.6 runtime can work in Android 2.1 runtime. However, device information such as sensor, keyboard, and display size, varies from one physical device to another. Running Android OS in

various setting is simple method to keep application environment.

- *CPU management:*

The Android is not designed to run an a multiple core environment. Therefore hypervisor's CPU allocation is important to strengthen the efficiency of CPU power.

Multiple application controllers is an enabler to run multi user applications. The discussion is focused about device support for multi user and how to run application.

Multiple device support for Android Application: From the viewpoint of the Android application lifecycle, only one application can use the display, and the other applications automatically run in the background process. To solve this issue, multiple display device support and application mapping is required.

Data Security Integration: The Android has security mechanism to protect the application data sector from other application using user account based access control. Of course Android is not designed to use same application for different users. So, if users share same application data sector, mixing of unexpected user data may occur.

There are two approaches to solve this problem. One is virtual SD card approach. When all user accesses to SD card is controlled, it can prevent access to another user's application data. The benefit of this approach is that implementation impact is limited to SD card driver. Second approach is using a file system function. GNU chroot enables changing the application root directory dynamically. This approach would also prevent unexpected file access.

VI. CONCLUSION

This paper, proposes Android as a Server Platform system that enables the use of sharing server-side Android OS among multiple users. It is possible to develop a prototype system about proposed multi-tenant Android architecture. It is believed that proposed architecture shows high performance on virtual image-based virtualization for mobile applications.

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DEVELOPMENT OF TOURISM IN MALDIVES

Suresh Kumar Kundur

Abstract- Tourism is the largest sector of the economy in the Maldives, as it plays an important role in earning foreign exchange revenues and generating employment in the tertiary sector of the country. The archipelago of the Maldives is the main source of attraction to many tourists visiting the country. Tourism began in the Maldives in the late 1900's. A United Nations mission on development which visited the Maldives Islands in the 1960s did not recommend tourism, claiming that the islands were not suitable. Ever since the launch of the first resort in Maldives in 1972, however, tourism in Maldives has flourished. Tourism in Maldives started with just two resorts. At present, there are over 80 resorts located in the different atolls constituting the Republic of Maldives. Over the past few decades, the number of tourists in Maldives has risen continuously. Today, more than 500,000 tourists visit the Maldives each year. This paper gives a detailed account of the development of tourism industry and the initiatives taken by the Maldivian government to promote tourism in the country.

Index Terms- Tourism, Development, Growth, Market share, Tourism products

I. INTRODUCTION

Maldivian archipelago located 500 km from southern tips of both India and Sri Lanka. Is a beautiful string of 1,190 low-laying coral islands scattered across the equator in the vast expanse of the Indian Ocean, giving us a rare glimpse of what aptly described as tropical paradise. Just consider this sparkling white sun-kissed beached, crystal-clear lagoons studded with profusely coloured corals; azure warm seas with an undisturbed exotic marine life palm-fringed island the providing serenity all of it summarized by the famous Moroccan traveler Ibn Battuta on describing Maldives as "one of wonders of the world"

The sun, the sand and the sea, these are just three simple realities beckoning tourist from far and wide to these little islets, giving as a result, a glorious sense of happiness and proving to be a heavenly getaway from the word and its worries. The Maldives teaches the visitors the pleasurable art of doing nothing, simply lazing around and enjoying some the most spectacular and colourful vistas offered by nature.

No wonder than that tourists flock in large numbers to the 80-odd self-contained island resorts provided with all the comforts and warmth exuded by traditional Maldivian hospitality. This is why Maldives is considered to be the ultimate destination, the future world for holiday-makers.

Importance of tourism

Tourism is the largest economic industry in the Maldives, as it plays an important role in earning foreign exchange revenues and generating employment in the tertiary sector of the country. The

archipelago of the Maldives is the main source of attraction to many tourists visiting the country worldwide.

II. THE STUDY AREA

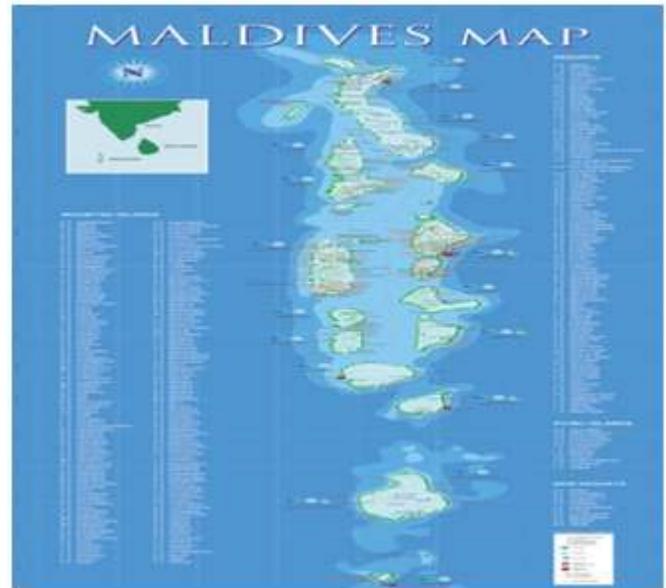


Figure 1: Location Map of Study area

The Maldives archipelago is on the south- south western region off the coast of India. The latitudinal extent is 7° 06' 30"N to 00 and longitudinal extent of Maldives is 3° 15' N and 73° 00' 41' 48" S latitude and 72° 32' 30" E to 73° 45' 54" E longitude.

A series of 1,190 coral islands grouped into 26 atolls located in the Indian Ocean out of which 19 atolls are administrative atolls. The Maldives has an area of less than 300 square kilometers and a total coastline of 644 kilometers. The islands form a narrow chain of 820 kilometers in length and 130 kilometers in width within an area of 90,000 square kilometers of ocean. The capital city island, Male, is located within Male atoll, which is in the center of the strip of islands that makes up the Maldives. The Maldives is the smallest country in Asia.

Population

The Maldives has a population of 298,968 (in 2006) spread among 196 islands. Strong disparities are evident in the population distribution between the islands: Male, the capital island, has a population of 102,377, or nearly one-third of the total population, whereas there are 142 islands with fewer than 1000 inhabitants and 76 islands with fewer than 500 persons. Only three islands have a population greater than 5000. Hence, most of the inhabited islands are sparsely populated while a small

number of islands are heavily congested. The growth of Male' is a result of migration from the other islands as people seek better job and educational opportunities, and an improved quality of life. However, this migration has resulted in inequalities both economic and social terms between Male' and the other atolls. Youth unemployment, increasing crime rate, social disharmony and drug abuse are all outcomes of the highly congested living conditions prevalent in Male' and some other islands. The Maldivian age structure is very young with approximately 77% of the population below the age of 40 years.

III. TOURIST ARRIVAL TRENDS

As Figure 1 shows, the main reasons that tourists come to the Maldives are for leisure, honeymoon and diving. The majority of tourists (53%) seek leisure and relaxation, but with its strong appeal as a romantic destination, the 'honeymooner's' category (30%) is also significant. The underwater beauty of the islands also attracts divers; they make up 15% of all visitors.

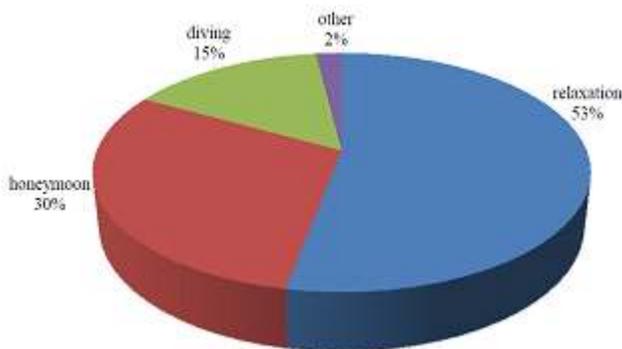


Figure 1: Purpose of visit

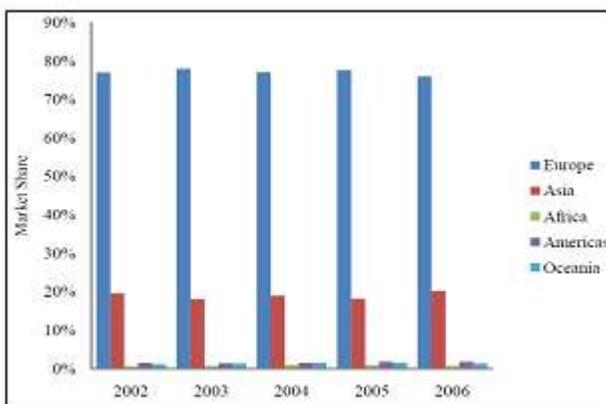


Figure 2: Tourist Arrival Trend

Tourist arrivals to the Maldives have been increasing steadily at an average of 10% per annum over the last ten years, except for the dramatic decline in arrivals during the year 2005 due to the December 2004 Asian tsunami. (Table.1). The tsunami caused the closure of a number of resorts and tourist arrivals declined by 35.9% in 2005. The Maldives sustained significant economic losses from the tsunami due to the economy's heavy reliance on tourism. However, Maldives' tourism has shown remarkable recovery after the tsunami: in 2006 the annual growth

rate in tourist arrivals rose to 52.3%, with nearly 779651 visitors. The annual average occupancy rate has been 68.2% from 2001 to 2010.

Table 1: Tourist arrival: Annual growth rate (2000-2010)

Year	Annual growth rate in (%)
2000-2001	-0.73
2001-2001	4.51
2002-2003	16.25
2003-2004	9.42
2004-2005	-35.89
2005-2006	52.26
2006-2007	12.28
2007-2008	1.05
2008-2009	-3.97
2009-2010	18.87

Source: MTCA

Monthly international tourist arrivals to the Maldives shows the largest tourist source market is Western Europe, the concentration of monthly tourist arrivals occur winter months in Europe. The warmer months in Europe coincide with the months of lower tourist arrivals, which are from May to September. Over the last five years, Europe has been the leading tourist source market to the Maldives, contributing an average of more than 76% of the total tourist arrivals. Trends in source markets between 2002 and 2006 are illustrated in Figure 2

Out of the leading source markets, Italy ranked first in 2006 with a share of 69.6% of the European market. The UK was the second largest (19.8%), followed by Germany (11.8%) then France (7.2%). Switzerland, Russia and Austria all had much smaller shares (4.4%, 3.6% and 2.3% respectively). From Asia, Japan was the largest contributor in 2006 with 6.6% of market share, followed by China (4.4%). The market share of Africa was 0.7% for the same year, while the countries from the region of the Americas contributed 1.8% and from Oceania only 1.3%. The top ten markets for Maldives in 2006 are Italy (25%), United Kingdom (22%), Germany (15%), France (9%), Japan (8%), China (5%), Switzerland (5%), Russia (5%), Korea (3%) and Austria (3%) which is illustrated in Figure 3.

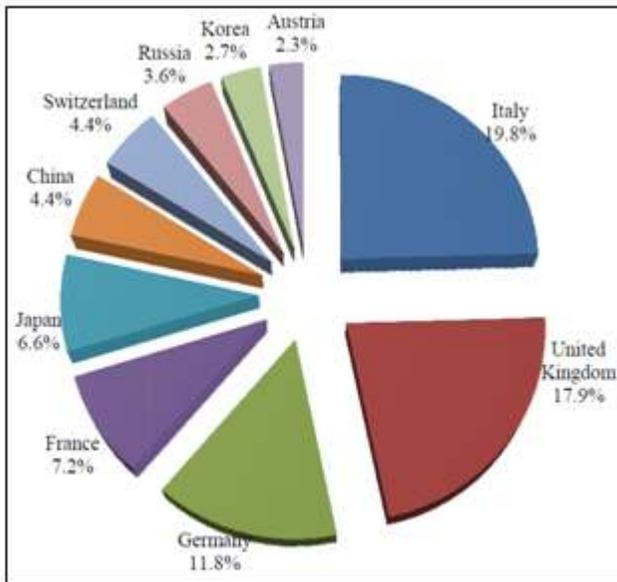


Figure 3: Market Share

IV. TOURISM DEVELOPMENT

Tourists first started coming to the Maldives in significant numbers in 1972 when the first resort, with a 280-bed capacity, was established. In the years since, five phases can be identified in the development of the Maldivian tourism industry (MTCA, 2008a).

The first phase is considered to be from 1972 to 1978, when tourism was largely unplanned and took place according to individual initiative (Dowling, 2000). The 17 resorts with 1300 beds that were established during this time (MTCA, 2008a) were very simple in facilities and modest in services due to a lack of resources and trained personnel in the field. Speed boats and mechanized fishing boats were used to transfer passengers and cargo between the airport, Male' and different resort islands (ibid). Thus all resort development was concentrated in close physical proximity to the only international airport, i.e. near the capital island of Male'. This has resulted in over 47% of the resorts being located in the central region of the country (MTCA, 2008a). During this initial phase, tourism did not play a significant role in the economy (Domroes, 2001).

The second phase covers the years 1979 to 1988. With the opening of a further 41 resorts, this period witnessed the establishment of a large number of resorts within a short period of time. The creation of a wide network of air services through charter carriers with various promotional packages, as well as the increased capacity of resorts, fuelled development of tourism in a short span of time. It was during this period that foreign companies began to invest in the Maldivian tourism industry. By the end of 2006, out of the 89 resorts operating in the Maldives, 68 were leased to local parties, 14 resorts were leased to joint-venture companies and the remaining seven islands were leased to foreign companies. Only 47% of the resorts are operated by local parties, with the rest being operated by foreign companies or foreign shareholding companies (MTCA, 2007a).

An important highlight of the second phase of tourism development was The First Tourism Master Plan (FTMP) which was formulated in 1983. The FTMP laid the foundation for sustainable development of tourism, emphasized environmental protection and called for integration of tourism into the social and economic development of the country. Resorts developed during the final years of the second phase followed the FTMP. Policies set out in the FTMP that limit built-up space on resorts, require building heights to be compatible with the natural vegetation of the islands, and include measures for environment and reef protection are still adhered to in resort development. Rules introduced during this phase also set the guidelines for the quality of services and facilities provided to tourists. A regulation instigated under the FTMP stated that the built-up area on tourist resorts should not exceed 20% of the total land area of the island. This regulation contributed to the creation of peaceful and quiet environments on resort islands – now a key feature of Maldives' tourism.

The third phase of tourism development, from 1989 to 1997, saw the opening of 16 additional resorts with a further bed capacity of 4920. The positive impacts of the vast developments in transport and technology experienced in the Maldives, and the world over, during the early 1990s were reflected in tourism development during this period.

Thus, apart from growth and expansion of resorts, this was the phase when innovative and high-quality services were introduced to tourism development. The Faculty of Hospitality and due to the fast rate that tourism developed, and with a shortage of local skilled labour, local manpower alone was unable to cater for the demand for jobs created by the tourism industry. As a result, during this phase a large number of expatriates joined the industry. By the end of 2006, out of the 22,000 jobs in the tourism sector (MTCA, 2008b) 11,095 jobs were filled by expatriates (MPND, 2007a). This was in spite of a government regulation that states that the employment of expatriates in tourist resorts should not exceed more than 50% of the total employees.

The period from 1998 to 2001 was the fourth phase of tourism development in the Maldives. Tourism development during this period came under the Second Tourism Master Plan (STMP) which covers the years from 1996 to 2005. A key feature of the STMP was the plan to expand and develop tourism into more regions across the country, with the aim of decentralizing tourism from Male' atoll and spreading the benefits of tourism among all the atolls, particularly the southern and northern regions. In addition, reducing expatriate labour and increasing the participation of women in the tourism labour force were also key targets. With regard to women's role in tourism, there is a huge gender disparity in employment: only 1512 women were working in the industry in 2006 compared with 10,578 men (MTCA, 2007a). Cultural and social norms play a major role in this imbalance. The isolated nature of resorts and the unavailability of the option of commuting to work daily from the inhabited islands are contributing factors that discourage women from working in resorts. A seminar on the Management of Human Resources in the Tourism Industry notes: It was generally agreed that hiring women to work at resorts proved difficult due to security concerns and attitudes of parents who do not want their children to be employed at resorts, which are perceived as predominantly male working environment (MTCA, 2008b). It was during this

phase that international resort brands began to establish themselves in the Maldives. While spa resorts were launched with the aim of introducing higher quality tourism, a wide range of accommodations were also introduced in order to attract tourists from various market segments. As such, apart from resorts, hotels, guest houses, yachts and safari boats began their operations. With resorts opening in areas far from Male' International Airport, seaplanes were introduced in place of speedboats to transfer tourists from the airport to resorts. During the fifth phase of tourism development, which extends from 2002 to 2008, the Third Tourism Master Plan 2007–2011 (TTMP) was launched in 2007. Its key aim is “taking tourism to the people within the broader framework of sustainable development in the economic, environmental, and social spectra” (MTCA, 2007a, p. 1).

During this period, islands throughout the country were released for tourism development. Islands and plots for tourism development are leased from the government on fixed-term contracts under a competitive bidding process in 2006, 35 islands were designated for tourism development. This latest release of sites included plots of land for city hotel development on inhabited islands. This was a new initiative because, until then, tourist development had strictly followed the one-island-one-resort concept which was aimed at limiting potential negative social impacts from tourism, a policy which has created the “distinctive concept of ‘Resort Islands’” (Domroes, 2001, p. 123) in the Maldives. Each resort island provides its own infrastructure, power, water supply, sewerage and rubbish disposal arrangements (Dowling, 2000). Government regulation dictates that for waste management, each resort must have incinerators, compactors and bottle crushers (Domroes, 2001).

For the first time a public company was formed within the tourism industry to give locals a share in the tourism industry. Maldives Tourism Development Corporation (MTDC) holds 45% government share and 55% public share. By the end of 2007, there were 89 resorts with a bed capacity of 17,802. In addition, safari vessels, hotels and guest houses provide lodgings totaling 235 tourist establishments with a bed capacity of 20,505 (MTCA, 2007a). Hotels and guest houses cater for tourists, business and domestic travelers. These facilities provide convenient accommodation for tourists who transit in Male' before or after their stay in the resorts or safari vessels. Tourism has become the largest economic industry in the Maldives, providing 22,000 jobs (ibid) and contributing 30% of government revenue, 30% of GDP and 70% of foreign exchange (MMA, 2008).

Today, the Maldives is a world-renowned tourist destination, with several international brand names in its tourism portfolio, and it continues to win numerous international tourism awards (www.visitmaldives.com). Most of the resorts in the Maldives are capable of providing state-of-the-art facilities and services, entertainment and high-tech telecommunication services (Dowling, 2000). Over-water bungalows built on stilts in the shallow lagoons surrounding the resort islands and spas are a popular theme of recent years. In addition, some resorts boast underwater spas and restaurants (MTCA, 2008a). At present each

resort has its own fleet of speed launches providing fast and convenient travel. There are three airports serving inter-atoll domestic flights in addition to seaplane operators. In 2008, Gan International Airport commenced operations as a second international airport bringing tourists directly to the southern part of the Maldives. By the summer of 2007, 14 charter and 15 scheduled international airlines were operating flights to the Maldives from different destinations in Europe, Asia and Africa (MTCA, 2007b). Created the “distinctive concept of ‘Resort Islands’” (Domroes, 2001, p. 123) in the Maldives. Each resort island provides its own infrastructure, power, water supply, sewerage and rubbish disposal arrangements (Dowling, 2000). Government regulation dictates that for waste management, each resort must have incinerators, compactors and bottle crushers (Domroes, 2001).

As tourism became established in the Maldives, it played a major role in the country's economic and infrastructure development, especially the establishment of transportation links between the atolls and islands and the development of regional airports. Tourism has contributed both direct and indirect benefits. Among the direct benefits are increased employment opportunities and tourism-related construction. There are also a number of indirect benefits, though to a lesser degree, through increased activity in other economic sectors such as telecommunications and transportation and the revival of the handicrafts industry.

Due to the scarcity of resources, all major goods for developing and maintaining tourism services and facilities are imported, including building materials and equipment for the construction of tourist hotels and resorts. Hence, tourism does not generate a high overall multiplier effect. Instead, the high rate of imports, the large number of expatriates employed in tourism industry, and the prominent role that foreign investors play in the ownership, management and operation of tour companies are all factors that cause leakage of a major portion of tourism revenue earned by the Maldives. “This means that eighty cents of every dollar spent on tourist inputs accrued to foreign companies” The TTMP's emphasis on increasing linkages between tourism and other supporting sectors, namely fisheries, agriculture and handicrafts, was a strategy to reduce these leakages of tourism revenue.

As acknowledged by the TTMP, in spite of having a rich culture, heritage and history, “cultural and heritage tourism has not taken root in the Maldives”, hence it is argued that these forms of tourism should be promoted along with the key attractions of sun, sand and sea (MTCA, 2007c, p. 58). Maldives' tourism is dependent on the tropical beauty of the islands. The wealth of underwater coral gardens, white sandy beaches, crystal clear lagoons, underwater flora and fauna is the nucleus of the tourism resource (Domroes, 2001). All tourist experiences offered by tourism operators to various market segments are based on the identity of a tropical island destination.

Usual tourist activities in the Maldives include water sports such as diving, snorkeling, windsurfing, catamaran sailing, water skiing and surfing. In addition to these, resorts organize fishing and excursion trips to nearby inhabited and uninhabited islands and to the capital island, Male', by modern speedboats or

traditional fishing boats (dhoni). Night fishing is a particularly popular activity – the trips usually end with a barbecue at the resort with the day's catch. Aerial excursions by seaplane and submarine diving are also provided by some resorts. Most resorts and hotels have facilities for a variety of indoor and outdoor sports such as tennis, football, volleyball, badminton and squash. Live entertainment programmes are held in the evenings, often with local bands and dance troupes. As a diversification strategy, forms of tourism that portray “a strong identity of a perfect island destination” were proposed in the TTMP (MTCA, 2007c, p. 50). As such, Eco Tourism Resorts, Health Resorts, Luxury Islands, Floating Resorts, Budget Resorts, Live-aboard, Luxury Yachts and Training Resorts were identified as potential diversifications. All marketing communications for these products are proposed to be “designed to retain the unique image and brand of the Maldives” (ibid). While tourism has helped upgrade the general standard of living, (Yahya et al. (2005)) believe that the concentration of tourism development close to the capital Male' has contributed to creating income disparities between Male' and the other atolls. The proposition of the TTMP to promote community-based tourism was aimed at increasing the benefits of tourism to local communities as well as being an avenue for promoting culture and protecting heritage. While there is a high degree of economic dependence on the natural environment through tourism, as Dowling (2000) warned, “environmental problems faced by Maldives... are threatening the sustainability of the industry”. A major issue is solid waste disposal, the methods for which are incineration or dumping into the sea. With the annual average number of tourist arrivals exceeding that of the total population (MTCA, 2007b) and all requirements for tourist industry catered for by imports, including “thousands of tones of meat, vegetables and diesel oil every year”, the amount of waste produced is “unsustainable” From the resorts alone, 16.5 kg of waste per visitor is produced every week (Dowling, 2000).

The Maldives islands are low and flat, with elevations less than two meters above sea level. Thus, these islands are extremely vulnerable to elevated sea levels caused by climate change. Domroes (2001) pointed out that the environmental volatility of the Maldives archipelago is camouflaged by the detrimental impacts of tourism. Already the Maldives suffers from inundation and shoreline erosion, which are believed to be consequences of global warming and greenhouse gas emission (Gayoom, 1998). A dire prospect repeatedly proclaimed by environmentalists is that low-lying small islands such as the “Maldives archipelago will most likely disappear under the ocean” (Conrady & Bakan, 2008, p. 32). However, more recently, it has been announced that the question of Maldives going under the sea is overstated, because it has been established that islands can adjust to environmental changes such as rising sea levels and increased global temperatures (MSNBC, 2009). Global warming threatens coral reefs – the key attraction of the Maldives – as these natural attractions are sensitive to increases in temperatures.

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Survey of Network Protocol Verification Techniques

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Abstract- In the world of designing network protocols, verification is a crucial step to eliminate weaknesses and inaccuracies of effective network protocols. There are many models and tools to verify network protocols, including, Finite State Machines (FSM), Colored Petri Nets (CP-Nets), Temporal Logic, Predicate Logic, Estelle Specification, Path based Approach etc. This paper presents a survey of various techniques for verifying correctness properties of communications protocol designs.

Index Terms- protocol verification, validation, survey methods, petri nets.

I. INTRODUCTION

The advance in protocol specification using Formal Description Techniques (FDTs)[1] in recent years has opened up a new horizon for protocol verification. Three FDTs – SDL (Recommendation Z.100, 1987), Estelle (ISO/IEC 9074, 1989) and LOTOS (ISO/IEC 8807, 1989) – have been standardized. One of the main aims in developing FDTs is to have a formal specification acting as a sound basis for such verification. Academic research has recently made significant advances in the generation of test sequences from formal specifications and in the development of computer-aided tools, with the aim of improving the effectiveness of verification.

There is not much progress in the techniques for practical verification of communication networks. There is a big gap between verification practice and research results published in journals and reported at conference. This big gap between academic and industrial practices is the fact that academia has not been addressing the verification issues and problems account for the fact that academic verification methods are seldom used in industry. To help the industrialization of academic techniques, empirical studies and a new orientation towards real issues need to be given higher priority by researchers and field experience need to be more frequently reported. This paper presents a literature survey of communication protocol verification. The conclusion section summarizes our findings for each of these topics.

II. BACKGROUND, CONCEPTS AND TERMINOLOGY

This section describes some concepts and terminology related to communications protocols. An understanding of these concepts is necessary for understanding the various techniques described in the paper.

A. Protocol Specification, Verification and Validation

In layer-structured communication networks, protocols are defined as a set of rules which govern the exchange of messages through interactions of partners or processes to achieve two

goals. One is to provide a particular set of services to its local protocol layers above. The other goal is to furnish a set of logical rules or protocols to its remote peer partners on other machines. In the area of specification, the former is called service specifications; the latter is called protocol specifications. Protocols can be verified against their design and implementation. In other words, protocol can be verified either during the design phase before the system is implemented, or during the testing and simulation phase after the system has been implemented. Since design verification can detect design errors at the early stage, unnecessary or incorrect implementation can be avoided. Therefore, design verification has the potential to significantly reduce the cost of protocol development and testing. With respect to design verification, the work can be divided into two tasks: service-specification verification, and protocol specification verification. Since service specifications vary from system to system, different procedures are required for different protocols. Therefore, the protocol-specification verification has been the focus of most of researchers; and is discussed in the remainder of this paper. In summary, protocol verification is a task which attempts to detect the existence of logic errors in the protocol design specification at the early development stage. Some papers[17,18] refer to this logic verification as "validation". Since this is a survey paper, no distinction is made between these two. No matter which term is used, we are concerned primarily with the logical structure or syntax of protocols as opposed to their semantics or intended functions.

III. WHAT TO VERIFY – TYPES OF PROTOCOL ERRORS

There are six general types of protocol syntax errors. They are defined as follows:

- 1) **Unspecified Reception:** An unspecified reception is a reception that is executable but not specified in the design. Since the required reception is not specified in the design, the occurrence of it means the subsequent behavior of the system interaction is unpredictable.
- 2) **Nonexecutable Interaction:** A nonexecutable interaction is a transmission or reception that is specified in the design but never be executed. It is oftenly called dead code.
- 3) **Deadlock:** A state deadlock occurs when each and every processes can only remain indefinitely in the same state. In other words, a deadlock is a global state reachable from the initial global state, with all channels empty, in which no transmissions are possible. Deadlocks must be avoided, since once the system has arrived in a deadlock state, it is blocked forever.
- 4) **Livelock:** A livelock is a situation where several processes keep exchanging messages but without any

effective work being accomplished toward performing its services. It is sometimes called "dynamic deadlock". Livelock has to be avoided, since once it occurs, the system is locked forever into a small set of global states. It is sometimes called Temp o-blocking .

- 5) **State Ambiguity:** A state ambiguity exists when a state in one process can coexist stably (i.e. reachable with channels empty) with more than one state in another process. In practice, processes within a communication network often execute in highly synchronous manner. Thus, although state ambiguities do not necessary represent errors, they should be more carefully treated.
- 6) **Overflow:** An overflow is a channel state such that the number of messages in the channel is not bounded by a predefined positive integer number. In other words, any communications channel has a storage capacity that limits the amount of information it can carry at any instant. An attempt to exceed this capacity may result in loss of data being transferred among processes. Overflow may occur in two different situations: finite overflow, or infinite overflow. Finite overflow indicates that channels are bounded by one number, although not the predefined one; whereas infinite overflow indicates that channels are never bounded. While the former may be dynamically solved; the latter gives a serious sign of existence of potential design errors. In addition, a protocol is "well-formed" *iff* it contains no unspecified reception and no nonexecutable interaction. A protocol is "live" *iff* it is free from deadlocks and unspecified receptions. In other words, the protocol will progress indefinitely if it is live. Finally, a protocol is "safe" *iff* it is live and always terminates properly.

IV. SURVEY METHODS

In 1988 an **Algorithmic procedure** to check whether a protocol provides a desired service is developed. This method describes protocols as a collection of interacting processes. For modeling the interaction between processes, the synchronous interprocess input/output operations proposed by Hoare in his language of communicating sequential The safety behavior of the processes is described using FSM's whereas the liveness behavior is described using propositional temporal logic. The reason for choosing FSM's for the safety behavior is that it typically consists of simple actions in response to numerous events such as user commands, message arrivals, and time-outs [3]. On the other hand, the liveness properties of many processes, such as the communication medium, require the description of infinitely long sequences of messages, which is hard to do using FSM's, but is easy to do with temporal logic.

In 1990 Petri nets [7] are widely used for modeling and analysis of concurrent processing systems. In order to describe certain fundamental properties of concurrent systems, such as eventuality and fairness, in Petri net models, Suzuki [10] introduced temporal Petri nets in which temporal constraints of a given net are represented by formulas containing temporal operators, such as \circ (eventually) and θ (henceforth). Temporal Petri nets are Petri nets in which certain restrictions on the firings of transitions are represented by formulas containing temporal

operators. The temporal Petri net which models the protocol is analyzed formally by using the existing theory of w-regular expressions and Buchi-automata.

In 1993 the formal **Communication Finite State Machine (CFSM) model**[4] is developed, a communication protocol consists of several communicating entities which can be represented in some CFSMs. Global state reachability analysis is one of the most straightforward ways to automatically detect logical errors in a communication protocol specified in the CFSM model. Global state reachability analysis generates all of the reachable global states and checks the correctness one by one. Even though communication protocols are error free, global state reachability analysis still needs to be executed completely. Thus backward protocol verification method is proposed, to detect logical errors. By analyzing the properties of deadlock error, unspecified reception error, and channel overflow error, some candidate erroneous global states are generated. Then, each candidate global state is checked whether there is a path, i.e., a global state sequence, connects to the original initial global state. If there is a path, then the candidate global state is really an erroneous global state and the communication protocol does have some logical errors. Otherwise, if there is no candidate global state or none of the candidate global state has a path, then the communication protocol is error free.

In 1994 A number of protocol verification reduction techniques were proposed in the past. Most of these techniques are suitable for verifying communicating protocols specified in the Communicating Finite State Machine (CFSM) model. However, it is impossible to formally specify communicating protocols with predicate and variables using the CFSM model. The **Extended Communicating Finite State Machine (ECFSM) model**[5], which incorporates the mechanism for representing variables and predicates, can formally model communicating protocols with variables and predicates. To have more efficient verification for ECFSM-specified protocols, an integrated ECFSM-based global state reduction technique is given. This method is based on two techniques: the dead variables analysis which can reduce the number of global states, and the ECFSM-based maximal progress state exploration which can speed up the global state reachability analysis. Using ECFSM-based method, the maximal progress protocol verification can be directly applied to the Formal Description Techniques (FDTs) which are based on the extended state transition model, i.e., ISO's Estelle and CCITT's SDL.

In 1995 Estelle specifications involve translating the specifications into another form, such as finite state machines or Petri nets for which verification tools have been implemented. All of the Estelle verification tools impose some restrictions on the specifications to be verified: they use a subset of Estelle or restrict the complexity of the specifications that can be verified; or the specifications need to be in a variant of Estelle, rather than standard Estelle. In particular, dynamic behaviours and exported variables of an Estelle specification are not handled. Thus developed an approach, to verifying standard Estelle specifications by translating them into Numerical Petri Net (NPN)[10] specifications. The merits of this approach are that all dynamic behaviours, exported variables and most Estelle statements can be handled. The deficiencies are that *priority* and

delay clauses and the *systemprocess* attribute can not be modelled.

In 2000 the concept of **concurrent path** is used in concurrent program testing [5]. Assume a concurrent system is composed of concurrent modules. The concurrent path is a partial-order representation, a combination of modules execution behavior, i.e., an ordered set of module paths. The full set of concurrent paths is included in the Cartesian product of the path sets of all modules, which are easily generated. The analysis to determine whether a member in the product is a concurrent path is performed independently. Hence, the memory requirement to generate the concurrent path depends on the complexity of individual module and individual concurrent path rather than that of the whole system. Therefore, it will concentrate on formalizing the concurrent path of a concurrent system to perform the verification. The new approach is called the **path-based approach**[6]

In 2009 A method is proposed, that uses the **process algebra** [13] for protocol specification, and transformation rules for a translation of the specification into a Petri net while preserving the semantics of the specification. Petri nets are well-known formal method for their analytical power to deal with a problem of protocol verification: invariant, reachability, deadlock and liveness analysis. Elements of theory behind the method are sketched in a short way. The elegance of protocol specification by using the process algebra [10] and a powerful analysis by means of Petri nets [5] are main reasons for such the integration,

In 2010 a **Colored Petri nets** (CP-nets) [18] based method to integrate functionality correctness verification and performance analysis for network protocols is given. The central idea is that CP-nets based functional models for a protocol is constructed for correctness validation, and then this model is slightly modified by adding performance related temporal constrains and data monitor units, and finally simulation based performance analysis executes. CP-nets models used in both analysis processes are coessential, that is, every occurrence sequence in the performance model corresponds to an occurrence sequence in the functional model. So if functional models are validated and successfully translated to performance models, both of them would satisfy the functionality requirements of the protocol. Furthermore, CP-nets and its modeling and analysis tool, CPN Tools [3], have many strong capabilities used to facilitate modeling and analysis network protocols, e.g., flexible descriptive capability, visual feedback simulation, and effective analysis techniques. Adopting CP-nets as basic models to integrate functional verification and performance analysis for network protocols is feasible and effective.

V. CONCLUSION AND DISCUSSION

As we confirmed earlier, the field of verification and analysis needs more investigation, but as time goes on, a lot of research at different universities can be done to facilitate its correctness and improve its weaknesses. This paper has presented a survey on communication protocol verification. The aim is to provide pointers to practitioners on reports that could be useful and relevant to practical communication protocol verification.

We have focused our survey on the following topics:

Method	Year	Researcher
Algorithmic method	1988	Krishan Sabnani
Petri net	1990	Ichim <i>Suzuki</i>
CFSM	1993	Chung-Ming Huang and Duen-Tay Huang
ECFSM	1994	Chung-Ming Huang and Jenq-Muh Hsu
Estelle	1995	Ajin Jirachiefpattana and Richard Lai
Path based approach	2000	W.-C. Liu, C.-G. Chung
Process algebra	2009	Slavomir Simonak, Stefan Hudak and Stefan Korecko
Coloured Petri nets	2010	Jing LIU, Xinming YE, Jun ZHANG, Jun LI, Yi SUN

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Language Learning Strategies Employed by EFL Science-oriented University Students in Vietnam: An Exploratory Study

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Abstract- The present language learning strategy classification is based on data reported by 30 science-oriented students from 6 different universities in the north of Vietnam through the semi-structured interviews. Based on the language learning purposes to be achieved, the Language Learning Strategy Inventory (LLSI) comprises two main categories, i.e. specific language skills enhancement and general language knowledge enhancement. As a result, the specific language skills enhancement consists of 43 emergent individual strategies, and the general language knowledge enhancement consists of 11 individual strategies. The researchers always keep in mind that the present LLSI is not comprehensive and may not cover all strategies that science-oriented students have employed. However, the proposed LLSI may be considered to be representative of the language learning strategies employed by science-oriented students in the north of Vietnam.

Index Terms- language learning strategies, science-oriented students, language learning strategy classification.

I. INTRODUCTION

English language learning and teaching in Vietnam nowadays is considered as the key to open the world of academic and economic development. As a result, English has been the foreign language of the first choice for almost all learners. English is a compulsory subject from the 3rd grade in primary schools to tertiary level (MOET, 2010). It is also one of the four foreign languages (English, French, Russian, and Chinese) in the entrance examination for the higher education level.

According to Oxford (1990, p. 17), “there is no complete agreement on exactly what strategies are; how many strategies exist; how they should be defined, demarcated, and categorized; and whether it is – or ever will be possible to create a real, scientifically validated hierarchy of strategies; therefore, classifications conflicts are inevitable”. Similarly, Ellis (1994) affirms that learning strategies differ in a number of ways, reflecting the particular subjects that the researchers worked with, the setting, and the particular interests of the researcher. It is clear that, different researchers have different ways or their own criteria or system in classifying language learning strategies. As a result, their language learning strategy classifications may be based on their personal experiences as a teacher (e.g. Stern 1983, and 1992), their own language learning strategy investigations (e.g. Stern, 1992; Rubin 1975; O’Malley and

Chamot 1990; Oxford 1990; Coleman 1991; and Intaraprasert 2000), or their reviews of their own research works or other researchers theories (e.g. Rubin 1975; Stern 1983, 1992; Carver 1984, and Ellis and Sinclair 1989).

Language learning strategy research works conducted with Vietnamese learners tended to explore overall strategies which Vietnamese learners employed or which strategies introduced by Oxford (1990) that Vietnamese learners reported employing frequently. Some other research works, simply explored strategies employed in learning the English language, and how these strategies affected the students’ language achievement, e.g. Huyền (2004) and Hiền (2007). Furthermore, few studies on language learning strategies conducted with Vietnamese students learning English as a foreign language and concentrated on how to become successful learners by employing language strategies (Diệp, 1997). A few studies put the focus on variables that affected the choice of language learning strategies such as gender, major fields of study as in Khuong (1997); Hằng (2008). No research work has been conducted to explore types of strategies reported by science-oriented university students exclusively. Therefore, the present language learning strategy classification is based on data reported by 30 science-oriented students from 6 different universities in the north of Vietnam. The semi-structured interviews were conducted to elicit information about language learning strategies employed by learners to go about learning English.

II. RESEARCH ELABORATION

A. Terms Used in the Study

- Language Learning Strategies

Language learning strategies (LLSs) in the present investigation are defined as conscious behaviours or thought processes performing learning actions, whether they are observable (behaviours or techniques) or unobservable (thoughts or mental process), that Vietnamese science-oriented university students themselves reported using in order to enhance their English language learning.

- Science-oriented Students

‘Science-oriented students’ in this investigation refers to the undergraduate students who undertake their full-time degree majoring in ‘Science and Technology’ and ‘Health Science’ in six universities in the north of Vietnam. These universities include: Thainguyen University of Technology (TNUT), Thainguyen Medical and Pharmacy University (TMPU), Hanoi

Medical University (HMU), Hanoi University of Science and Technology (HUST), Haiphong University (HPU), and Haiphong Medical University (HPMU). These students are undertaking their English courses in the first two years at their universities as required by the curriculum.

B. Research Objectives

The present investigation aims at examining and identifying types of language learning strategies employed by science-oriented students in learning English as a foreign language in northern Vietnamese universities.

The present investigation has been designed to conduct under the 'theory-after-research' manner as termed by Punch (1998, p.16) which refers to research work that ends up with a theory explained from the data the researcher has collected. The present investigation does not aim to reconfirm or test any theory about language learning strategy use by language learners.

C. Participants

The data were collected between April and June, 2011 from 30 science-oriented students who were purposively selected from 6 universities in the north of Vietnam. These universities were randomly stratified from different geographical regions to take part in the data collection. Two universities (one Science and Technology, one Health science) in each region (the northern central, the northern midland and the north east) were selected. The interviewees were the students who were studying EAP or ESP course, or already finished that course in the previous semester. The selection of students was to ensure they would provide enough useful information for the researchers to generate a language learning strategy inventory. Among the 30 students who were interviewed, 15 were Health Science students, and 15 were Science and Technology students. The Science and Technology students were 12 males and 3 females, and the Health Science were 6 males and 9 females.

D. Instruments

The one-on-one semi-structured interviews were used as the main method for data collection in the present investigation. The interview questions were mainly designed to ask how they dealt with learning the English language. Further, they were asked if they encountered any problems and how they solved the problems. The content of the interview questions partly emerged from the related literature review, available research works in the field of language learning strategies, and partly through the researcher's personal experience as a language learner and a language teacher. What follows is the summary of the sample interview questions for the present investigation:

Questions 1, 2: background information of the interviewee's name, and field of study

Questions 3, 4: an elicitation of the interviewee's language learning strategies in every single skill

Questions 5, 6: an investigation of interviewee's opinion about what he or she finds difficult in learning English and how those problems were solved

Question 7: an investigation of each student's comments about English learning and teaching from their experience.

E. Procedure

The first semi-structured interviews were conducted with five Science and Technology students at TNUT in the northern midland. Everything was smooth for arranging an appointment because the students were very co-operative. However, some

students seemed to be worried because they thought that they would be interviewed in English. The researchers had to ensure them that the language used for the interview was Vietnamese which seemed to make them feel more comfortable and confident.

While conducting the semi-structured interview, apart from the interview skills which were trained and experienced in the pilot stage, the researchers always kept in mind what Denscombe (2003) suggested that setting a relaxed atmosphere in which the students feel free to open up on the topic is necessary. In addition, Measor (1985) indicated that one way to build a good relationship between the interviewer and the interviewees is to ask their names or nick names. Therefore, the researchers followed these points and addressed the students by their name like what the researchers did in class when teaching. It was found very useful since the students felt relaxed and confident when responding to the interview questions. During the interview, as stated by Robson (2002), the researchers also listened to the student more than spoke; put questions in a straightforward, clear and non-threatening way to the students; didn't ask leading questions; looked satisfied with students' responses, and made students feel that they were understandable and easy to talk to. The researchers did the same interview process to the other five Science and Technology and Health Science universities in the northern midland, the northern central, and the north east respectively.

F. Analysis

After having finished the interview process, the researchers started transcribing each interview recording verbatim. Then, the researchers translated all the transcription from Vietnamese to English. The interview translated-version was then checked by the researchers' colleagues who are English teachers and have taught English for at least 5 years. The next process was to analyze data obtained after translation in order to discover language learning strategies reported to be employed by these science-oriented university students.

When all the interview data obtained were transcribed and translated, the researchers started to generate the preliminary language learning strategy inventory by doing the following steps:

1. The researchers carefully read through the interview data regarding language learning strategies reported by 30 science-oriented students from 6 universities to get a whole picture of how they used LLSs in learning the English language.

2. Each language learning behavior or strategy which was consistent with the working definitions of the present investigation was accordingly identified, and the codes were then given to such behavior and strategy. The researchers had to be very carefully at this step to ensure that every single reported strategy or behavior was identified.

3. From the list of every single reported language learning strategy, the researchers started to look at the similarities and differences among the reported statements. It was found that the interviewees produced altogether 417 statements about language learning behaviours or strategies to achieve or to enhance the target language. The researchers started to think how to group and categorise these statements.

4. The researchers realized that it was impossible to include all of the 417 behaviour or strategies in the language learning strategy

classification. As a result, the researchers had to group these 417 statements according to the similarities of the context or situation in which the learning behaviours or strategies reported employing by 30 science-oriented students. In this step, the researchers also had to deal with the question how to classify these reported statements. Should the researchers follow the classification system like those of Rubin (1981), Ellis and Sinclair (1989), Oxford (1990), Coleman (1991) or Intaraprasert (2000) classification system which was based on the purpose of strategy use? The researchers decided to try the preliminary classification based on the reported purposes of strategy use. Initially, there were 74 language learning behaviours or strategies remaining, and they were categorized roughly under two main categories: the strategies to enhance the specific language skills, and the strategies to enhance the general language knowledge.

5. In general, the reported 417 statements were employed to enhance the process of learning the target language. The researchers considered these strategies according to the purpose of the students when employing the reported strategies; it meant that the researchers looked at the 'what' students had done to improve their language learning, not the 'how' students had done to achieve the specific purpose. For example, one student reported "I looked up every new word before I read the reading text, this helped me understand the text clearer ...[translated]", another student reported "I had to read mechanical engineering materials, it was too difficult to understand the text so I found a similar reading document in Vietnamese to read, therefore, I could comprehend the reading text in my major ...[translated]" The researchers found that these strategies were employed to comprehend the specific reading text, not to improve their reading skill. As a result, the researchers had to read very carefully every single statement, not only to clarify the specific purpose of each action but also to make sure these reported statements in each group shared the similar characteristics in the context or situation in which they were reported to be used. Finally, based on the 417 statements, 74 main groups emerged. It was not easy to categorise each strategy into a suitable group and to find the suitable name to cover most because some strategies reported being employed seemed to overlap with others.

6. At this step, the researchers did some revision and had a discussion with colleagues. After the discussion, the researchers found that some reported strategies tended to be communication strategies. According to Tarone (1980); Ellis (1994); Cohen (1998), 'communication strategies' are related to language use rather than language learning. The communication strategies are used to enable language users to organize their utterances as effectively as possible to get their messages across to particular listeners. Tarone (1980) also proposed 3 criteria to determine whether a strategy is for communication or learning which include: a) a speaker desires to communicate a message to a listener; b) the speaker believes the linguistic or sociolinguistic structure desired to communicate a message is not shared with the listener; and c) the speaker chooses to either avoid or attempt to communicate a message. Taking into account these criteria, 20 of 74 language learning strategies were excluded from the language learning strategy groups.

7. The researchers started to look at every individual strategy in each group to specify clearly the purpose again and came up with nine purposes. Appropriate names for purposes of strategy use

were initially given, and then the researchers started to match strategy items and each purpose. At this step, the researchers started to reconsider how these nine groups of strategy use could be classified further. The researchers looked through all these groups again and again to find whether there was a common characteristic these purposes might share. Consequently, the proposed 'Language Learning Strategy Inventory' with two main categories was identified. These include strategies 1) to enhance specific language skills; and 2) to enhance general language knowledge. The first main category comprises 4 purposes for core language skills (listening, speaking, reading, and writing), and 3 purposes for supportive language skills (pronunciation, grammar, and vocabulary). The second main category comprises 2 purposes which are media reliance and non-media reliance strategies to enhance general language knowledge.

III. FINDINGS

In classifying language learning strategies for the present investigation, it was evident that the LLSs in both categories were supportive of each other. That is, the strategies which students reported employing in order to enhance the specific language skills may help them improve their general language knowledge. For example, the strategies to enhance the knowledge of vocabulary which students reported employing may help to improve the reading skill. It means that, there are no clear-cuts at all among the strategy use. Therefore, the language learning strategies under the two main categories have a spiral rather than linear relationship.

The proposed 'Language Learning Strategy Inventory' with two main categories was generated and presented as follows:

I. Specific Language Skills Enhancement

1. Core Language Skills

1.1 Strategies for Speaking Skill Enhancement

- Participating in discussions in groups or classes, or clubs
- Self-practising with non-course books
- Seeking an opportunity to communicate with foreigners or native speakers of English
- Doing a part-time job at tour offices, hotels or restaurants
- Taking an extra (speaking) class at a language centre
- Talking to oneself
- Starting conversations with other people in English.
- Encouraging oneself to speak English even when one is afraid of making a mistake
- Asking an interlocutor to correct a mistake when speaking English

1.2. Strategies for Reading Skill Enhancement

- Reading English brochures, leaflets or billboards
- Reading materials of one's major in English language
- Reading short stories or funny stories in English
- Reading instructions or manuals in English
- Looking for opportunities to read as much as possible in English

1.3. Strategies for Listening Skill Enhancement

- Listening to English songs
- Listening to radio programs in English
- Watching television programs in English

- Attending extra classes where native English speakers teach the English language
- Seeking an opportunity to listen to the English language
- Listening to the recording repetitively

1.4. Strategies for Writing Skill Enhancement

- Writing e-mail, diary, notes, messages, letters, or reports in English
- Practising writing sentences in English
- Comparing one's writing with friends'
- Seeking assistance from other people, such as teachers or friends
- Doing extra writing exercises from non-course books
- Having extra writing tutorials

2. Supportive Language Skills

2.1. Strategies for Pronunciation Enhancement

- Imitating native speakers
- Checking one's recorded pronunciation against the recordings
- Using a dictionary to check one's pronunciation
- Asking friends or teachers to help check the pronunciation
- Practising pronunciation in front of the mirror

2.2. Strategies for Grammar Enhancement

- Doing extra grammar exercises from non-course books
- Taking notes on grammar points
- Linking newly-learned grammar structures with previously-learned ones
- Asking the teacher for clarification when appropriate
- Having extra grammar tutorials

2.3. Strategies for Vocabulary Enhancement

- Memorising words in English
- Learning words' formations or words' roots
- Using stickers or flash cards
- Translating English words into Vietnamese or Vietnamese words into English
- Grouping new vocabulary items according to their similarity in meanings or spellings
- Using new vocabulary items to converse or to compete with peers
- Playing word games

II. General Language Knowledge Enhancement

1. Media Reliance Strategies

- Using a mobile phone or a tape recorder or a compact disc
- Joining a forum or a blog or a chat room
- Making use of online resources, such as e-library, online dictionary or Google Translate
- Singing 'karaoke' in English
- Self-practising with commercial software

2. Non-media Reliance Strategies

- Creating English learning atmosphere for oneself
- Trying to find as many ways as one can to use English
- Asking teachers how to learn English effectively
- Trying to learn about the culture of native English speakers
- Practicing general English with friends

- Noticing one's English mistakes and use that information

IV. CONCLUSION

The language learning strategy inventory for the present investigation emerged from the content analysis of the one-on-one semi-structured interview. Based on the purposes to be achieved, the LLSI comprises two main categories which are specific language skills enhancement and general language knowledge enhancement. The specific language skills enhancement category consists of 43 individual strategies, and the general language knowledge enhancement category consists of 11 individual strategies. The proposed LLSI may be considered to be representative of the LLSs employed by science-oriented students in the north of Vietnam.

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Flora of Outer Hills of Kashmir Himalayas (Jammu and Kashmir State) – Genus *Euphorbia* (*Euphorbiaceae*)

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I. INTRODUCTION

Euphorbia is the largest genus of family Euphorbiaceae comprises of over 2000 species. Members of this genus are found distributed in the diverse habitats of humid tropics, subtropics and temperate regions of the world. The vegetative and floral characters, inflorescence and latex facilitate the identity of species easy. Genus *Euphorbia* has been studied in the different district of Jammu and Kashmir but the complete enumeration of the genus is still wanting. Perusal of floristic literature indicates that Singh and Kachroo (1976), Sharma and Kachroo (1981), Swami and Gupta (1998) have studied the family Euphorbiaceae in their respective flora. Singh and Kachroo (1976) described five species from Srinagar, Kashmir. Sharma and Kachroo (1981) and Swami and Gupta (1998) described seven species from Jammu and Udhampur respectively. In the present communication the authors have described eight species from the outer hills of Kashmir Himalayas, of which *Euphorbia orbiculata* H. B. K. is new for the flora of Jammu and Kashmir State.

II. MATERIALS AND METHODS

Plant explorations were carried out in different seasons of the year at some selected sites in Jammu and Kashmir. This paper is based on the collection of angiosperm flora in general. The forays of two different types were undertaken round the year, the collection trips to distant places were of the duration of 3- 7 days. In between, brief trips of 1- 2 days durations were executed along or in the company of one or more helpers. In this way, it was possible to raise the collections from the different parts of the state. In the first year the collections were massive and in the subsequent years they reduced to solitary specimen. While collecting the plant specimens field numbers were allotted and relevant data about the plant was recorded in the field book. The specimens were carried to the Laboratory in the polythene bags, ruck-sacks or in plant press depending upon the length of trip and distance of the place of collection. The plants collected were pressed in the in wooden press wrapped in blotters. These specimens are changed frequently to reduce the discoloration of foliage and flowers and to avoid rotting. The dried specimens were mounted on the Herbarium sheets. Printed labels were pasted and relevant data was entered. These specimens were identified with the help of taxonomic literature.

III. KEY TO THE SPECIES OF EUPHORBIA L.

1. + Leaves opposite or whorled ----- 2
 - Leaves alternate ----- 7
2. + Upper leaves opposite or whorled ----- 3
 - All leaves opposite ----- 4
3. + Leaves obovate, spatulate, apex rounded; involucre with 4 yellow gland ----- 5. *E. helioscopia*
 - Leaves elliptic, oblong-obovate; involucre with solitary greenish or coloured glands----- 3. *E. geniculata*
4. + Ascending herbs; leaves more than 12 mm long ----- 5
 - Prostrate herbs; leaves less than 12 mm long ----- 6
5. + Hispidly hairy; glands reddish; limb very small to nearly obsolete ----- 2. *E. hirta*
 - Glabrous to puberulous; glands greenish; limb conspicuous, white or pink----- 4. *E. indica*
6. + Capsule pubescent at angles----- 7. *E. prostrata*
 - Capsule glabrous all over ----- 6. *E. orbiculata*
7. + Capsule covered with conical warts ----- 1. *E. cornigera*
 - Capsule not covered with conical warts ----- 8. *E. wallichii*

1. *Euphorbia cornigera* Boiss. in DC. Prodr. **15** (2) : 122. 1862; Stewart, *l.c.* 448. 1972; *E. pilosa* L. var. *cornigera* (Boiss.) Hooker f., FBI. **5** : 260-261. 1887.

Perennial, glabrous or pubescent herbs; stem several from woody base, 30-70 cm tall; leaves alternate, oblong, 3-10 x 0.5-1.8 cm, glabrous on both surfaces, margin entire, apex rounded, base cuneate; inflorescence umbellate; bracts ovate, lanceolate, rhomboid, suborbicular, apex rounded; involucre 5 toothed, glands yellow; margin rounded, entire; flowers of both the sexes present within an involucre; styles united half-way down, each 2-fid; fruits 3-lobed, covered with narrowlyconical processes; seeds ovoid, subglobose, smooth.

2. *E. hirta* L., Sp. Pl. 454. 1753; Stewart, Ann. Cata. Vasc. Pl. W. Pak. & Kashm. 449. 1972. *E. pilulifera* Sensu Boiss. in DC., Prodr. 15(2): 21. 1862; Hooker, f., FBI. 250. 1887 (non L. 1753).

Erect-ascending hispidly hairy herbs; stem herbaceous, branched, hairy, green, latex milky; leaves opposite, superposed, simple, subsessile, ovate, oblong or elliptic (Fig.104A), puberulous, base oblique or refuse, 10-35 x 5-15 mm, margin serrate; involucre subsessile, bearing appressed hair without; cyathia aggregated into axillary clusters; each cyathium consists of 5 involucre, fused forming a cup, gland on inner side of bract (Fig. 104B), reddish; flowers of both sexes present within an involucre; single female flower in centre surrounded by many male flowers;

ovary tricarpeal syncarpous, superior, trilobular, styles 3, each bifid; fruit brown a capsule, transversely ribbed.

3. *E. geniculata* Orteg. Nov. Rar. Pl. Hort. Matr. Decad. 18. 1797; Sherff, Ann. Miss. Bot. Gardn. 25 : 72. 1937; Babu, Herb. Fl. DD. 459. 1977. *E. prunifolia* Jacq. Hort. Schoenbr. 3 : 15. 1798; Backer & Bakh. f., Fl. Java 2 : 502. 1965.

Erect, annual, glabrous or pubescent herbs, 30-80 cm tall; stem fistular, ribbed, branched towards the tip; leaves linear, lanceolate, elliptic-oblong, obovate, 2-10 x 0.5-7 cm, sparsely hairy on both surfaces, puberulous on margin; petiole 1-5 cm long; involucre upto 5 mm long, lobes 5, ovate, fimbriate; flowers of both sexes present within an involucre; fruits 3-lobed, smooth; seeds tuberculate.

4. *E. indica* Lam., Dict. Bot. 2: 423. 1786; Stewart, Ann. Cata. Vasc. Pl. W. Pak. & Kashm. 450/ 1972. *E. hypericifolia* Hooker f., FBI. 5: 259. 1887. p.p. (auct. non L.).

Annual herbs; stem weak, hollow, glabrous to puberulous, latex milky; leaves opposite, elliptic, upper surface glabrous, lower surface puberulous, margin entire or minutely dentate, 1.5-2.5 x 1-1.5 cm; cyathia terminal or axillary; involucre nearly glabrous, limb white or pink; glands 4-5; flowers of both sexes present within involucre; seeds reddish brown, transversely wrinkled.

5. *E. helioscopia* L., Sp. Pl. 459. 1753; Hooker f., FBI. 5: 262. 1887; Sharma & Kachroo, Fl. Jammu 1: 281. 1981.

Annual, erect glabrous herbs; stem 15-50 cm in height, latex milky, branched only towards tip, cauline leaves alternate, shortly stalked, obovate or oblong, spatulate, 1-5 cm, margin serrulate, green above, glaucous beneath; inflorescence umbellate; rays very short; involucre 4-toothed, glabrous; glands yellow, stiff, hairy towards top; flowers of both sexes present within an involucre; styles free; fruits depressed, globose, smooth; seeds 4-angled with coarsely reticulate surface.

6. *E. orbiculata* H.B.K. Nov. Gen. 2 : 52. 1817; Raj & Panig in Taxon 17 : 547. 1968. *E. microphylla* Heyne in Roth. Nov. Pl. Sp. 227. 1821. non Lamk. 1786; Hooker f., FBI. 5 : 252. 1887. P.P.

Annual, prostrate, pubescent herb; stem several from base, upto 25 cm tall, hairy; leaves opposite, petiolate, glabrous above, sparsely hairy beneath in young leaves; stipule lanceolate subulate, hairy; inflorescence cyathium; involucre campanulate, glabrous, glands 4, minute, orbicular; flowers of both the sexes

present within an involucre; capsule glabrous, quadrangular; seeds pinkish brown.

7. *E. prostrata* Ait., Hort. Kew ed. 1, 2: 139. 1779; Boiss. in DC. Prodr. 15(2): 47. 1862; Hooker f., FBI. 5: 266. 1887; Stewart, Ann. Cata. Vasc. Pl. W. Pak. & Kashm. 452. 1972.

Annual, prostrate herbs; stem weak, terete, puberulous or pubescent; leaves subsessile, ovate, oblong, apex rounded, base oblique, margin serrulate in upper half; stipule linear, lanceolate, remotely fimbriate; cyathia solitary, pedunculate; involucre campanulate or elongate, turbinate, glabrous or slightly puberulous; glands 4, red or purple, suborbicular; flowers of both the sexes present within an involucre; capsule subglobose, long stalked, trigonous, hairy on angles; seeds reddish-brown.

8. *E. wallichii* Hooker f., FBI. 5: 258. 1887; Stewart, Ann. Cata. Vasc. Pl. W. Pak. & Kashm. 453. 1972.

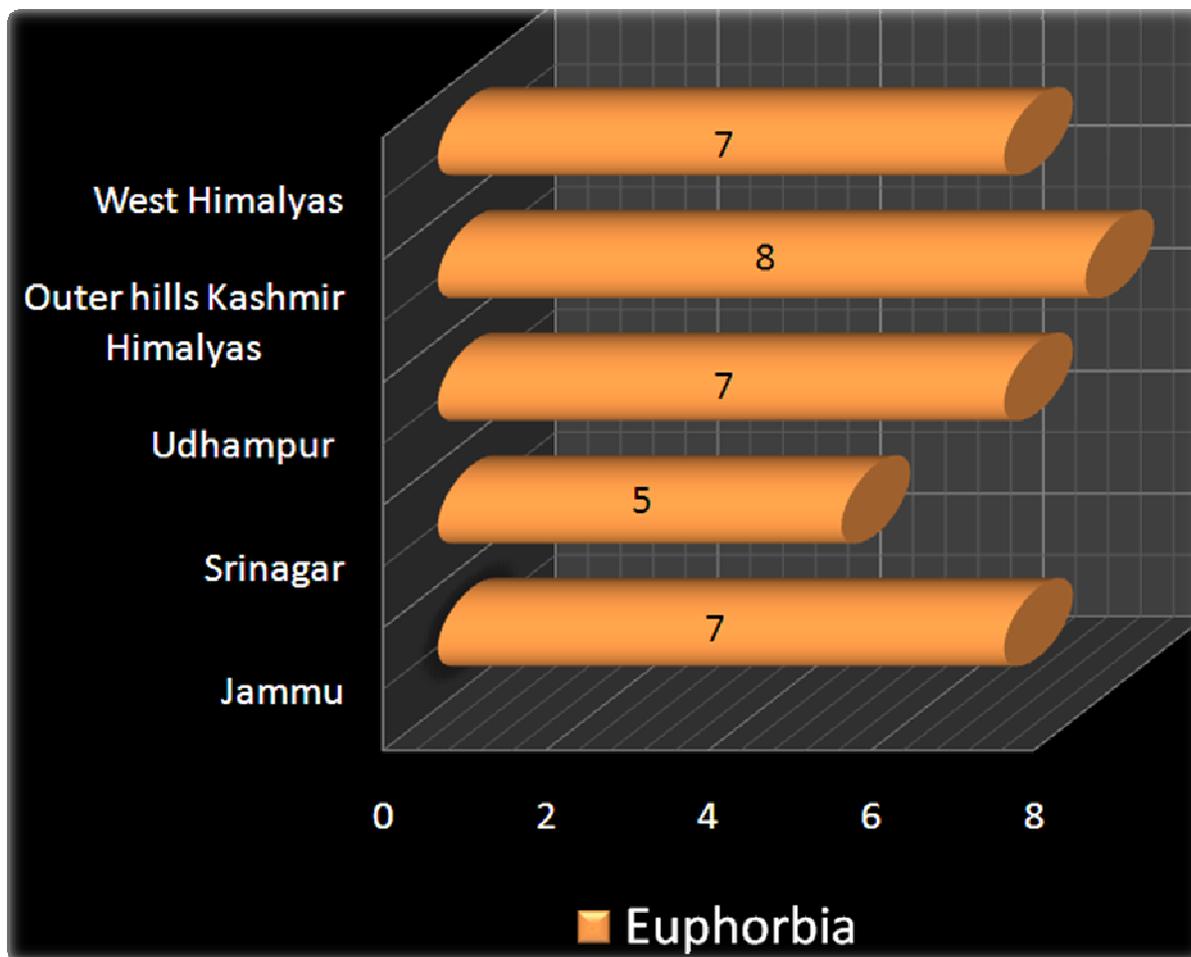
Annual or perennial erect herbs; root-stock woody; stem 30-70 cm in height, glabrous or pubescent; stem leaves alternate, sessile or subsessile, ovate, lanceolate, 3-10 x 1-3 cm, bright green or pale yellow beneath; cyathia pseudumbellate, ray S-7; leaves of pseudumbels 5-7, whorled, ovate, lanceolate, pale-yellow; ray leaves 3, yellow or greenish-yellow; cyathia sessile; glands transversely ovate, rounded or undulate; flowers of both the sexes present within an involucre; capsule 3-lobed, bearing crauncle not covered with conical warts.

IV. DISCUSSION

Species of *Euphorbia* have been studied by the different authors of regional floras of the State of Jammu and Kashmir. These include Singh and Kachroo (1976), Sharma and Kachroo (1981), Swami and Gupta (1998). As many as 7 species of *Euphorbia* have been described by Sharma and Kachroo (1981) in the flora of Jammu and plants of its neighbourhood and Swami and Gupta (1998) described 7 species from Udhampur district of Jammu and Kashmir State. Singh and Kachroo reported 5 species from Srinagar, Kashmir.

V. CONCLUSION

The present author have reported 8 species from Outer hills of Kashmir Himalayas. Of these species *E. orbiculata* H. B. K. is new for the flora of Jammu And Kashmir State.



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Flora of Outer hills of Kashmir Himalayas (Jammu and Kashmir State) – Family *Scrophulariaceae*

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Abstract- The paper provides enumeration and description 14 genera and 30 species of family Scrophulariaceae from outer hills of Kashmir Himalayas, Jammu and Kashmir State. A key to the genera is given in order to differentiate them from each other. All the genera and species within each genus are arranged in alphabetical order. The description of each species is followed by the place of their occurrence and approximate elevation where the species grows.

Index Terms- flora, scrophulariaceae, outer hills, kashmir himalayas, J & K, India.

I. INTRODUCTION

Scrophulariaceae is one of the largest and most widely distributed family and best represented in the outer hills of Kashmir Himalayas. Plants are usually herbs abounding banks of rivulets, moist places, sandy situations and alpine meadows. Some of these species have been brought under cultivation because of their possession of pretty attractive variety of colours such as genus *Digitalis*, *Mimulus*, *Pedicularis* etc. *Picrorhiza kurrooa* Royle ex Benth. is a well known species of this region which is popular for medicinal value, locally used for a variety of ailments, however, some of the other species are also conspicuous on account of their medicinal value. Genus *Veronica* is represented as a highly diversified in this area. The genera represented by one or two species in this region are *Antirrhinum*, *Euphrasia*, *Kickxia*, *Lathraea*, *Picrorhiza*, and *Verbascum*.

Perusal of floristic literature reveals that this area has been explored by Royle (1833- 39), Hooker (1872- 1897), Pennell (1943), Stewart (1972) and Sharma and Kachroo (1981). The present authors have confined their study of Euphorbiaceae to the outer hills of Kashmir Himalayas.

II. MATERIALS AND METHODS

Plant explorations were carried out in different seasons of the year at some selected sites in the outer hills of Kashmir Himalayas of Jammu and Kashmir. This paper is based on the collection of angiosperm flora in general and species of family Scrophulariaceae. The forays of two different types were undertaken round the year, the collection trips to distant places were of the duration of 3- 7 days. In between, brief trips of 1- 2 days durations were executed along or in the company of one or more helpers. In this way, it was possible to raise the collections from the different parts of the area of study. In the first year the collections were massive and in the subsequent years they

reduced to solitary specimen. While collecting the plant specimens field numbers were allotted and relevant data about the plant was recorded in the field book. The specimens were carried to the Laboratory in the polythene bags, ruck-sacks or in plant press depending upon the length of trip and distance of the place of collection. The plants collected were pressed in the in wooden press wrapped in blotters. These specimens are changed frequently to reduce the discoloration of foliage and flowers and to avoid rotting. The dried specimens were mounted on the Herbarium sheets. Printed labels were pasted and relevant data was entered. These specimens were identified with the help of taxonomic literature.

III. KEY TO THE GENERA

1. + Number of stamens 2 or 4----- 2
- Number of stamens 5 ----- 12. *Verbascum*
2. + stamens 2 (*Lindernia* has 2 staminodes also)----- 3
- Stamens 4 ----- 5
3. + Calyx 4-lobed; corolla tube very short ----- 13. *Veronica*
- Calyx 5-lobed; corolla tube longer than calyx ----- 4
4. + Leaves 7- 15 cm long teeth coarsely toothed ----- 6
- Leaves 1- 3.5 cm, teeth faintly pointed ----- 7. *Lindernia*
5. + Flowers upto 1 cm long ----- 14. *Wulfenia*
- Flowers upto 5 cm long----- 2. *Digitalis*
6. + Corolla distinctly 2-lipped----- 7
- Corolla not 2-lipped ----- 13
7. + Flowers yellow ----- 8
- Flowers blue, pink or purple ----- 10
8. + Corolla tube spurred at base ----- 4. *Kickxia*
- Corolla tube not spurred at base ----- 9
9. + Leaf margin dentate; upper lip of corolla not beaked -----
- 6. *Lindenbergia*
- Leaf margin pinnatifid; upper lip of corolla long beaked-----
- 10. *Pedicularis*
10. + Calyx 4-lobed----- 3. *Euphrasia*
- Calyx 5-lobed----- 11
11. + Calyx tube prominently keeled----- 9. *Mimulus*
- Calyx tube not keeled ----- 12
12. + Corolla saccate or spurred at base ----- 1. *Antirrhinum*
- Corolla not saccate or spurred ----- 8. *Mazus*
13. + Leaves pinnatisect, 5- 7 mm broad ----- 5. *Leptorhabdos*
- Leaves pinnatisect, 10- 30 mm broad ----- 11. *Scrophularia*

IV. TAXONOMIC DESCRIPTION OF SPECIES

1. ANTIRRHINUM

Antirrhinum orontium L., Sp. Pl. 617. 1753; Hooker f., Fl. Brit. Ind. 4: 253. 1883; Penn., Acad. Nat. Sci. Philad. Monog. 5: 61. 1913; Ann. Cata. Vasc. Pl. W. Pak. & Kashm. 646. 1972.

Annual, erect, glandular-hairy herbs; leaves subsessile, basal leaves opposite, cauline leaf linear, oblong-lanceolate, 1.7-5 x 0.2 – 0.3 cm, margin often entire, recurved; flowers solitary axillary or racemed, rose-purple or white – purple; calyx 5-lobed, lobes linear, longer than corolla, green; corolla bilipped, white – purple or rose purple, hairs glandular, saccate or spurred at base; stamens 4, didynamous, epidetalous, attached at base, filaments glabrous, anther cells distinct, yellow; style filiform, hairy, stigma bilobed; capsule ovoid, globose, beaked, hairs glandular; seeds compressed, minute, 5-8 mm long.

Rare on sandy soil and dry situations at Ramsu and Ramban. Specimens collected from Ramban (580 m).

2. DIGITALIS

Digitalis purpurea L., Sp. Pl. 621. 1753; Stewart, Ann. Cata. Vasc. Pl. W. Pak. & Kashm. 647. 1972.

Annual herbs; stem upto 1 m tall, usually branched; radical leaves long stalked, ovate or ovate-lanceolate, cauline leaves subsessile, gradually reducing in size towards apex; inflorescence raceme; flowers pendulous, zygomorphic, bisexual, white tinged purple-pink, upto 5 cm long; calyx 5-lobed, lobes broadly ovate; corolla bilipped, white, tinged purple-pink; stamens 5; style persistent; capsule ovoid, exceeding the calyx in length.

3. EUPHORASIA

Euphrasia simplex D. Don, Prodr. 95. 1815; Hooker f., Fl. Brit. Ind. 4: 305. 1884.

Annual, erect herbs; stem 10-30 cm tall, pubescent or glandular; leaves opposite, sessile, ovate, 0.5-1.5 cm long, margin sharply toothed; inflorescence terminal spikes; flowers zygomorphic, white or lilac tinged yellow at throat; bracts leaf-like; calyx tubular, 4-lobed, green; corolla bilipped, tube cylindrical, longer than calyx, upper lip erect, bilobed, lower spreading, trilobed, lobes usually notched; stamens 4, in unequal pairs, anthers bithecous, hairy, style long, stigma minute, capitate; capsule flattened, as long as calyx.

Abundant on open, grassy slopes at Machial, Paristan, Alinwas and Atholi. Specimens collected from Machail (3, 500 m).

4. KICKXIA

Kickxia ramossima (Wall.) Janchen in Ost. Bot Zeitschr. 82: 152. 1933; Stewart, Ann. Cata. Vasc. Pl. W. Pak. & Kashm. 649. 1972. *Linaria ramosissima* Wall. Ic. 1830- 1832; Hooker f., Fl. Brit. Ind. 4: 251. 1883.

Perennial herbs; stem much branched, solid, green; leaves alternate, triangular, upto 3.5 cm long, base hastate, apex acute, glabrous on both surfaces; inflorescence raceme; flowers pedicellate, pedicel 1.5 cm long, decurved, zygomorphic, bisexual, yellow; sepals 5, green, margin scarious, persistent; corolla bilipped, yellow, spurred at base, tube tinged pink, upper lip bilobed, lower trilobed; stamens 4, free, in equal pairs, filaments filiform, yellow, hairy, anthers bithecous; ovary superior, bicarpellary syncarpous, style short, stigma capitate; capsule globular, seeds many, minute.

Abundant in rock crevices along road sides at Kishtwar, Thathri and Ramban. Specimens collected from Ramban (850 m).

5. LEPTORHABDOS

Leptorhabdos parviflora (Benth.) Benth., in DC., Prodr. 10: 510. 1846; Stewart, Ann. Cata. Vasc. Pl. W. Pak. & Kashm. 650. 1972.

Erect, nearly glabrous herbs; stem 30-90 cm tall, branched; leaves sessile, basal opposite, cauline alternate, 2.5-7.5 x 0.5 – 0.7 cm, pinnatisect, segments linear, toothed or entire; inflorescence raceme; flowers zygomorphic, bisexual, light-pink; calyx bell-shaped, 5- toothed; corolla tube short, limb 5-lobed, lobes nearly equal; stamens 4, didyanamous, anthers free, cells perfect; style long, stigma minute; capsule oblong flattened, enclosed in calyx; seeds 2-4 per capsule.

6. LINDENBERGIA

Lindenbergia macrostachya (Benth.) Benth., Scroph. Ind. 22. 1835; Hooker f., Fl. Brit. Ind. 4: 262. 1884; Penn., Acad. Nat. Sci. Monog. 5: 35. 1943.

Perennial, glabrous or pubescent herbs; stem robust, erect, 60-100 cm tall; leaves ovate or oblong-lanceolate, 2.5 – 7.5 x 1.2 – 2.5 cm, apex acuminate, margin serrate, glabrous; inflorescence rigid spikes; flowers zygomorphic, bisexual, bright yellow; bracts longer than calyx; calyx bell – shaped, 5-lobed, lobes short, acute, patently hairy, glandular; corolla bilipped, tube short, cylindrical, glandular hairy outside, upper lip bilobed, recurved, not beaked, lower lip trilobed, larger with two prominent folds at base; stamens 4, didynamous, included, anther cells 2, separate; ovary hairy, style slender, stigma bilobed; capsule ovoid.

A stiff, perennial herb inhabiting rock crevices at Assar (950 m).

7. LINDERNIA

Lindernia crustacea (L.) F. Muell., Cens. Austral. Pl. 97. 1882; Penn., Scroph. W. Himal. 29. 1943.

Erect or diffuse glabrous herb; stem branched, 10-45 cm tall; leaves shortly stalked, broadly ovate, 0.5 – 1.2 cm long. Margin crenate; flowers solitary axillary, zygomorphic, bisexual, purple or red; calyx 5-lobed; corolla bilipped, tube cylindrical, longer than calyx, upper lip erect, notched, lower lip trilobed, broad, spreading; stamens 4, didynamous, anthers cohering in pairs; style curved, stigma flat bilobed; capsule ovoid, about equaling or shorter than calyx.

Lindernia nummularifolia (D. Don) Wettst. in Engler & Prantl. Pflanzenf. 4: (3b): 79. 1891; Saldanha in Fl. Hassan Dist. 522. 1976.

Annual herbs; stem simple or branched, quadrangular, creeping, often rooting from nodes, hairy on angles; leaves sessile, rounded – orbicular, 5-10 mm across, base subcordate; flower terminal, sessile clusters, zygomorphic, bisexual; calyx 5-segmented, segments linear, lanceolates; corolla bilipped, white, upper lip brown, lower lip with purplish centre; perfect stamens 4; capsule 10 mm long, almost twice as long as calyx, cylindrical.

Lindernia parviflora (Roxb.) Haines, Bot. Bih. Oriss. 635. 1922. Penn., Acad. Nat. Sci. Philad. Monog. 5; 31. 1943.

Annual, erect or decumbent-ascending herbs; stem branched from base, quadrangular, glabrous; leaves sessile, ovate, lanceolate, 5-12 x 2-6 mm., glabrous, 3- nerved from base; flower solitary, axillary, pedicellate, pedicel 1-14.4 cm long; sepals 5, green; corolla tube cylindrical, bilipped, upper lip erect, broad, notched, lower lip spreading; perfect stamens 2; capsule ellipsoid upto 5 mm long, twice the length of calyx.

8. MAZUS

Mazus delavayi Bonati in Bull. Herb. Boiss. Ser. 2, 8: 530. 1908; Penn., Acad. Nat. Sci. Philad. Monog. 5: 34. 1943.

Annual, hirsute, non-stoloniferous herbs; radical leaves simple, oblanceolate or nearly obovate, 5-8 cm long, base spatulate, apex obtuse or rounded, pubescent on both surfaces, cauline leaves alternate, obovate, 3-5 x 1-1.5 cm, apex obtuse, margin crenate, hairy on both surfaces; inflorescence raceme; flower zygomorphic, bisexual, pedicellate, pedicel shorter than calyx; calyx 5-lobed, lobes acute, hairy without; corolla bilipped, white tinged blue, tube short, upper lip bifid, lower lip larger, trilobed, lobes spreading; stamens 4, didynamous, anther cells divergent; stigma lamellate; capsule globose, included.

Mazus pumilus

Annua, non-stoloniferous herbs; stem often branched from base, glabrous or sparsely hairy; radical leaves obovate, oblong, spatulate, 3-8 x 0.7-6 cm, base cuneate, apex rounded, margin crenate, irregularly toothed, glabrous or patently long hairy, cauline leaves sessile, obovate, margin crenate; inflorescence lax racemes; flower zygomorphic, bisexual, pedicellate, longer than calyx; calyx 5-lobed, lobes accrescent; corolla bilipped, upper lip bilobed, lower lip trilobed, spreading, white or pale – blue, hairs glandular without; capsule 3 mm long.

Abundant on moist places at Batote, Doda, Dacchan and Marwa. Specimens collected from Batote (1, 500 m).

M. surculosus (Burm. F.) Steenis in Nova Guinea n. Sect. 9: 31. 1958.

Perennial, stoloniferous herbs; stolons rooting; basal leaves obovate, 3-9 x 1-3 cm, spatulate, margin crenate or subpinnatifid; inflorescence lax racemes; flowers ebracteate, zygomorphic, bisexual, pale – blue or white; calyx 5-lobed, tube short; corolla bilipped, blue; stamens 4, didynamous; stigma 2-lamellate; capsule globose or compressed.

Abundant on moist situations and waste places at Batote and Sanasar. Specimens collected from Batote (1, 500 m).

9. MIMULUS

Mimulus strictus D. Don, Prodr. 87. 1825; Penn., Acad. Nat. Sci. Philad. Monog. 5: 32. 1943.

Annual, erect, glabrous herbs; stem branched, quadrangular; leaves opposite, sessile, oblong, lanceolate-oblong, 3-6 x 0.3 – 0.8 cm, stem clasping, glabrous on both surfaces, margin entire; flowers solitary axillary, zygomorphic, bisexual, pedicel 2.5-5 cm long; calyx 5-lobed, ribbed, tubular, tube prominently keeled; corolla bilipped, white spotted yellow, margin spotted yellow, margin minutely serrate; stamens 4, didynamous, anther-cells divergent, filaments short, glabrous; style slender, stigma 2-lamellate; capsule oblong.

10. PEDICULARIS

Pedicularis bicornuta Kl. Bot. Ergeb. Reise Walden. 109. Pl. 61. 1852; Hooker f., Fl. Brit. Ind. 4: 312. 1884.

Annual, erect herbs; root fleshy, stout, fibrous; stem 15-60 cm tall; leaves alternate, linear or linear-oblong, margin pinnatifid, middle lobes rounded, crenate; inflorescence spike; bracts crenate; flowers zygomorphic, bisexual, yellow; calyx campanulate, 5-lobed, lobes crested; corolla bilipped, upper lip annulated, modified into a slender bifid tail, lower lip trilobed, spreading; stamens 4, didynamous, anthers held in pairs under the upper lip; style slender, stigma subcapitate; capsule 2.5-3 cm long oblong, finely acuminate; seeds reticulate.

Rare on stony and gravelly soil at Chasthoti and Dacchan. Specimens collected from Chasthoti (3, 000 m).

P. pectinata Wall. ex Benth., Scroph. Ind. 52. 1835; Hooker f., Fl. Brit. Ind. 4: 306. 1884.

Erect, annual herbs; stem 15-45 cm tall; radical leaves pedicellate, oblong-lanceolate, 5-25 x 2.5 – 7.5 cm, margin pinnatifid, cauline leaves whorled, lanceolate, 1-2 pinnatifid, segments serrate; inflorescence 5-15 cm long spike; flowers zygomorphic, bisexual, rose red; bracts ovate, lanceolate, as long as calyx; calyx 5-toothed, teeth entire, acute; corolla bilipped, tube as long as calyx, upper lip of corolla beaked, beak sickle-shaped, recurved; stamens 4, didynamous, filaments hairy; style slender, stigma capitate; capsule; capsule ovoid, 1-1.3 cm long, acute; seeds ridged, deeply pitted.

P. punctata Decne in Jacq. Voy. Bot. 117. Pl. 122. 1884; Penn., Scroph. W. Himal. 154. 1943.

A small slightly velvety hairy herb; stem many from base; leaves stalked, oblong, linear, 5-18 x 0.6-3 cm, margin pinnately divided, lobes many, short, slightly rounded, toothed; inflorescence axillary and terminal racemes or heads; flower upto 5 cm long, zygomorphic, bisexual, rose – pink; calyx 3-toothed, 0.6 – 1.3 cm, lobes crested, corolla bilipped, tube slender, short, yet 3-6 time as long as calyx; corolla bilipped, upper lip a slender annular horn, gradually narrowed to a point, lower lip broadly 3-lobed; stamens 4, didynamous, anthers under the upper lip pairs; style slender, stigma subcapitate; capsule 0.6 – 1.3 cm long, broadly oblong, longer than calyx.

11. SCROPHULARIA

Scrophularia calycina Benth., Scroph. Ind. 18. 35. 1836; Hooker f., Fl. Brit. Ind. 4: 253. 1883.

Perennial, erect herbs; stem 30-60 cm tall, tender parts glandular; leaves alternate, ovate or lanceolate, 2.5-10 cm long, shortly stalked, apex acute, margin coarsely toothed; inflorescence lax cymes, forming short panicles; flower zygomorphic, bisexual, greenish – purple; calyx 5-parted, segments lanceolate, acute; corolla tube globose, 5 parted, 4 upper erect, lower spreading; stamens 4, didynamous, turned downwards, included, staminode one, ovate, sharp-pointed; style long, stigma minute; capsule ovoid, equaling or shorter than calyx; seeds many, oblong.

Scrophularia dentata Royle, ex Benth., Scroph. Ind. 18. 1835; Yamazaki, Enum. Fl. Pl. Nep. 3: 126. 1982.

Annual herbs, glabrous at base, glandular towards apex, turning black on drying; stem erect; leaves petiolate, spatulate, obovate or oblong, apex obtuse, margin crenate incised towards base; flowers in short erect cymes, minutely pedicellate, zygomorphic, bisexual; calyx 5-toothed, teeth rounded, obscurely scarious; stamens 4, didynamous, pointing downwards, staminodes narrow, small; style slender, stigma notched; capsule globose, pointed.

Scrophularia exerta Penn., Monog. Scroph. W. Himal. 45. 1943.

Annual or perennial herbs; stem quadrangular, glabrous below, viscidly pubescent towards apex; leaves petiolate, ovate or ovate-cordate, 5-10 cm, margin crenate, rarely pinnatisect; inflorescence 30-60 cm long panicles; flower zygomorphic, bisexual, green; calyx 5-parted, segments rounded with scarious margin; corolla bilipped, tube ovoid, 5-lobed, 2 upper lobes longer than the lower 3; stamens 4, far exerted, staminodes spatulate; style filiform; capsule subglobose, pointed; seeds rugose.

S. scabiosaefolia Benth. in Prodr. 10: 311. 1846; Hooker f., Fl. Brit. Ind. 4: 256. 1883.

Annual, erect, glabrous or glandular, often foetid herbs; leaves obovate, oblong, base spatulate, margin entire, pinnatifid or lobulate, terminal lobe usually larger; inflorescence cyme; flowers zygomorphic, bisexual; calyx teeth 5, margin distinctly scariosu; corolla bilipped, tube short upper lip erect, lower one spreading; stamens 4, didynamous, turned downwards, staminode broad; style long, stigma minute, notched; capsule ovoid, acute, beaked; seeds rugose.

12. VERBASCUM

Verbascum Thapsus L., Sp. Pl. 177. 1753; Hooker f., Fl. Brit. Ind. 4: 250. 1883.

Annual, erect herbs; stem 0.5 – 1.5 m tall, simple or branched, densely stellate tomentose; basal leaves petiolate, alternate, simple, ovate, 15-50 cm long, margin entire or nearly so, cauline leaves sessile, ovate, base decurrentm densely tomentose on both surfaces; inflorescence spicate spikes, rarely subsissle; flowers actiniomorphic, bisexual, yellow; calyx 5-lobed, lobes ovate, lanceolate, acute, imbricate; corolla 5-lobed, upper petal exterior in bud, yellow, pubescent without; stamens 5, lower 3 with short filaments, bearded, other have long filaments, glabrous; stigmn capitates; capsule ovoid, as long as calyx, 7 x 5 mm, tomentum stellate.

Rare, on road sides, abundant on stony slopes slopes at Baggar and Choshati. Specimens collected from Chashoti (3,500m).

13. VERONICA

Veronica agrestis

Prostrate, pubescent, annual herb; stem 7-20 cm tall; leaves petiolate, petiole upto 0.5 cm long, rarely subsessile, lamina broadly ovate, 0.5-2 cm long, margin crenate or serrate, pubescent on under surface, more or less glabrous above; flower solitary axillary, pedicellate, pedicel as long as subtending leaves, zygomorphic, bisexual, white or white tinged blue; calyx 4-parted, green, exceeding the capsule, apex obtuse; corolla tube cylindric, lobes 4, spreading, white or white tinged blue; stamens 2, exserted, anther cells parallel; style upto 3 mm long; capsule faintly reticulate towards apex; seeds orbicular or oblong, 10-20 per fruit.

Abundant in harvested rice field at Batote and Banihal. Specimens collected from Banihal (1,400 m).

V. anagallis-aquatica L., Sp. Pl. 12. 1753; Fl. Brit. Ind. 4: 293. 1884.

Erect, somewhat succulent herbs; base stoloniferous, glabrous, puberulous, glandular towards apex; leaves sessile, oblong, lanceolate, 3-10 x 0.5-2 cm, base amplexicaule, apex acute, margin entire or serrate; inflorescence lax, 7.5-15 cm long recemes; flower zygomorphic, bisexual, pink or purplish; calyx 4-lobed, upto 5 mm long, corolla tube longer than calyx, lobes 4, spreading; stamens, exserted another cells parallel; stigma subcapitate; capsule oval, strongly flattened, emarginated.

Abundant along water channels and banks of rivulets of Batote (1,300 m).

V. beccabunga L., Sp. Pl. 12. 1753; Hooker f., Fl. Brit. Ind. 4: 293. 1884.

Annual, decumbent-ascending, glabrous or puberulous herbs; stem creeping, succulent, hollow, branched, 20-35 cm long; leaves sessile or subsessile, elliptic-oblong, rarely obovate, 2-5 cm long, base rounded, apex obtuse, margin crenate-serrate;

inflorescence few or many flowered, 5-10 cm long axillary racemes; flower actinomorphic, bisexual, blue or pink, pedicellate; calyx 4-lobed, ovate-oblong, subacute; corolla tube short, 4-lobed, blue or pink; stamens 2, exserted; capsule broadly ovate; seeds ovoid or oblong, biconvex.

Abundant on banks of water bodies at Batote (1,500 m). *V. biloba* L., Mant. 172. 1771; Hooker f., Fl. Brit. Ind. 4: 294. 1884. Annual, erect herbs; stem slender, pubescent; leaves ovate or lanceolate, basal leaves opposite, 1.2-2.5 cm long, margin serrate, cauline leaves alternate, margin entire, glandular hairy; flowers solitary axillary, pedicellate, pedicel 1 cm long, actinomorphic, bisexual; calyx 4 parted, margin glandular hairy; corolla blue, tubular, tube short, lobes 4; stamens 2, epipealous, exserted, another cells bitheous, filaments short, 2 mm long, dorsifixed; ovary superior, bicarpellary syncarpous, style shrot, stigma capitates; capsule deeply bilobed, pubescent; seeds oblong, deeply pitted.

Abundant along road side at Ramban, Assar and Kishtwar. Specimens collected from Ramban (800 m).

V. melissaefolia Poir in Encyc. Meth. Bot. 8: 526. 1808; Stewart, Ann. Cata. Vasc. Pl. W. & Kashm. 665. 1972.

Annual, erect or suberect harbs; stem slender, 30-60 cm tall, tomentose; leaves opposite, sessile, ovatelanceolate or oblong, 2-4 x 1-3 cm, base ovate, apex obtuse, margin coarsely toothed, lamina glabrous above, hairy along nerves underneath; inflorescence raceme; flower actinomorphic, bisexual, blue; calyx; corolla tube short, 4-lobed, blue; stamens 2, exserted; capsule obcordate, ciliate.

Common on slopes at Kailash Parbat (3,500 m). *V. persica* Poir., Encycl. Meth. Bot. 542. 1808; Hooker f., Fl. Brit. Ind. 4: 294. 1883.

Annual, hairy, prostrate or decumbent herbs; stem 5-25 cm long; leaves petiolate, ovate-oblong, base rounded, apex obtuse, margin crenate; flowers solitary axillary, pedicel much longer than subtending leaves ; calyx 4-parted, lobes ovate or lanceolate, spreading in fruits, far exceeding the capsule; corolla tube cylindric, 4-lobed, bright blue; stamens 2, exserted ; capsule much boarder than long, reticulations distinct, 5-12 seeded; seeds boat-shaped, deeply pitted.

V. serpyllifolia L., Sp. Pl. 12. 1753; Hooker f., Fl. Brit. Ind. 4: 296. 1884; Stewart, Ann. Cata. Vasc. Pl. W. Pak. & Kashm. 666. 1972.

Annual herbs; stem branched, right from base; leaves opposite, spatulate, oblong, coriaceous, margin entire; inflorescence recame ; flower actionmorphic, bisexual, white or blue with yellow base, pedicellate, pedicel 3 mm long; calyx 4-parted, glandular hairy; corolla tube slender, short, 4-lobed white or blue with yellow base ; stamens 2, epipetalous, exserted, anthers bitheous, filaments short, glabrous; ovary bicarpellary, style white, stigma capitate, blue; capsule bilobed, hairy.

V. stewartii penn., Scroph. W. Himal. 81. Pl. 7c. 1943.

Prostrate, hairy, annual herbs, stem weak, 15-40 cm long; leaves opposite, petioled, ovate, cordate or orbicular, margin crenate-serrate; flower pedicellate, pedicel equaling the leaves, solitary axillary, zygomorphic, bisexual, light blue; calyx 4-lobed, lobes cordate, ciliate, exceeding the corolla, acuminate; corolla tube very short, 4-lobed, light blue; stamens 2, exserted, style linear ; capsule biglobose; seed subglobose, rogoose, 1-2 per cell.

14. WULFENIA

Wulfenia amhertiana Wall. ex Benth.

Perennial glabrous herbs; scape 15-30 cm tall, erect, slender; basal leaves many, petiolate, ovate-oblong, margin crenate; inflorescence spike, second; flower upto 1 cm long, zygomorphic, bisexual, blue – purple, turning white age, pointing downwards; calyx 5-parted, segments lanceolate, acute glabrous; corolla 4 mm long, tube short, slenderic, lobes 4, upper one minutely notched; stamens 2, exserted; stigma minute, capitate; capsule oblong, bilobed, as long as calyx.

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V. DISCUSSION

Family Scrophulariaceae has been studied by different authors from different pockets of the state and described in regional floras of the state. The prominent of them include include Singh and Kachroo (1976), Sharma and Kachroo (1981), Swami and Gupta (1998). The publication from the Kashmir division of the state deals with the flora of Srinagar reported 18 species belonging to 7 genera (Singh and Kachroo, 1976) and other others two publication on district floras are confined to the flora of Jammu and flora of Udhampur (Sharma and Kachroo, 1981; Swami and Gupta, 1998) respectively. 23 species of 14 genera have been described (Sharma and Kachroo 1981) from Jammu and as many as 21 species belonging to 13 genera (Swami and Gupta, 1998) from Udhampur district of Jammu and Kashmir State. The flora bridging the two divisions of the state is still wanting. Hence the present compilation is provided to with 14 genera and 30 species to fill up the gap between Jammu and Kashmir divisions of the state.

VI. DISCUSSION

The communication being provided shows highest and rich diversity of flowering plants in this region in comparison to the neighbouring districts of the state of Jammu and Kashmir.

ACKNOWLEDGEMENT

The authos are grateful to Prof. A. K. Koul Dean, Centre for Biodiversity, BGSB University, Rajouri for encouragement.

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Cystopteris fragilis f. kashmiriensis Bhellum and Razdan-A new forma from India

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Abstract- The present paper put on record *Cystopteris kashmiriensis* Bhellum and Razdan a new forma from Jammu and Kashmir State, collected from the different elevations between 1600 m and 2700 m. It is compared with the morphologically similar *Cystopteris fragilis f. fragilis* Bir and Trikha and differs from it being large in height, pinnules with acute apex and deeply toothed, spores large and scaly, appendiculate with 1-2 pairs of basal appendages. The drawings were sketched by use of camera lucida and micrographs of the spores were taken under 10 x X 40 x magnification.

Index Terms- A new forma of *Cystopteris fragilis* from Kashmir, India

I. INTRODUCTION

Cystopteris generally known as bladder fern or fragile fern grows in the rocky areas or stony and gravelly soil. *Cystopteris* has about 10 species distributed all the world over (Lovis 1977) and belongs to family Cystopteridaceae (Maarten et al. 2011). The taxonomic revision of the genus has been studied by Blasdell (1963). *Cystopteris* is widely distributed in America, Africa and neighbouring Islands of Euroasia. It also occurs in Southern Australia, Tumania, New Zealand, Hawaiian Islands as well as the central Islands of Kerqueen and South Georgia. In the flora of Jammu and Kashmir, only three species are reported namely *Cystopteris dickiean*, *C. fragilis* and *C. montana*. There has been a considerable debate on the taxonomic status of this genus complexity particularly based on the characters of fronds and surface sculpturing of the spores (Parks et al., 2000). Similar studies have been carried out on spore morphology in different genera (Murtza, et. al. 2004; Faridah-Hanum et al. 2008; Devi & Singh 2011). In the present communication only two forma such as *Cystopteris fragilis f. fragilis* (L.) Bernh. and *Cytoperis fragilis f. kashmiriensis* has been studied from the different populations of the region and on the basis of diverse morphological characters a new forma is reported.

II. MATERIALS AND METHODS

The specimens were collected from the different altitudinal zones of Botanical Garden, University of Kashmir (1600 m), Gumri (3000 m), and Gulmarg (2700 m) of Kashmir Himalayas. For the study of scales, the parts bearing scales were kept in luke warm water for about 2 to 3 hours, then scales were gently removed with the help of forceps and mounted in Hoyer's medium (Anderson 1954) which had the following contents: Chloral hydrate: 200 gm

Glycerine: 20 cc.
Distilled water: 50 cc.
Gum acacia: 30 gm

The above mentioned contents were stirred well and mixed at room temperature to form the mountant. Camera lucida drawings were sketched at table height under 9x X 2x magnifications. The spore description is based on acetolysed (Erdtman, 1952) preparations. Microphotographs of spores were taken under 10x X 45x magnification. For the study of meiotic chromosomes, fronds with developing sporangia were fixed in cornoy's fluid (absolute alcohol, glacial acetic acid and chloroform in the proportion of 1: 1: 1) for 24 hours, then thoroughly washed and preserved in 70% of ethyl alcohol. Preserved sporangia were squashed in acetocarmine. Micrographs were taken under 7x X oil magnification. Explanatory diagrams are also given for cytological figures.

A. *Cystopteris fragilis f. kashmiriensis* Bhellum & Razdan

Root-stock erect, numerous, thread-like; young parts covered with scales (Figure 1); Scales ovate, lanceolate, apex acute not ending in a glandular cell yellowish brown. Cells are tetra to hexagonal in shape (Figure 2). Fronds arising in tuft, 15- 22 cm long, soft, delicate. Stalk 3- 7 cm long, dark brown, rachis green. Blade bipinnate, 3- 5 cm wide in the middle, tapering towards apex, green. Pinnules oblong, rhomboidal, apes acute, lobes pointed, deeply toothed. Sori in clusters on the ventral side of pinnules, brown when fully mature. Spores monolete, bilateral, convex in the lateral view and oblong, in polar view, size 49.09 x 30.9 µm., laesura 22. 1 µm., long, surface densely spinulose (Figure 6).

Specimens examined: The species is distributed in Kashmir Himalayas from 1600 to 3000 m.

B. *Cystopteris fragilis f. kashmiriensis* Bhellum & Razdan *f. nov.*

The new forma differet in plantae majors 15- 22 cm longae viridi stipula lactentia. Pinnules apice acutis, lobis acuminates et denticulatis profunde, spores etiam majora, laesura 22.1 µm longa. Summus appendages appendiculate Libra cum pars librae est flavescens et furva caligine fusca flavescens munitae sint tenues atque muratis whileas ceteris cellulis (Figure 4) uriusque formae.

This forma has been collected from Gulmarg, growing in rock crevices generally near water. It differs from the *Cystopteris fragilis f. fragilis* in the following characters.

- i. Plants larger 15- 22 cm long, stalk green.
- ii. Pinnules acute, lobes pointed and deeply toothed.
- iii. Spores larger 49.9 x 30.9 µm. with 22.1 lo µm long laesura.
- iv. Scales appediculate with 1- 2 pairs of basal appendages.

Upper half of the scale is yellowish brown and thick walled whileas rest of the cells are yellowish brown and thin walled (Figure 4)

Table 1: Differences between *Cystopteris fragilis f. fragilis* and *C. fragilis f. kashmiriensis*

S. No.	<i>Cystopteris fragilis f. fragilis</i> Bir & Trikha (Figure 2)	<i>Cystopteris fragilis f. kashmiriensis</i> Bhellum & Razdan (Figure 1)
1	Plants 11 to 17 cm long	Plants 15- 22 cm long
2	Pinnules obtuse at the apex, the lobes blunt and shallowly toothed	Pinnules acute at the apex, lobes pointed and deeply toothed.
3	Scales ovate, lanceolate with acute apex, ending in a glandular cell (Figure 3).	Scales with 1-2 pairs of basal appendages, apex without a glandular cell (Figure 4).
4	Spore size 42.2 x 26.3 μm . with 21.6 μm . long lasura (Figure 3)	Spore size 49.9 x 30.9 μm . long with 22.1 μm . long lasura (Figure 4)

The acetocarmine squash preparations of *Cystopteris fragilis f. fragilis* and *C. fragilis f. kashmiriensis* revealed normal course of meiosis with chromosome number $n= 84$ (Figure 5). The species is a tetraploid sexual.

III. ETYMOLOGY

The forma is named after the region Kashmir from where the specimens were collected. traploid sexual.

IV. RESULTS AND DISCUSSION

Faridah et al. (2008) focused his attention on morphology of spore and anatomical characteristics in addition to other features. Vida (1974) has undertaken a detailed cytological analysis of *C. fragilis* complex in Europe where possibility of somatic polyploidization is reported. During the spore study of *Cystopteris*, Blasdell (1963) has observed that with the increase in ploidy level of a species there is also an increase in the spore size and has further pointed that the average spore size of a plant within the genus can indicate its ploidy level with accuracy. From the present observations also both the forma studied are tetraploids but show variations in spore size. So it is evident that different ploidy levels of a genus can not be the reason for difference in the spore size but a species with same chromosome number growing in two different habitats can also exhibit difference in the spore size.

In dermal appendages of *Cystopteris* the apical cell may or may not be glandular. This character is useful in distinguishing different species of the genus. In fact, Indian species of *Cystopteris* can be distinguished on the basis of shape, colour and margin of the rhizome scale. Scales of *C. fragilis* are ovate, lanceolate, yellowish brown with acuminate apex ending in a glandular cell, margin entire as also reported presently for *C. fragilis f. fragilis* but the dermal appendages of *C. himalayensis* studied during present investigation revealed certain differences to these characters. These are appendiculate with 1-2 pairs of basal appendages and upper half of the scale is yellowish brown with thick walled cells while as rest of the cells are yellowish and thin walled, apex without a glandular cell.



Figure 1: *Cystopteris fragilis f. kashmiriensis*



Figure 2: *Cystopteris fragilis* f. *fragilis*

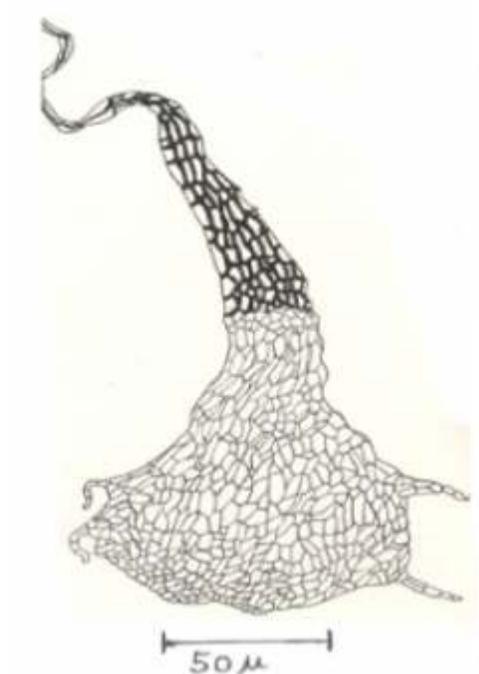


Figure 4: *Cystopteris fragilis* f. *kashmiriensis*

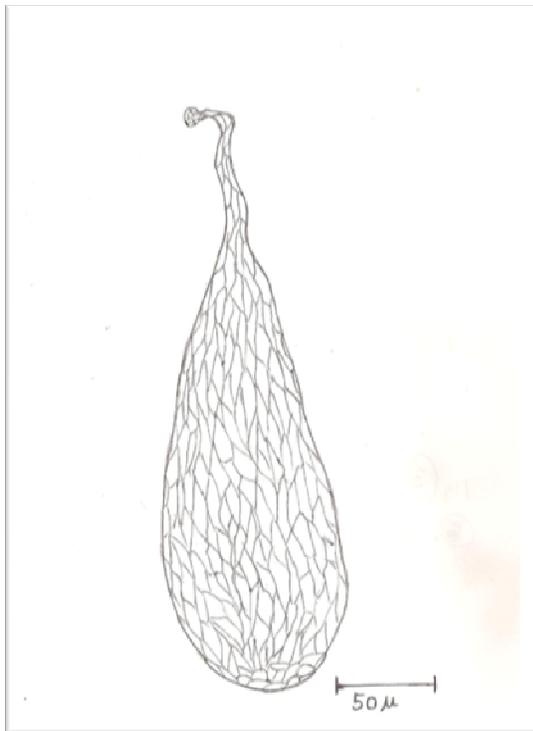


Figure 3: *Cystopteris fragilis* f. *fragilis*

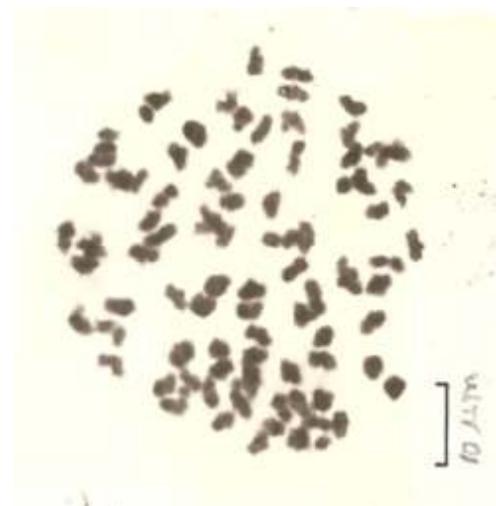


Figure 5: Chromosome number



Figure 6: Spore of *Cystopteris fragilis* f. *kashmiriensis*

Type: India, Jammu and Kashmir, Kashmir (KASH. 14483). The specimens were collected from Kashmir.

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Simulation of Real, Reactive Power and Regulation with UPFC

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Abstract- The Unified Power Flow Controller (UPFC) is the most sophisticated and complex power electronic equipment that has emerged for the control and optimization of power flow and also to regulate the voltage in electrical power transmission system. This paper presents real, reactive power and voltage control through a transmission line by placing UPFC at the sending end using computer simulation. When no UPFC is installed, real and reactive power through the transmission line cannot be controlled. A control system which enables the UPFC to follow the changes in reference values like AC voltage, DC voltage and angle order of the series voltage source converter is simulated. In this control system, a generalized pulse width modulation technique is used to generate firing pulses for both the converters. Simulations were carried out using MATLAB and PSCAD software to check the performance of UPFC.

Index Terms- power flow controller (UPFC), real, reactive power and voltage control

I. INTRODUCTION

With increasing demand of electric power, the existing transmission networks even in the developed countries are found to be weak which results in a poor quality of unreliable supply. In order to expand or enhance the power transfer capability of existing transmission network the concepts of FACTS (Flexible AC transmission system) is developed by the Electric Power Research Institute (EPRI) in the late 1980s. The main objective of facts devices is to replace the existing slow acting mechanical controls required to react to the changing system conditions by rather fast acting electronic controls. FACTS means alternating current transmissions systems incorporating power electronic based and other static controllers to enhance controllability and increase power transfer capability [1]. Facts controllers may be series, shunt or combination of both. Shunt controllers inject current into the system and may be variable impedance or variable source or both for ex: Static Synchronous Compensator (STATCOM), static var compensator (SVC) etc. Series controllers inject voltage in series with the line for ex: Static Synchronous Series Compensator (SSSC), Thyristor controlled Series Capacitor (TCSC), Thyristor switched series Capacitor (TSSC), Thyristor Controlled Series Reactor (TCSR), Thyristor Switched Series Reactor (TSSR). A combination of static synchronous compensator (STATCOM) and static series compensator (SSSC) which are coupled via a common dc link to allow bidirectional flow of real power between series o/p terminals of SSSC and shunt o/p terminals of STATCOM is called UPFC (unified Power Flow Controller).

The UPFC is the most versatile and complex of the FACTS devices, combining the features of the STATCOM and SSSC. The UPFC can provide simultaneous control of all basic power system parameters, ie, transmission voltage, impedance and phase angle. It is recognized as the most sophisticated power flow controller currently, and probably the most expensive one. In this paper, a UPFC control system that includes both the shunt converter and the series inverter has been simulated. The performance of UPFC in real, reactive power flow and regulation of voltage has been evaluated.

The improvements in the field of power electronics have had major impact on the development of concept itself. A new generation of FACTS controllers has emerged with the improvement of Gate Turn-off (GTO) thyristor ratings(4500V to 6000V, 1000A to 6000A).These controllers are based on voltage source converters and include devices such as Static Var Compensators (SVCs), Static Synchronous Compensators(STATCOMS), Static Synchronous Series Compensators(SSSCs) and the Unified Power Flow Controllers (UPFCs).

II. OPERATING PRINCIPLE OF UPFC

The basic components of the UPFC are the two voltage source converters sharing a common dc storage capacitor, and connected to the power system through the coupling transformers. One converter is connected to in shunt to the transmission system via a shunt transformer, while the other one is connected in series through a series transformer. A basic UPFC functional scheme is shown in Figure .1.

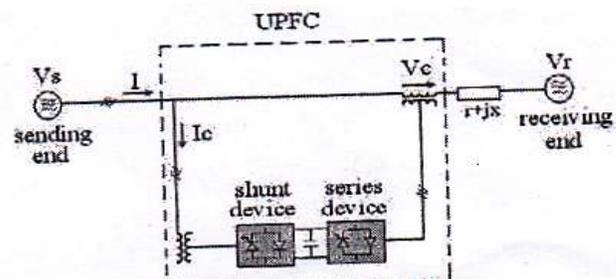


Figure 1: Basic functional scheme of UPFC

The series inverter is controlled to inject a symmetrical three phase voltage system, of controllable magnitude and phase angle in series with the line to control active and reactive Power flows on the transmission line [5]. So this inverter will exchange active and reactive power with the line. The reactive power is

electronically provided by the series inverter and it is excited by dc link capacitor [6]. The shunt converter is operated in such a way as to demand this dc terminal power from the line keeping the voltage across the storage capacitor V_{dc} constant. So the net real power absorbed from the line by the UPFC is equal only to the losses of the converters and their transformers. The remaining capacity of the shunt converter can be used to exchange reactive power with the line so to provide the voltage regulation at the connection point.

The main function of UPFC is to inject an ac voltage with controllable magnitude and phase angle at the power frequency in series with the voltage and the transmission line via an insertion transformer [2]. This injected voltage is provided by the inverter (booster) which acts essentially as a synchronous AC voltage source. The real power exchanged between the line and the inverter is supplied by the exciter through the DC bus and is equal to the real power exchanged between the line and the exciter at the shunt terminal. By inserting a controllable AC voltage, the UPFC regulates the magnitude and phase angle of transmission line voltage at its series terminal to achieve a prescribed active power and reactive power in the line.

The two converters can work independently of each other by separating the dc side. So in that case, the shunt converter is operating as a STATCOM that generates or absorbs reactive power to regulate the voltage magnitude at the connection point. Instead, the series inverter is operating as SSSC that generates or absorbs reactive power to regulate the current flow, and hence the power flows on the transmission line.

III. MATHEMATICAL MODEL OF UPFC

The basic model of UPFC and its operation can be represented as shown in Figure 2.

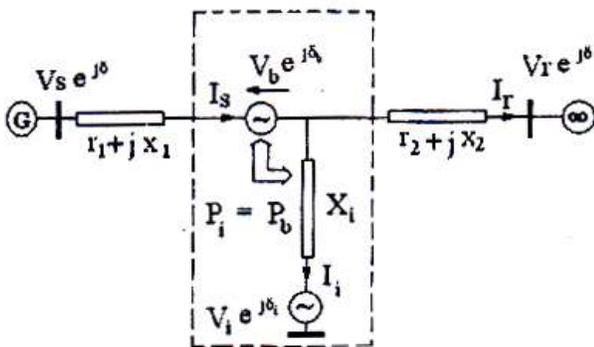


Figure 2: Mathematical model of UPFC

In this model, we have considered the UPFC is placed at the centre of a medium transmission line (100km). The equations for sending end active and reactive power can be obtained from the real and imaginary powers of power equation as follows:

$$P_s = \text{Real part of } [V_s \angle \alpha \times I_s^*]$$

$$= 0.138 + 0.25 \times \sin(\alpha_b - \alpha) - 0.138 \times \cos \alpha$$

$$Q_s = \text{Imaginary part of } [V_s \angle \alpha \times I_s^*]$$

$$= 1.56 - 1.56 \times \cos \alpha + 0.25 \times \cos(\alpha - \alpha_b) + 0.02 \sin(\alpha - \alpha_b) - 0.138 \sin \alpha$$

The variation limits of α_b and α are according to the following relation:

$$0 \leq \alpha_b \leq 2\pi$$

$$0 \leq \alpha \leq 0.71 \text{ radians}$$

IV. SIMULATION SETUP IN PSCAD

Figure 3. shows the simulation model including a power system with a transmission line. The UPFC installed near the sending end effectively controls the power flow from sending to receiving end.

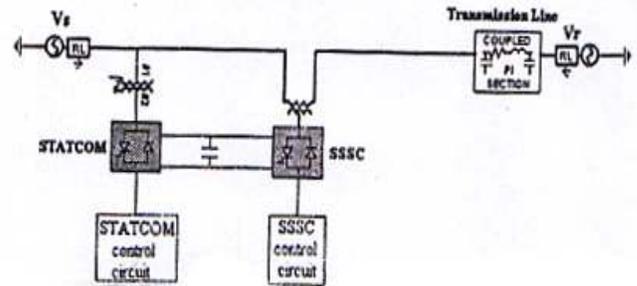


Figure 3: Power system study model

Here V_s and V_r are assumed to be sending and receiving end voltages. This model is based on the assumption that sending end corresponds to a power plant while the receiving end to an electric power network. The receiving end voltage V_r being an infinite bus will not cause any phase angle change. The phase angle of V_s is adjusted according to the power demand for the power plant. A phase difference of 12° sending and receiving end voltages is simulated.

The main circuit of the series device (SSSC) consists of a three phase PWM inverter, the ac terminals of which are connected in series to a transmission line through 3 single phase transformers. The shunt device (STATCOM) consists of a three phase PWM inverter, the ac terminals of which are connected in parallel with the transmission line via a three phase star delta transformer [3].

A. Control circuits

In this simulation, the shunt converter operates in automatic voltage control mode. Figure 4. shows the DC voltage control circuit for the shunt converter. DC link voltage is measured (VDCM) and compared with the reference value (VDCref), whose error is fed to the PI controller to generate the shift.

Similarly, AC voltage from the sending end bus feeding the shunt coupling transformer is measured in p.u (V_{pum}) and compared with the ac voltage set point (here 1.0 p.u), whose error is m_i . Figure 5. shows the AC voltage control circuit for shunt converter. Two sets of signals, reference and triangular ones are needed, one set for turning on and the other for turning off the GTOs. The generated shift and m_i signals are used to develop firing pulses for 6 GTOs in the inverter in PSCAD environment. A generalized sinusoidal pulse width modulation switching technique is used for pulse generation. HL logic is used to generate firing pulses.

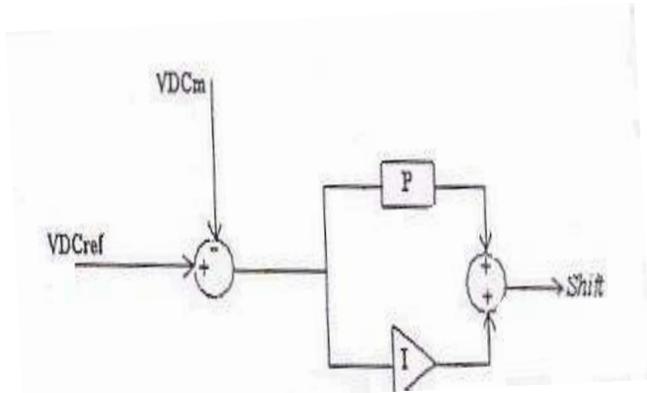


Figure 4: STATCOM DC Voltage controller

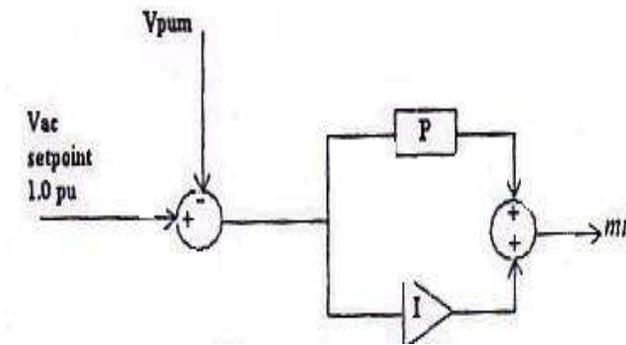


Figure 5: STATCOM AC Voltage controller

In this case series inverter operates in the direct voltage injection mode. The series inverter simply injects voltage as per the theta order specified. Figure .6. shows the series inverter control circuit, which is an open loop phase angle controller, generates modulation index, mi and shift. The mi and shift are used to generate firing pulses.

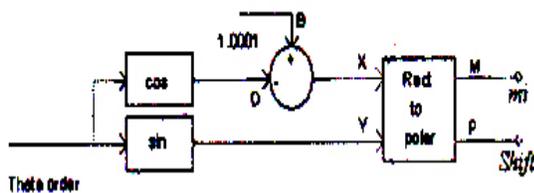


Figure 6: Series inverter open loop phase angle controller

V. SIMULATOR RESULTS

A transmission line of a simple power system with parameters as given in Table 1 is considered. UPFC is placed in series with the transmission line at the sending end. Voltage ,active power, reactive power with UPFC and without UPFC are studied and compared. The power system studied is SMIB system. When the transmission line is without UPFC, the sending end and receiving end voltages are 1 p.u as shown in Figure . 7(a). when UPFC is

placed across the same transmission line, the voltage regulation is improved as per F igure .7(b).

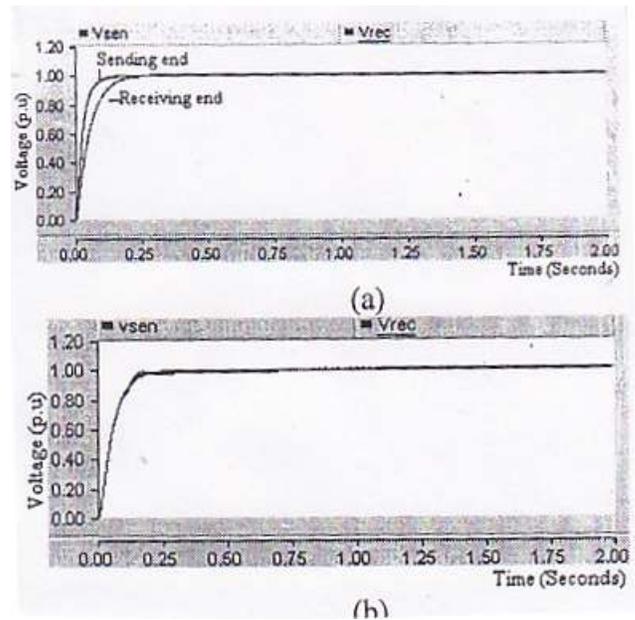


Figure 7: Sending and receiving end voltages (a) Without UPFC (b) With UPFC

In this simulation, the theta order input to the series inverter control circuit is 5° . The series inverter injects voltage into the transmission line at point of connection.

By varying the theta order input to the controller the phase and magnitude of series injected voltage can be varied.

When the transmission line is without UPFC, the real and reactive power flow cannot be controlled [4]. Figure 8(a) shows the active power through the line without UPFC. Figure 8(b) shows the active power flow through the line which is controlled by UPFC. Transmission capability of existing transmission line is highly improved with the presence of UPFC. But the difference between the sending end real power and receiving end real power is high in the transmission line with UPFC. This is due to increase in transmission losses, which include losses in both converters and coupling transformers.

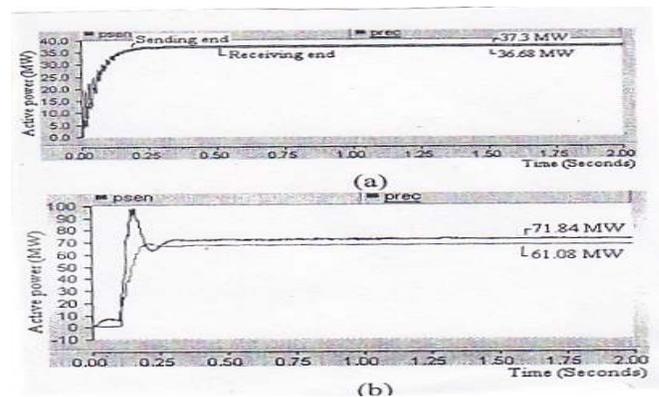


Figure 8: Sending and receiving end active power (a) Without UPFC (b) With UPFC

The reactive power flow through the transmission line with and without UPFC is shown in Figure .9. The raise in transmission capability is noticed from the simulation results.

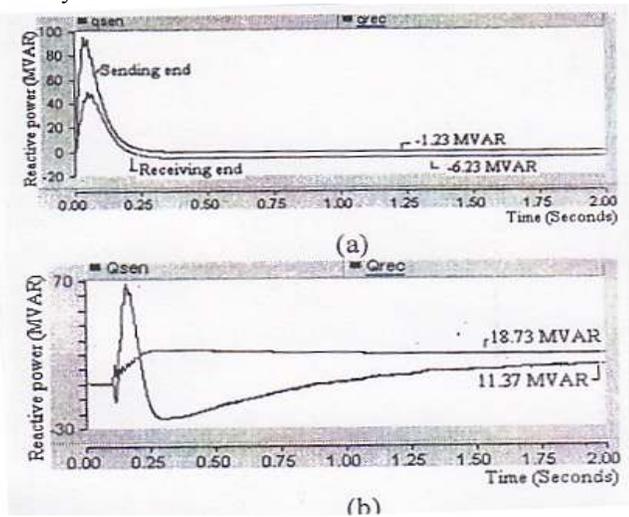


Figure 9: Sending and receiving end reactive power (a) Without UPFC (b) With UPFC

The performance of the UPFC can be justified by its controller’s performance. AC voltage controller tracking its reference values is shown in Figure .7. Similarly DC voltage controller tracks its reference value, 46 KV as shown in Figure .10.

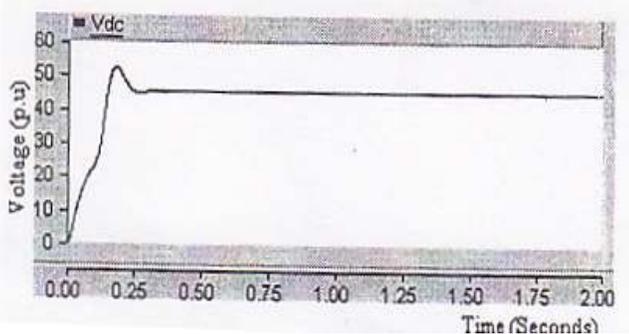


Figure 10: DC link voltage in UPFC

The series inverter injects voltage of variable magnitude and phase into the transmission line at the point of its connection, there by controlling real and reactive power flow through the line. The active power through the line is supplied by SSSC active power. This real power obtained from the DC source connected to its DC terminals. The shunt converter provides the required power to the series inverter through the DC link active power [7].

TABLE 1. SYSTEM PARAMETERS

Line to line voltage	230 KV
Frequency	60 HZ
Transmission rating	100 MVA
Capacitance of DC link	2000μF
DC link voltage	46KV
Length of transmission line	100 Km
Resistance of the line	32.1 μΩ/m
Inductive reactance of the	388 μΩ/m

line	
Capacitive reactance of the line	242 M m/Ω

VI. CONCLUSION

In this PSCAD environment is used to simulate the model of UPFC connected to a three phase three wire transmission system. This paper presents control and performance of UPFC intended for installation on a transmission line. A control system is simulated with shunt converter in AC and DC voltage control mode and series inverter in open loop phase angle control mode. Simulation results show the effectiveness of UPFC in controlling real, reactive power and voltage through the line. Due to AC voltage controller, AC voltage regulation is improved. The DC voltage controller maintains the DC link voltage to the DC voltage set point 46 KV. This paper presents an improvement in the real and reactive power flow through the transmission line with UPFC when compared to the system without UPFC.

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Watermarking Scheme for Color Image Authentication

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Abstract- Digital watermarking is the technique for embedding information into a digital signal. The watermarking technique provides a persistent link between the authenticator and the content it authenticates. The digital image watermarking can be categorized into different category-Visible and Invisible as well as Fragile, Semi-fragile and Robust. In this kind of watermarking the information is added as digital data to the original, but it cannot be perceived in Human Visual System (HVS). Image authentication has achieved a sharp attention now a day due to broad availability of Internet services. Mal distribution and illegal copying of image, volatiles the authenticity of image ownership. The proposed technique will ensure the complete authentication of ownership in a dynamic manner. The proposed technique forms the watermark from the host image itself by combining the unique zone of the host image, and then it is embedded to the host image with LSB scheme. It allows a user with an appropriate secret key and a hash function to verify the authenticity, integrity and ownership of an image. If a forger performs the watermark extraction with an incorrect key and inappropriate hash function, the user obtains an image that resembles noise. This provides integrated solution for ownership authentication where the watermark is unique for that particular host image, thus the authentication is ensured in an efficient way. At the watermark extraction end, blind extraction method is used, i.e., neither the host image nor the watermark image is required at the time of watermark extraction. The PSNR is a measure of quality of watermarked image. PSNR is provided only to give us a rough approximation of the quality of the watermark for different color images.

Index Terms- authentication; ownership; invisible watermarking; LSB scheme

I. INTRODUCTION

Digital Watermarking is the technique for embedding information into a digital signal. The watermarking technique provides a persistent link between the authenticator and the content it authenticates. The digital image watermarking can be categorized into different category- Visible and Invisible as well as Fragile, Semi-fragile and Robust. In invisible fragile watermarking the information is added as digital data to the original, but it can not be perceived in Human Visual System(HVS). Suppose a user doesn't have a watermark or the user doesn't have that much of time to create the watermark. As a remedy to the aforesaid problem we've introduced a new framework that dynamically forms the watermark from the host image by combining the unique zone of the host image. As an added flavor the ownership authentication is guaranteed in an efficient manner. Because every host image will have its own dynamically formed watermark. The dynamic watermarking framework will ensure:

- *No watermark construction overhead.*
- *Uniqueness in dynamically formed watermark.*

II. TECHNIQUES OF WATERMARKING

A. Least Significant Bit Modification

The most straight-forward method of watermark embedding, would be to embed the watermark into the least-significant-bits of the cover object .Given the extraordinarily high channel capacity of using the entire cover for transmission in this method, a smaller object may be embedded multiple times. Even if most of these are lost due to attacks, a single surviving watermark would be considered a success. LSB substitution however despite its simplicity brings a host of drawbacks. Although it may survive transformations such as cropping, any addition of noise or lossy compression is likely to defeat the watermark. An even better attack would be to simply set the LSB bits of each pixel to one...fully defeating the watermark with negligible impact on the cover object. Furthermore, once the algorithm is discovered, the embedded watermark could be easily modified by an intermediate party. An improvement on basic LSB substitution would be to use a pseudo-random number generator to determine the pixels to be used for embedding based on a given "seed" or key . Security of the watermark would be improved as the watermark could no longer be easily viewed by intermediate parties. The algorithm however would still be vulnerable to replacing the LSB's with a constant. Even in locations that were not used for watermarking bits, the impact of the substitution on the cover image would be negligible. LSB modification proves to be a simple and fairly powerful tool for steganography, however lacks the basic robustness that watermarking applications require.

B. Frequency Domain Techniques

An advantage of the spatial techniques discussed above is that they can be easily applied to any image, regardless of subsequent processing (whether they survive this processing however is a different matter entirely). A possible disadvantage of spatial techniques is they do not allow for the exploitation of this subsequent processing in order to increase the robustness of the watermark. In addition to this, adaptive watermarking techniques are a bit more difficult in the spatial domain. Both the robustness and quality of the watermark could be improved if the properties of the cover image could similarly be exploited. For instance, it is generally preferable to hide watermarking information in noisy regions and edges of images, rather than in smoother regions. The benefit is two-fold; Degradation in smoother regions of an image is more noticeable to the HVS, and becomes a prime target for lossy compression schemes. Taking these aspects into consideration, working in a frequency domain of some sort becomes very attractive. The classic and still most popular domain for image processing is that of the Discrete-Cosine-Transform, or DCT. The DCT allows an image to be broken up into different frequency bands, making it much easier to embed

watermarking information into the middle frequency bands of an image. The middle frequency bands are chosen such that they have minimize they avoid the most visual important parts of the image (low frequencies) without over-exposing themselves to removal through compression and noise attacks (high frequencies).

One such technique utilizes the comparison of middle-band DCT coefficients to encode a single bit into a DCT block. To begin, we define the middle-band frequencies (F_M) of an 8×8 DCT block as shown below in figure 1.

F_L is used to denote the lowest frequency components of the block, while F_H is used to denote the higher frequency components.

F_M is chosen as the embedding region as to provide additional resistance to lossy compression techniques, while avoiding significant modification of the cover image.

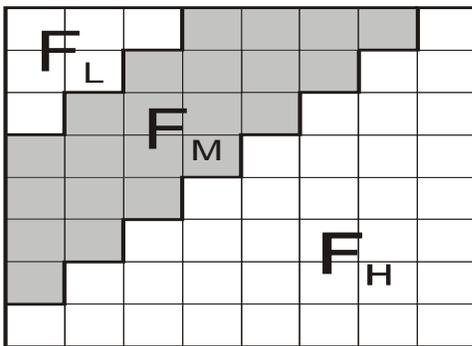


Figure 1. Definition of DCT Regions

Next two locations $B_i(u_1, v_1)$ and $B_i(u_2, v_2)$ are chosen from the F_M region for comparison. Rather than arbitrarily choosing these locations, extra robustness to compression can be achieved if we base the choice of coefficients on the recommended JPEG quantization values. If two locations are chosen such that they have identical quantization values, we can feel confident that any scaling of one coefficient will scale the other by the same factor...preserving their relative size.

III. TECHNIQUE FOR FORMATION OF WATERMARK

Convert the host image from RGB model to YST model. Then we divide the host image in 'n' number of different blocks depending on the size of the image. After that we apply Discrete Cosine Transform (DCT) on such blocks and identify the maximum pixel from all blocks those contain the most high frequencies. Combining those pixels we form the watermark image dynamically.

A. Algorithm for formation of watermark

- Convert the Host Image from RGB model to YST model.
- Divide the host image in 'n' number of different blocks depending on the size of the image.
- After that apply Discrete Cosine Transform (DCT) on such blocks.
- Identify the maximum pixel from all blocks those contain the most high frequencies.
- Combine those pixels we form the watermark image dynamically.

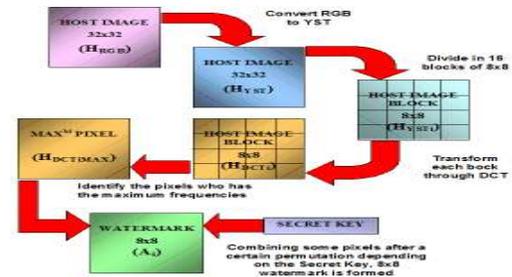


Figure 2. Schematic Diagram to form Watermark

B. Execution of Algorithm for formation of watermark

- Input: Host Image Block

$$H_i = \begin{bmatrix} 117\&116\&111 & 117\&116\&111 & \dots & 115\&118\&111 & 116\&117\&111 \\ 121\&120\&115 & 120\&119\&114 & \dots & 110\&113\&106 & 109\&112\&105 \\ \vdots & \vdots \\ 111\&112\&106 & 111\&112\&106 & \dots & 104\&109\&102 & 106\&109\&102 \\ 111\&110\&105 & 110\&111\&105 & \dots & 105\&110\&103 & 107\&110\&103 \end{bmatrix}$$

- Convert H_i from RGB color model to YST color model to form H_{YSTi} .

$$H_{YSTi} = \begin{bmatrix} 115.75 & 115.75 & \dots & 116.32 & 119.75 \\ 118.75 & 118.03 & \dots & 119.04 & 118.03 \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ 106.73 & 107.33 & \dots & 109.32 & 108.72 \\ 107.72 & 108.33 & \dots & 108.72 & 107.72 \end{bmatrix}$$

- Transform H_{YSTi} through Discrete Cosine Transform to obtain H_{DCTi} .
- Identify all such H_{DCTi} pixels those contain most high frequencies.
- Combining those pixels after certain permutation depending on a secret key the watermark is formed.

IV. TECHNIQUE FOR EMBEDDING WATERMARK AND EXTRACTING THE WATERMARK

Extract LSB's of 'Blue (B)' value from each pixel of individual blocks of host image using a secret key and a hash function. 'Blue' is the most high frequency part of an image. That's why it is less sensitive to Human Visual System (HVS). Only the 'Blue' value of the color host image is to be manipulated.

A. Algorithm for Embedding Watermark using LSB Scheme

Input: Color host image block (Y_i), Watermark image(A), Secret key (K).

Output: Watermark embedded image block (W_i).

- Get the pixel information from the host image (Y_i) to get (Y_{ip}).

- The LSB of the binary values of Y_{ip} is converted to zero to form L_i .
- Generate H_i depending on the value of L_i and The 16-bit secret key (K).
- Generate A_i by extracting LSB of blue value of each pixel of A .
- Generate X_i by XORing H_i and A_i .
- Generate W_i by replacing the LSB of Y_{ip} with X_i .

B. Algorithm for Extracting Watermark using 1-bit Scheme:

Input: Watermark embedded image block (W_i),
Secret key (K).

Output: Extracted watermark image block (A_i).

- The LSB of the binary values of W_i is converted to zero to form L_i .
- H_i is generated depending on the value of L_i and The 16-bit secret key (K).
- R_i formed by extracting LSB of blue value of each pixel of W_i .
- A_i is formed by XORing H_i and R_i .

C. Execution of Algorithm for Embedding Watermark using LSB Scheme:

Input: Host Image block

$$Y = \begin{bmatrix} 155\&153\&154 & 153\&153\&153 & 154\&154\&154 & 156\&158\&157 \\ 155\&153\&154 & 54\&154\&154 & 55\&155\&155 & 156\&158\&157 \\ 153\&151\&152 & 154\&154\&154 & 156\&156\&156 & 156\&158\&157 \\ 152\&150\&151 & 154\&154\&154 & 157\&157\&157 & 156\&158\&157 \end{bmatrix}$$

Watermark Image:

$$A = \begin{bmatrix} 172\&197\&168 & 154\&183\&153 & 146\&180\&145 & 144\&178\&143 \\ 155\&186\&155 & 142\&173\&141 & 137\&171\&134 & 139\&171\&134 \\ 144\&180\&144 & 137\&171\&134 & 141\&173\&134 & 140\&170\&132 \\ 145\&179\&142 & 141\&173\&134 & 141\&172\&131 & 138\&169\&128 \end{bmatrix}$$

Secret Key: $K = 1111\ 0000\ 1010\ 1100$

The binary information of blue value of a pixel of Y_i is given by Y_{ip} .

$$Y_{ip} = \begin{bmatrix} 10011010 & 10011001 & 10011010 & 10011101 \\ 10011010 & 10011010 & 10011011 & 10011101 \\ 10011000 & 10011010 & 10011100 & 10011101 \\ 10010111 & 10011010 & 10011101 & 10011101 \end{bmatrix}$$

The binary information of blue value of a pixel of A is given by A_b .

$$A_b = \begin{bmatrix} 10101000 & 10011001 & 10010001 & 10001111 \\ 10011011 & 10001101 & 10000110 & 10000110 \\ 10010000 & 10000110 & 10000110 & 10000100 \\ 10001110 & 10000110 & 10000011 & 10000000 \end{bmatrix}$$

The LSB of the binary values of Y_{ip} is converted to zero to form L_i .

$$L_i = \begin{bmatrix} 10011010 & 10011000 & 10011010 & 10011100 \\ 10011010 & 10011010 & 10011010 & 10011100 \\ 10011000 & 10011010 & 10011100 & 10011100 \\ 10010110 & 10011010 & 10011100 & 10011100 \end{bmatrix}$$

H_i is generated depending on the value of L_i and The 16-bit secret key (K).

A_i is formed by extracting LSB of blue value of each pixel of A .

$$A_i = \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

X_i is formed by XORing H_i and A_i .

$$X_i = \begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix}$$

W_i is formed by replacing the LSB of Y_{ip} with X_i .

$$W_i = \begin{bmatrix} 10011010 & 10011000 & 10011010 & 10011101 \\ 10011010 & 10011011 & 10011010 & 10011101 \\ 10011000 & 10011011 & 10011100 & 10011101 \\ 10010110 & 10011010 & 10011100 & 10011100 \end{bmatrix}$$

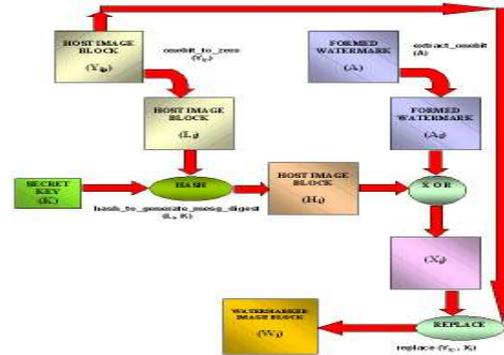


Figure 3. Schematic Diagram for Embedding Watermark



Figure 3. a) Host Image b) Formed Watermark



Figure 4. a) Watermarked Image b) Extracted Watermark

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Automatic Accident Detection via Embedded GSM message interface with Sensor Technology

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Abstract- An automatic alarm device for traffic accidents is introduced in this paper. It can automatically find a traffic accident, search for the spot and then send the basic information to first aid center within two seconds covering geographical coordinates, the time and circumstances in which a traffic accident takes place. GPS software is fitted in the vehicle will now start communicate with the satellite and get the latitude and longitude values and send the information to the centralized server.

Then the server will search the nearest hospital and send the accident information to the hospital. The hospital will then be sending the ambulance to the accident zone. Then the injured people will be saved as soon as possible. This process will save time in particular for the areas in the outer part of main zone.

Index Terms- GSM, MEMS, automatic accident detection, GPS.

I. INTRODUCTION

The rapid development of economic construction and people's living standard continues to improve. as well as road traffic accident take place frequently which caused huge losses of life and property to the country and people. Traffic has become an important event in the national interest. it will be a serious consequences if people cannot sent weft to the outside for help when traffic occur. Poor emergency incident is a major cause for the high number of traffic fatalities and the death rate in our country.

The design is a equipment which can detect accidents ,search of accident place and sent rescue alarm automatically. application of this device can significantly shorten the warning time of the accident and determine the accident site. accident detection and information sending are full automated, which win a valuable rescue time. It plays a significant role in rescuing the wounded lives and reducing loss of lives and property of the State and people to reduce road traffic hazards. This design has acquired the utility patent of State Intellectual Property Office, patent number: ZL 200920089697.9.

II. SYSTEM ARCHITECTURE

The design is a traffic accident automatic detection and long-distance alarm device.It makes up of the control module MC9S08AW60, information detection module includes large

range dual-axis accelerometer MMA621010EG and small-scale three-axis accelerometer sensor MMA7260QT, GPS positioning module GS-87, people machine interaction module, including the keyboard and LED, and message sending module TC35i module. When a vehicle collision accident occurred,large number dual-axis accelerometer MMA621010EG detects the level of the collision automatically, vehicle rollover accident occurred, the Z-axis of small range acceleration sensor automatically detects the vehicle roll angle . Accident signal is sent when the angle is greater than the set value given. using mobile phone text messages of accident information (accident geographical coordinates, altitude, license plate number, time, date) through the TC35i sent to the owner's family and friends, rescue units and the transport sector.block diagram shown in Figure 1.

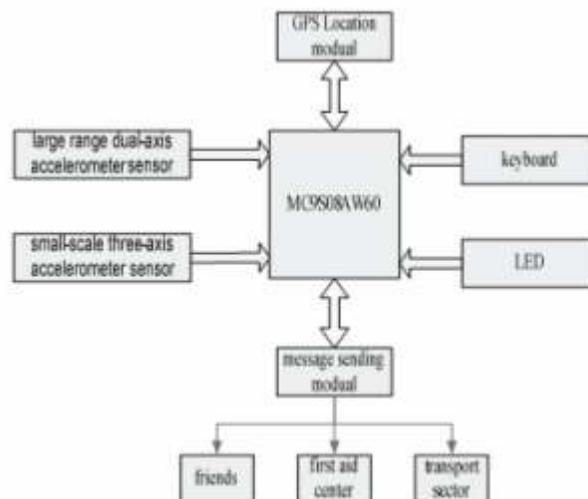


Figure.1: System structure diagram

GS-87 real-time search for satellite signals, through the program to extract the geographic coordinates, altitude, time, date and other information. The phone number to receive text messages and the license plate numbers can be directly solidified in the program. Keyboard keys are "false alarms", emergency", "reported safety" and "close the colorful LED". LED lights indicate system functions were normal, the system fails, GPS satellite signal search, and send information the normal and abnormal signals.

III. HARDWARE DESIGN

A. The Information Detection Module

Information detection module consists of large-range dual-axis accelerometer MMA621010EG and small-scale three-axis accelerometer sensor MMA7260QT. MMA621010EG is a proven special car accident sensor which is integrated XY-axis accelerometer and built-in serial peripheral interface SPI bus, compatible with 3.3V and 5V voltage. The accelerometer has self-test function. mechanical and circuit can be calibrated performance before and after the installation. advanced converter design to improve the sensor offset and over damped response, to improve system reliability and reduce the high frequency, high amplitude attenuation of the parasitic resonance.

The sensor can help identify false status which may lead to an accident situation, to ensure accurate detection of accident information. Accelerometer MMA7260QT, can read low order of magnitude drop, tilt, locomote, orientation, shock and vibration errors. Sensitivity is 1.5g, 2g, 4g and 6g. It has 3 μ A sleep mode configuration, 500 μ A low operating current, 1.0 ms fast response power supply, which can effectively detect vehicle rollover accident information, etc.

B. GPS Location Module

GPS location module GS-87 is the third generation of GPS receiver chip designed by the United States SiRF star III company, which consists of a radio frequency integrated circuit, a digital signal processing circuit and standard embedded GPS software composition. Radio frequency integrated circuit is used to detect and process GPS RF signal. Digital signal processing circuit is used to process the IF signal. The standard embedded GPS software is used search and follow up GPS satellite signals, Users to coordinate and speed is available according to the information. It is a high performance, low-power intelligent satellite receiver module or called satellite engine, is a complete GPS receiver.

C. Message Transmission Module

Message transmission module is TC35i module of the German Siemens TC35 module series. This is the latest Siemens wireless modules, compatible with the TC35 functionally. TC35i supports dual-band 900MHz and 1800MHz and supports for voice, data, short message and fax service, low power, is a highly integrated GSM module. Module and the microprocessor interface circuit shown in Figure 2.

ODBC:

Microsoft Open Database Connectivity (ODBC) is a standard programming interface for application developers and database systems providers. Before ODBC became a de facto standard for Windows programs to interface with database systems, programmers had to use proprietary languages for each database they wanted to connect to. Now, ODBC has made the choice of the database system almost irrelevant from a coding perspective, which is as it should be. Application developers have much more important things to worry about than the syntax that is needed to port their program from one database to another when business needs suddenly change.

The advantages of the scheme are so numerous that are probably thinking there must be some catch. The only disadvantage of ODBC is that it isn't as efficient as talking

directly to the native database interface. ODBC has had many detractors make the charge that it is too slow. Microsoft has always claimed that the critical factor in performance is the quality of the driver software that is used. In our humble opinion, this is true. The availability of good ODBC drivers has improved a great deal recently. And anyway, the criticism about performance is somewhat analogous to those who said that compilers would never match the speed of pure assembly language. Maybe not, but the compiler (or ODBC) gives the opportunity to write cleaner programs, which means finish sooner.

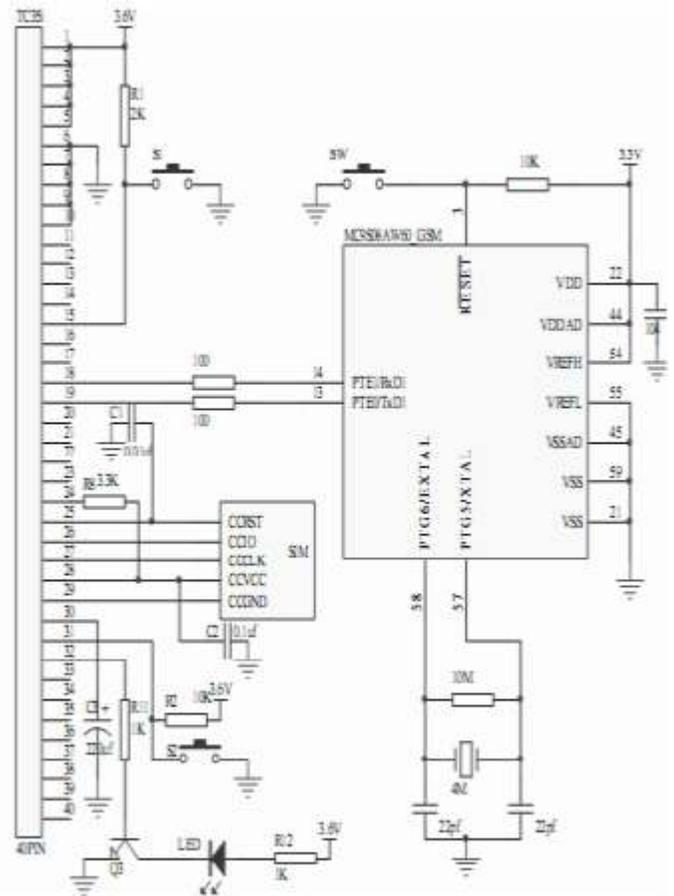


Figure 2: TC35i module connected with the microprocessor circuit

The 1-5,6-10 pins of TC35i are power supply pins, are connected to 3.6V power supply "+" and "-". The 15-pin of ZIF socket is the module enable pin. The serial port pins 18,19 are connected to microprocessor serial communication pins. 24-29 pins are connected to SIM card. 32-pin SYNC is connected to LED to indicate system status. LED light can indicate that TC35i is off or sleeping, SIM card is not inserted or the network login and TC35i being logged into the network is holding machine status signals.

IV. SYSTEM SOFTWARE DESIGN

The development environment for the system software is CodeWarrior 6.1 with the C program language been used. Flow chart of the program is presented in Fig.3. It is shows that the system includes the features as motorcycle accident information

detection, GPS satellite positioning and alarm information sending. After the system initialized by powered-on, it runs the sensor calibration program and system self-test program. Sending alarm information when the system is abnormal. It is to determine to send "false alarm", "Emergency for help" and "reported safety" information by scanning keyboard signal. It is confirmed that the motorcycle accident occurred when data abnormal detected by information detection module. Position information searched by the GPS and then sent by GSM. X'Y of MMA621010EG and Z-axis of MMA7260QT connected to the AD conversion interface of the microprocessor after a RC low-pass filter. The analog signal converted to digital by the 8-bit AD. It enables the microprocessor to detect the rollover or collision accident information effectively by calculating the different roll angle and set collision acceleration threshold.

According to NMEA-0183 protocol standard specifications, GPS receiver transmits the position and speed information to the PC and PDA etc. via the serial port. NMEA-0183 is a standard protocol which GPS receiver complied with. It is the most widely GPS receiver used protocol currently. According to NMEA - 0183, data is sent in statements. The receiver send multiple types of statements, only a few of letters in certain statements is valid, so it needs to parse the received data, separating out the required information. GS-87 module provides a serial communication interface, this design chooses 9600bps, serial communication parameters: Baud Rate: 9600, Data bits: 8 bits, stop bit: 1 bit, no parity. The SCI communication interface of MC9S08AW60 can read data sent by GS-87, the processing program can extract the effective geographic coordinates and time information. TC35i module data input/output interface is compliant with ITU-T RS232 interface standard. Fixed parameters: 8 data bits and 1 stop bit, no parity, baud rate 300bps ~ 115kbps, hardware control signal RTS0/CTS0, software flow control XON / XOFF, CMOS level, support the standard AT command set. Because instruction content is the ASCII code and short message in Chinese is encoded UNICODE code, the transmitting data must be encoded when microprocessor control TC35i module via AT commands. For the number of Chinese characters is large and the microprocessor resources are limited, the UNICODE code must put into the microprocessor memory which related to the Chinese characters involved in the message.

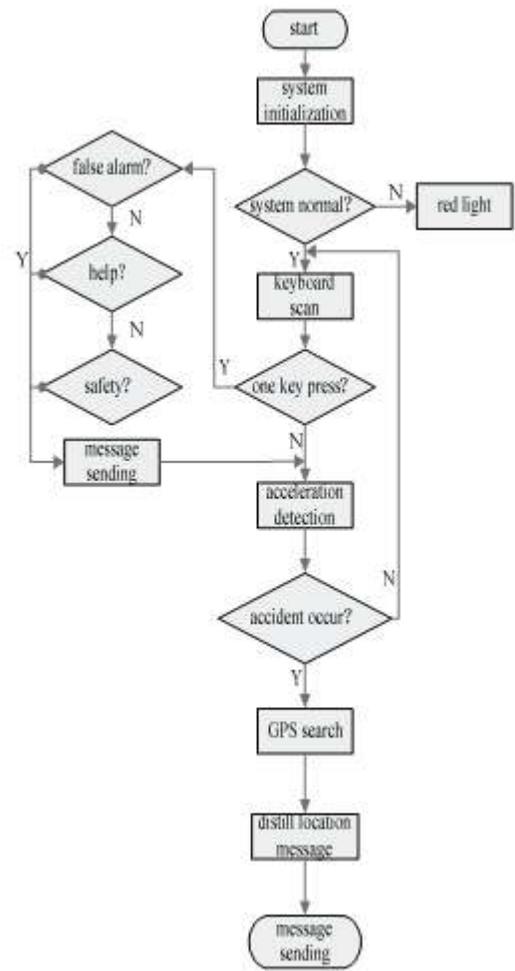


Figure.3: System software flow chart

ALGORITHM:

1. KNN Algorithm Description:

The K-nearest-neighbor measures the distance between a query scenario and a set of scenarios in the data set. The *k*-nearest neighbor algorithm (KNN) is a method for classifying objects based on closest training examples in the feature space. KNN is a type of instance-based learning, or lazy learning where the function is only approximated locally and all computation is deferred until classification. The *k*-nearest neighbor algorithm is amongst the simplest of all machine learning algorithms: an object is classified by a majority vote of its neighbors, with the object being assigned to the class most common amongst its *k* nearest neighbors (*k* is a positive integer typically small). If *k* = 1, then the object is simply assigned to the class of its nearest neighbor.

In pattern recognition, the *k*-nearest neighbor algorithm (k-NN) is a method for classifying objects based on closest training examples in the feature space. K-NN is a type of instance-based learning, or lazy learning where the function is only approximated locally and all computation is deferred until classification. The *k*-nearest neighbor algorithm is amongst the simplest of all machine learning algorithms: an object is classified by a majority vote of its neighbors, with the object being assigned to the class most common amongst its *k* nearest

neighbors (k is a positive integer, typically small). If $k = 1$, then the object is simply assigned to the class of its nearest neighbor. The neighbors are taken from a set of objects for which the correct classification (or, in the case of regression, the value of the property) is known. This can be thought of as the training set for the algorithm, though no explicit training step is required. The k -nearest neighbor algorithm is sensitive to the local structure of the data. Nearest neighbor rules in effect compute the decision boundary in an implicit manner. It is also possible to compute the decision boundary itself explicitly, and to do so in an efficient manner so that the computational complexity is a function of the boundary complexity. Usually Euclidean distance is used as the distance metric; however this is only applicable to continuous variables. In cases such as text classification, another metric such as the overlap metric (or Hamming distance) can be used. Often, the classification accuracy of " k "-NN can be improved significantly if the distance metric is learned with specialized algorithms such as Large Margin Nearest Neighbor or Neighborhood components analysis.

DISTANCE

The distance between two scenario using some distance function is $d(x,y)$ where scenarios are composed of features such that $x = \{x_1, \dots, x_N\}, y = \{y_1, \dots, y_N\}$.

Two Distance functions are discussed in this summary:

1. Absolute distance measuring:

$$d_A(x,y) = \sum_{i=1}^N |x_i - y_i|$$

2. Euclidean distance measuring:

$$d_E(x,y) = \sum_{i=1}^N \sqrt{x_i^2 - y_i^2}$$

KNN Algorithm:

The algorithm on how to compute the K-nearest neighbors is as follows:

1. Determine the parameter K = number of nearest neighbors beforehand.
2. Calculate the distance between the query-instance and all the training samples. It can use any distance algorithm.
3. Sort the distances for all the training samples and determine the nearest neighbor based on the K -th minimum distance.
4. Since it is supervised learning, get all the Categories of training data for the sorted value which fall under K .
5. Use the majority of nearest neighbors as the prediction value.

V. CONCLUSION

An automatic alarm device for traffic accidents is designed in this paper. It can shorten the alarm time greatly and locate the accident spot accurately, realizing the automation of accident detection and information transmission. Consequently, it will save the rescuers from wasting their time in search. The experiments of model car's collision and rollover proved that this system can automatically detect corresponding accident and sent

related information. Such functions can be achieved by buttons representing "false alarm", "help" and "safety", respectively.

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Nanoparticles as Alternative to Pesticides in Management Plant Diseases - A Review

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Abstract- For the past few decades, there has been a considerable in research interest in the area of natural product delivery using particulate for controlling plant pathology. The secondary metabolites in plants have been used in the formulation of nanoparticles through increase the effectiveness of therapeutic compounds used to reduce the spread of plant diseases, while minimizing side effects for being: rich source of bioactive chemicals, biodegradable in nature and non-polluting (eco-friendly). Particulate systems like Nanoparticles have been used a physical approach to alter and improve the effective to properties of some types of synthetic chemical pesticides or in the production of bio-pesticides directly. Here, we review various aspects of nanoparticles formulation, characterization, effect of their characteristics and their applications in management plant diseases.

Index Terms- nanoparticles, natural product, secondary metabolites, synthetic chemicals, management disease

I. INTRODUCTION

The need for biosynthesis of Nanoparticles rose as the physical and chemical processes were costly. So in the search of for cheaper pathways for nanoparticle synthesis, scientists used microorganisms and then plant extracts for synthesis. Nature has devised various processes for the synthesis of nano- and micro- length scaled inorganic materials which have contributed to the development of relatively new and largely unexplored area of research based on the biosynthesis of nonmaterial's (Mohanpuria et al., 2007). Biosynthesis of Nanoparticles is a kind of bottom up approach where the main reaction occurring is reduction/oxidation. The microbial enzymes or the plant phytochemicals with anti oxidant or reducing properties are usually responsible for reduction of metal compounds into their respective Nanoparticles.

The three main steps in the preparation of Nanoparticles that should be evaluated from a green chemistry perspective are the choice of the solvent medium used for the synthesis, the Biomimetic Synthesis of Nanoparticles: Science, Technology & Applicability 5 choice of an environmentally benign reducing agent and the choice of a non toxic material for the stabilization of the Nanoparticles. Most of the synthetic methods reported to date rely heavily on organic solvents. This is mainly due to the hydrophobicity of the capping agents used (Raveendran et al., 2002). Synthesis using bio-organisms is compatible with the green chemistry principles: the bio-organism is (i) eco-friendly as

are (ii) the reducing agent employed and (iii) the capping agent in the reaction (Li et al., 2007). These papers come to highlight on Bioactive Nanoparticles of plant which can be effective alternatives to from plant secondary metabolites as botanical biopesticides.

II. USE OF PLANTS TO SYNTHESIZE NANOPARTICALS

The advantage of using plants for the synthesis of nanoparticle is that they are easily available, safe to handle and possess a broad variability of metabolites that may aid in reduction. A number of plants are being currently investigated for their role in the of nanoparticle. Gold Nanoparticles with a size range of 2-20 nm have been synthesized using the live alfa alfa plants (Torresday et al., 2002). Nanoparticles of silver, nickel, cobalt, zinc and copper have also been synthesized inside the live plants of *Brassica juncea* (Indian mustard), *Medicago sativa* (Alfa) and *Heliantus annus* (Sunflower). Certain plants are known to accumulate higher concentrations of metals compared to others and such plants are termed as hyper accumulators. Of the plants investigated, *Brassica juncea* had better metal accumulating ability and later assimilating it as nanoparticle (Bali et al., 2006). Recently much work has been done with regard to plant assisted reduction of metal nanoparticle and the respective role of phytochemicals. The main phytochemicals responsible have been identified as terpenoids, flavones, ketones, aldehydes, amides and carboxylic acids in the light of IR spectroscopic studies. The main water soluble phytochemicals are flavones, organic acids and quinones which are responsible for immediate reduction.

The phytochemicals present in *Bryophyllum sp.* (Xerophytes), *Cyprus sp.* (Mesophytes) and *Hydrilla sp.* (Hydrophytes) were studied for their role in the synthesis of silver nanoparticle. The Xerophytes were found to contain emodin, an anthraquinone which could undergo redial tautomerization leading to the formation of silver Nanoparticles. The Mesophytes studied contained three types of benzoquinones, namely, cyperoquinone, dietchequinone and remirin. It was suggested that gentle warming followed by subsequent incubation resulted in the activation of quinones leading to particle size reduction. Catechol and protocatchaldehyde were reported in the hydrophyte studied along with otherphytochemicals. It was reported that catechol under alkaline conditions gets transformed into protocatchaldehyde and finally into protocatcheucic acid. Both these processes liberated hydrogen and it was suggested that it played a role in the synthesis of thenanoparticles. The size of the Nanoparticles synthesized using xerophytes, mesophytes and hydrophytes were in the range of 2- 5nm (Jha et al., 2009).

Recently gold nanoparticles have been synthesized using the extracts of *Magnolia kobus* and *Diopyros kaki* leaf extracts. The effect of temperature on nanoparticle formation was investigated and it was reported that polydisperse particles with a size range of 5- 300nm was obtained at lower temperature while a higher temperature supported the formation of smaller and spherical particles (Song *et al.*, 2009). While fungi and bacteria require a comparatively longer incubation time for the reduction of metal ions, water soluble phytochemicals do it in a much lesser time.

Therefore compared to biomimetic synthesis of Nanoparticles: Science, Technology & Applicability 9 bacteria and fungi, plants are better candidates for the synthesis of Nanoparticles. Taking use of plant tissue culture techniques and downstream processing procedures, it is possible to synthesize metallic as well as oxide Nanoparticles on an industrial scale once issues like the metabolic status of the plant etc. are properly addressed.

III. SYNTHESIS OF NANOPARTICLES IN PLANT

Studies indicated that the reducing phytochemicals in the neem leaf consisted mainly of terpenoids. It was found that these reducing components also served as capping and stabilizing agents in addition to reduction as revealed from FT IR studies. The major advantage of using the neem leaves is that it is a commonly available medicinal plant and the antibacterial such best, bacteria and fungi in plant activity of the biosynthesized silver nanoparticle might have been enhanced as it was capped with the neem leaf extract. Biomimetic Synthesis of Nanoparticles. The major chemical constituents in the extract were identified as nimbin and quercetin this compound possible to be anti-pathological causes of plants. (Shankar *et al.*, 2004, Tripathy *et al.*, 2009). Study is because of the Increase in new resistant strains of insect, bacteria and fungi against most potent antibiotics. Has promoted research in the well known activity compounds, including Nanoparticles and was more pronounced against pest than organisms.

IV. APPLICATION OF NANOPARTICLES AGAINST ANTI-MICROBIOLOGY IN PLANTS

Silver Nanoparticles have shown promise against gram positive *S. aureus*. As Metal nanoparticle embedded paints have been synthesized using vegetable oils and have been found to have good antimicrobial activity (Kumar *et al.*, 2008).

The use of nano-sized silver particles as antimicrobial agents has become more common as technological advances make their production more economical. One of the potential applications in which silver can be utilized is in management of plant diseases. Since silver displays multiple modes of inhibitory action to microorganisms (Clement and Jarret 1994), it may be used for controlling various plant pathogens in a relatively safer way compared to synthetic fungicides (Kim *et al.*, 2006). Until now, limited research provided some evidence of the applicability of silver for controlling plant diseases (Kim *et al.*, 2006).

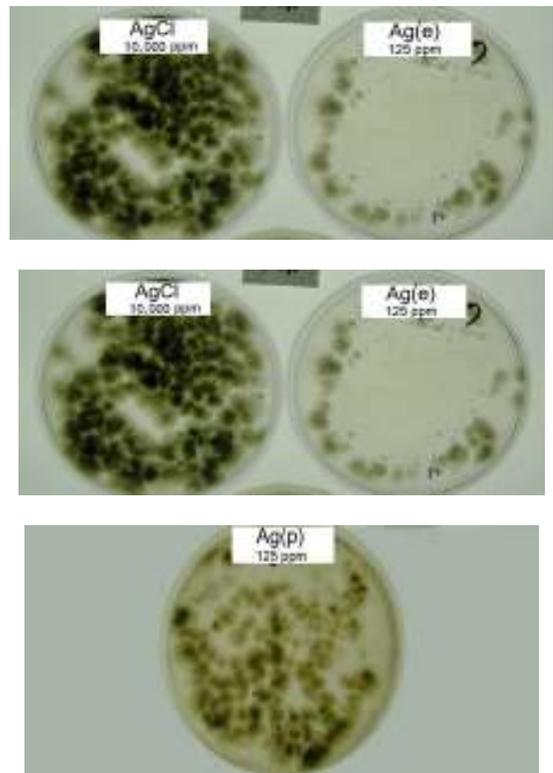
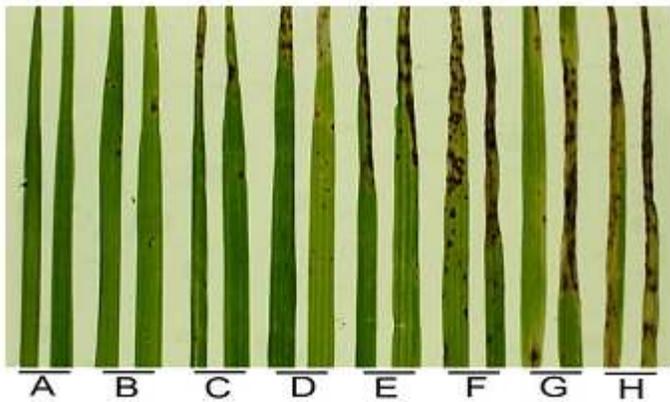


Fig. 1: Colony formation of *Bipolaris sorokiniana* on potato dextrose agar medium, 1 h post-treatment of spores with water, AgNO₃, AgCl, silver Nanoparticles [Ag(p)] and electrochemical silver [Ag(e)]. Images were captured after culture plates had been incubated for 6 days at 25°C. (Kim *et al.*, 2009).

Various forms of silver ions and Nanoparticles were tested by Kim *et al.* (2009) in the current study to examine the antifungal activity on two plant-pathogenic fungi, *Bipolaris sorokiniana* and *Magnaporthe grisea*. In vitro petri dish assays indicated that silver ions and Nanoparticles had a significant effect on the colony formation of these two pathogens. Effective concentrations of the silver compounds inhibiting colony formation by 50% (EC₅₀) were higher for *B. sorokiniana* than for *M. grisea*. The inhibitory effect on colony formation significantly diminished after silver cations were neutralized with chloride ions. Growth chamber inoculation assays further confirmed that both ionic and nanoparticle silver significantly reduced these two fungal diseases on perennial ryegrass (*Lolium perenne*). Particularly, silver ions and Nanoparticles effectively reduced disease severity with an application at 3 h before spore inoculation, but their efficacy significantly diminished when applied at 24 h after inoculation. The in vitro and in planta evaluations of silver indicated that both silver ions and Nanoparticles influence colony formation of spores and disease progress of plant-pathogenic fungi. In planta efficacy of silver ions and Nanoparticles is much greater with preventative application, which may promote the direct contact of silver with spores and germ tubes, and inhibit their viability.



Marek *et al* (2010) studied a significant reduction in mycelial growth was observed for spores incubated with silver Nanoparticles. The sporulation test showed that, relative to control samples, the number of spores formed by mycelia increased in the culture after contact with silver Nanoparticles, especially on the nutrient-poor PDA medium. The 24 h incubation of FC spores with a 2.5 ppm solution of silver Nanoparticles greatly reduced the number of germinating fragments and sprout length relative to the control.

Silver nanoparticles (WA-CV-WA13B) at various concentrations were applied before and after disease outbreak in plants to determine antifungal activities. In the field tests, the application of 100 ppm silver nanoparticles showed the highest inhibition rate for both before and after the outbreak of disease on cucumbers and pumpkins. Also, the application of 100 ppm silver nanoparticles showed maximum inhibition for the growth of fungal hyphae and conidial germination in *in vivo* tests. Scanning electron microscope results indicated that the silver nanoparticles caused detrimental effects on both mycelial growth and conidial germination (Kabir *et al*, 2010).

The antibacterial potentiality of zinc oxide (ZnO) nanoparticles (NPs), compared with conventional ZnO powder, against nine bacterial strains, mostly foodborne including pathogens, was evaluated using qualitative and quantitative assays. ZnO NP was more efficient as antibacterial agent than powder. Gram-positive bacteria were generally more sensitive to ZnO than Gram negatives. The exposure of *Salmonella typhimurium* and *Staphylococcus aureus* to their relevant minimal inhibitory concentrations from ZnO NP reduced the cell number to zero within 8 and 4 h, respectively. Scanning electron micrographs of the treated bacteria with NPs exhibited that the disruptive effect of ZnO on *S. aureus* was vigorous as all treated cells were completely exploded or lysed after only 4h from exposure. Promising results of ZnO NP antibacterial activity suggest its usage in food systems as preservative agent after further required investigations and risk assessments (Ahamed *et al*; 2011).

In study was planning to evaluate the potential of nano silver (NS) and nano dioxide titanium (TiO₂) to remove bacterial contaminants. Experiment involved NS and TiO₂ in MS medium. Tobacco explants were cultured on modified MS medium and evaluate after four weeks. This research shows that NS and TiO₂ had a good potential for removing of the

bacterial contaminants in tobacco plant tissue culture procedures (Kamran *et al*; 2011).

V. COLLOCATION

Use Nano particles for delivery of anti-microbiological or drug molecules will be at its helm in near future for therapy of all pathological sufferings of plants. There are myriad of Nanomaterials including polymeric nanoparticles, iron oxide nanoparticles, gold nanoparticles and silver ion which can be easily synthesized and exploited as pesticide. Antimicrobial activity of nano particles and after confirm the ability of nano to reduce the microorganism, we decide to using and adding NS to MS tissue culture media and the application of nanotechnology in the chemical and bio-based industries besides making a special reference on its usage in the nanoparticle formulations from plant secondary metabolites as botanical biopesticides .

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Result Analysis of Students Using Fuzzy Matrices

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Abstract- Fuzzy set theory was proposed by Lotfi A. Zadeh and has been found extensive applications in various fields. The concept of uncertainty was discussed by using fuzzy matrices. Throughout this article $[0, 1]$ denotes the unit interval, as a fuzzy Interval. Also all fuzzy matrices are matrices but every matrix is not fuzzy in general. We analyses the results of three students using Fuzzy Matrix Solution (FMS) with the help of product of fuzzy matrices. Under usual matrix multiplication this is not a fuzzy matrix, so that we need to define compatible operation analogs to product that the product again happens to be a fuzzy matrix by introducing max-min operation & min-max operation. Finally we conclude the results of three students as pass or fail using fuzzy matrix.

Index Terms- FMS, visual basic, indication relation, max-min operation

I. INTRODUCTION

Students play a major role in Educational field. Students are evaluated under different categories: By choosing their institution, studying well, gaining good knowledge, and getting good marks. Result analysis of each student paves the way for their higher education as well as their improvement in future. . Percentage marks prior to the grade scheme were converted into grades for ease of comparison.

The reliability of the new scheme was again studied using statistical analysis of data obtained from both the old and new schemes. Some assessment schemes use a grading category index (GCI) instead of actual mark for each assessment criterion. GCIs usually have a smaller number of options to choose from when awarding results. For example, the GCI may gave eight levels with the highest being awarded to exceptional students and the lowest being awarded to students of inadequate performance. This reduced level of categories has been shown to result in less variability between assessors compare to systems which use marking ranges between 0 and 100. The Results of the students are analyzed using Fuzzy Matrix Solution (FMS).

In this paper, we are analyzing the results of students using fuzzy matrix with the help of product of fuzzy matrices by introducing max-min operation & min-max operation. Finally we conclude that the Result of the student is Pass or Fail.

In this Section we recall some of the basic properties about fuzzy matrices and operations using them.

II. ADDITION OF FUZZY MARIX

A. Definition 1

Let X and Y be two fuzzy matrices ,we define the addition of fuzzy matrices as follows.

$$X+Y = \max \{X, Y\} \text{ or } \min \{X, Y\}.$$

For Example,

We add two fuzzy matrices X and Y and get the sum of them by fuzzy matrix as follows.

$$\text{Let } X = \begin{bmatrix} 0.3 & 0.7 & 0.8 \\ 0.6 & 0.5 & 1.0 \\ 0.9 & 0.4 & 0.6 \end{bmatrix} \text{ and}$$

$$Y = \begin{bmatrix} 1.0 & 0.2 & 0.3 \\ 0.8 & 0.5 & 0.2 \\ 0.5 & 0.1 & 0.8 \end{bmatrix} \text{ then}$$

Max $\{X, Y\}$

$$= \begin{bmatrix} \max(0.3,1.0) & \max(0.7,0.2) & \max(0.8,0.3) \\ \max(0.6,0.8) & \max(0.5,0.5) & \max(1.0,0.2) \\ \max(0.9,0.5) & \max(0.4,0.1) & \max(0.6,0.8) \end{bmatrix}$$

$$= \begin{bmatrix} 1.0 & 0.7 & 0.8 \\ 0.8 & 0.5 & 1.0 \\ 0.9 & 0.4 & 0.8 \end{bmatrix}$$

Similarly $\min \{X, Y\}$ can be obtained.

III. MULTIPLICATION OF FUZZY MARIX

B. Definition 2

The Product of two fuzzy matrices under usual matrix multiplication is not a fuzzy matrix. So that we need to define compatible operation analogs to product that the product again happens to be a fuzzy matrix. However even for this new operation if the product XY is to be defined we need the number of columns of X is equal to the number of rows of Y. The types of operations which can have are max-min operation and min-max operation.

$$\text{Let } X = \begin{bmatrix} 0.4 & 0.8 & 0.9 \\ 0.7 & 0.6 & 1.0 \\ 0.8 & 0.5 & 0.7 \end{bmatrix} \text{ and}$$

$$Y = \begin{bmatrix} 1.0 & 0.1 & 0.2 \\ 0.6 & 0.4 & 0.3 \\ 0.4 & 0.2 & 0.9 \end{bmatrix}$$

then XY defined using max.min function.

$$X*Y = \begin{bmatrix} C11 & C12 & C13 \\ C21 & C22 & C23 \\ C31 & C32 & C33 \end{bmatrix}$$

Where,

$$C_{11} = \max \{ \min (0.4, 0.1), \min (0.8, 0.6), \min (0.9, 0.4) \}$$

$$= \max \{ 0.1, 0.6, 0.4 \}$$

$$= 0.6$$

$$C_{12} = \max \{ \min (0.4, 0.1), \min (0.8, 0.4), \min (0.9, 0.2) \}$$

$$= \max \{ 0.1, 0.4, 0.2 \}$$

$$= 0.4$$

And so on.

$$X * Y = \begin{bmatrix} 0.6 & 0.4 & 0.9 \\ 0.7 & 0.4 & 0.9 \\ 0.8 & 0.4 & 0.7 \end{bmatrix}$$

Similarly for the same X and Y we can adopt the operation as min.max operation.

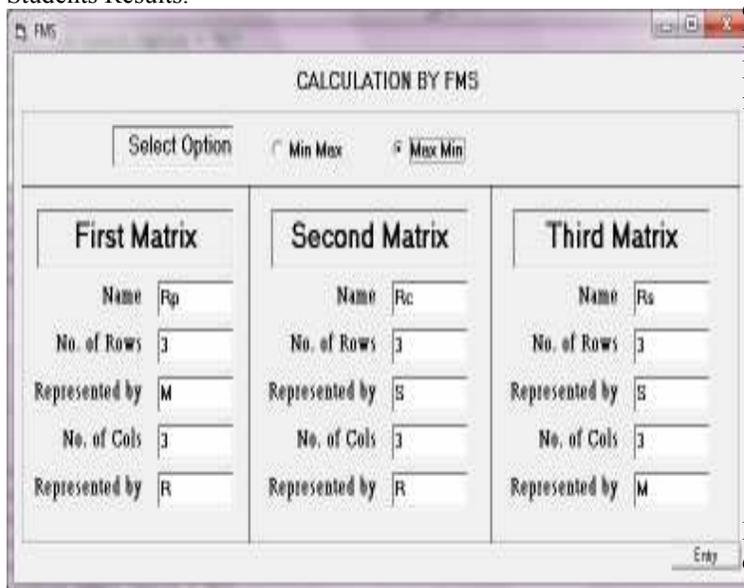
IV. ASSESSMENT OF MARKS

In this section the students results are mentioned as in the following categories:

Result Status	Corresponding Marks
Below Average	Less than 50
Average	Between 50 & 79
Above Average	Greater than or Equals 80

V. FUZZY MATRIX SOLUTION

It is observed that in our model we require composition of matrix using min.max or max.min operation it is difficult manually. Here we develop following software that enables the user to graphically design a fuzzy system for the analysis of Students Results.



Rp	R1	R2	R3
M1	0.9	0.7	0.4
M2	0.8	0.6	0.45
M3	1.0	0.75	0.8

Matrix for Confirmative relation $R_c = S \times R$ corresponds to the degree to which the Students Marks confirms the Results.

VI. CRISP SET

C. Definition 3

A set means any well defined collection of objects. The words aggregate, class or collection are also used in place of the word “set of sets”. But the use of the word set is common. In general capital letters like A,B,C,D.....etc are used to denote the sets and lower letters a, b, c, d,.....to denote the objects or elements belonging to these sets. We express the relation between an object and a set to which it belongs by writing, $a \in A$. There are three basic methods by which sets can be represented.

- (i) List method- $A = \{a_1, a_2, a_3, \dots, a_n\}$
- (ii) Set builder form
- (iii) A characteristic function. But here we use the first method.

VII. MAIN RESULT

D. Notations

Considering,

M – Crisp set of all Marks,

R – Set of Results,

W- Set of all Students.

Consider $M = \{M_1, M_2, M_3\}$

Where,

M_1 - Marks of Subject I

M_2 - Marks of Subject II

M_3 - Marks of Subject III

Consider $R = \{R_1, R_2, R_3\}$

R_1 - Above Average (≥ 80).

R_2 . Above Average (50-79).

R_3 . Below Average (< 50).

Let $S = \{S_1, S_2, S_3\}$ set of three Students for testing this model.

VIII. ENTERING DATA PART

Entering data in Matrix format for occurrence relation, confirmative relation, and fuzzy relations denoted by R_o , R_c and R_s respectively.

Matrix for performance relation is $R_p = M \times R$, indicates the frequency of performance of Marks M which gives the Result R.

Rc	R1	R2	R3
S1	1.0	0	0
S2	0	1.0	0
S3	0	0	1.0

IR2	R1	R2	R3
S1	0.9	0.8	1.0
S2	0.7	0.6	0.75
S3	0.4	0.45	0.3

Now assume a **fuzzy relation** $R_s = S \times M$, Specified Marks M_1 , M_2 and M_3 for three Students S_1 , S_2 and S_3 as follows:

Rs	M1	M2	M3
S1	0.9	0.8	1.0
S2	0.7	0.6	0.75
S3	0.4	0.45	0.3

The **Non-performance Indication Relation** calculated by $IR_3 = R_s * (1-R_p) =$

IR3	R1	R2	R3
S1	0.2	0.4	0.7
S2	0.2	0.4	0.7
S3	0.2	0.4	0.45

IX. CALCULATION PART

This is done using our software and relations R_p , R_c and R_s , we can now calculate the Results using four indication relations in four different stages 1. performance, 2. Confirmability 3. Non-performance, 4. Performance of Non-Specification as follows:

The **Performance Indication Relation of Result** calculated by $IR_1 = R_s * R_p =$

IR1	R1	R2	R3
S1	1.0	0.75	0.45
S2	0.75	0.75	0.45
S3	0.45	0.45	0.45

The **Non-Specification Indication Relation** calculated by $IR_4 = (1-R_s) * R_p =$

IR4	R1	R2	R3
S1	0.2	0.2	0.2
S2	0.4	0.4	0.4
S3	0.7	0.7	0.45

The **Confirmability Indication Relation of Result** by $IR_2 = R_s * R_c =$

X. CONCLUSION

From these Indications relations we may draw the following conclusions:

If R_1 and R_2 is maximum, we conclude that the Student facing success in Examinations.

(i.e) The Result of the Student is Pass.

If R_3 and R_4 is maximum, we conclude that the Result of the Student faces the Failure in Examination

(i.e) The Result of the Student is Fail.

Using Visual Basic we develop software to calculate Fuzzy relation. After collecting datas we have to entered the Performance of students marks in matrix R_s observed from each individual student. The software calculates from R_1 to R_4 gives the status of Results of the students.

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Analysis of comparison between Single Encryption (Advance Encryption Scheme (AES)) and Multicrypt Encryption Scheme

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Abstract- **Advanced Encryption Standard (AES)** is a specification for the encryption of electronic data. It supersedes DES. The algorithm described by AES is a symmetric-key algorithm, meaning the same key is used for both encrypting and decrypting the data. **Multicrypt** is a scheme that allows for the encryption of any file or files. The scheme offers various private-key encryption algorithms, such as DES, 3DES, RC2, and AES. AES (Advanced Encryption Standard) is the strongest encryption and is used in various financial and public institutions where confidential, private information is important.

Index Terms- AES, Multicrypt, Cryptography, Networking, Encryption, DES, 3DES, RC2

I. INTRODUCTION

This article compares Single Encryption scheme and Multicrypt Encryption scheme. Security has become a significant requirement in today's multimedia communications, by using Encryption scheme we can secure our important documents like financial document, other account related document, office related document, corporate documents, new proposals etc.

In this paper for Single Encryption Scheme I have chosen AES (Advance Encryption Scheme) & for Multicrypt Encryption scheme Cryptogram, Caser Cipher, One-Time Pad and Faster RSA algorithm used one after another for encryption of the same document.

AES: *Advanced Encryption Standard (AES)* is a block cipher with block size of 128 bits, or 16 bytes. Keys for the cipher come in one of three lengths: 128, 192 or 256 bits, which are 16, 24 or 32 bytes. The algorithm is oriented toward bytes (8 bits), but there is also emphasis on what the AES specification calls *words*, which are arrays of 4 bytes.

RC2-Rivest Cipher: - In cryptography, **RC2** is a block cipher designed by Ron Rivest in 1987. "RC" stands for "Ron's Code" or "Rivest Cipher"; other ciphers designed by Rivest include RC4, RC5 and RC6.

The development of RC2 was sponsored by Lotus, who was seeking a custom cipher that, after evaluation by the NSA, could

be exported as part of their Lotus Notes software. The NSA suggested a couple of changes, which Rivest incorporated. After further negotiations, the cipher was approved for export in 1989. Along with RC4, RC2 with a 40-bit key size was treated favourably under US export regulations for cryptography.

Initially, the details of the algorithm were kept secret — proprietary to RSA Security — but on 29th January, 1996, source code for RC2 was anonymously posted to the Internet on the Usenet forum, sci.crypt. Mentions of CodeView and SoftICE (popular debuggers) suggest that it had been reverse engineered. A similar disclosure had occurred earlier with RC4.

RC2 is a 64-bit block cipher with a variable size key. Its 18 rounds are arranged as a source-heavy Feistel network, with 16 rounds of one type (*MIXING*) punctuated by two rounds of another type (*MASHING*). A MIXING round consists of four applications of the MIX transformation, as shown in the diagram. RC2 is vulnerable to a related-key attack using 2^{34} chosen plaintexts.

DES-Data Encryption Standard: The **Data Encryption Standard (DES)** is a block cipher that uses shared secret encryption. It was selected by the National Bureau of Standards as an official Federal Information Processing Standard (FIPS) for the United States in 1976 and which has subsequently enjoyed widespread use internationally. It is based on a symmetric-key algorithm that uses a 56-bit key. The algorithm was initially controversial because of classified design elements, a relatively short key length, and suspicions about a National Security Agency (NSA) backdoor. DES consequently came under intense academic scrutiny which motivated the modern understanding of block ciphers and their cryptanalysis.

DES is now considered to be insecure for many applications. This is chiefly due to the 56-bit key size being too small; in January, 1999, distributed.net and the Electronic Frontier Foundation collaborated to publicly break a DES key in 22 hours and 15 minutes (see chronology). There are also some analytical results which demonstrate theoretical weaknesses in the cipher, although they are infeasible to mount in practice. The algorithm is believed to be practically secure in the form of Triple DES, although there are theoretical attacks. In recent years, the cipher has been superseded by the Advanced Encryption Standard (AES). Furthermore, DES has been withdrawn as a standard by the National Institute of Standards and Technology (formerly the National Bureau of Standards).

3DES -Triple DES: In cryptography, Triple DES is the common name for the Triple Data Encryption Algorithm (TDEA or Triple DEA) block cipher, which applies the Data Encryption Standard (DES) cipher algorithm three times to each data block.

The original DES cipher's key size of 56 bits was generally sufficient when that algorithm was designed, but the availability of increasing computational power made brute-force attacks feasible. Triple DES provides a relatively simple method of increasing the key size of DES to protect against such attacks, without the need to design a completely new block cipher algorithm.

II. SIMULATION SOFTWARE TOOLKIT (MULTICRYPT V1.0)

Multicrypt v1.0: Multicrypt v1.0 is a tool that allows for the encryption and decryption of the files in single or batch modes.

The Encryption algorithm used:

DES-Data Encryption Standard: DES is the archetypal block cipher — an algorithm that takes a fixed-length string of plaintext bits and transforms it through a series of complicated operations into another ciphertext bitstring of the same length. In the case of DES, the block size is 64 bits. DES also uses a key to customize the transformation, so that decryption can supposedly only be performed by those who know the particular key used to encrypt. The key ostensibly consists of 64 bits; however, only 56 of these are actually used by the algorithm. Eight bits are used solely for checking parity, and are thereafter discarded. Hence the effective key length is 56 bits, and it is never quoted as such. Every 8th bit of the selected key is discarded, that is, positions 8, 16, 24, 32, 40, 48, 56, 64 are removed from the 64 bit key leaving behind only the 56 bit key.

Like other block ciphers, DES by itself is not a secure means of encryption but must instead be used in a mode of operation. FIPS-81 specifies several modes for use with DES. Further comments on the usage of DES are contained in FIPS-74.

The algorithm's overall structure is shown in Figure 1: there are 16 identical stages of processing, termed *rounds*. There is also an initial and final permutation, termed *IP* and *FP*, which are inverses (IP "undoes" the action of FP, and vice versa). IP and FP have almost no cryptographic significance, but were apparently included in order to facilitate loading blocks in and out of mid-1970s hardware.

Before the main rounds, the block is divided into two 32-bit halves and processed alternately; this criss-crossing is known as the Feistel scheme. The Feistel structure ensures that decryption and encryption are very similar processes — the only difference is that the subkeys are applied in the reverse order when decrypting. The rest of the algorithm is identical. This greatly simplifies implementation, particularly in hardware, as there is no need for separate encryption and decryption algorithms.

The \oplus symbol denotes the exclusive-OR (XOR) operation. The *F-function* scrambles half a block together with some of the key. The output from the F-function is then combined with the other half of the block, and the halves are swapped before the next round. After the final round, the halves are not swapped; this is a

feature of the Feistel structure which makes encryption and decryption similar processes.

1. **Expansion** — the 32-bit half-block is expanded to 48 bits using the *expansion permutation*, denoted *E* in the diagram, by duplicating half of the bits. The output consists of eight 6-bit ($8 \times 6 = 48$ bits) pieces, each containing a copy of 4 corresponding input bits, plus a copy of the immediately adjacent bit from each of the input pieces to either side.
2. **Key mixing** — the result is combined with a *subkey* using an XOR operation. 16 48-bit subkeys — one for each round — are derived from the main key using the *key schedule* (described below).
3. **Substitution** — after mixing in the subkey, the block is divided into eight 6-bit pieces before processing by the *S-boxes*, or *substitution boxes*. Each of the eight S-boxes replaces its six input bits with four output bits according to a non-linear transformation, provided in the form of a lookup table. The S-boxes provide the core of the security of DES — without them, the cipher would be linear, and trivially breakable.
4. **Permutations** — finally, the 32 outputs from the S-boxes are rearranged according to a fixed permutation, the *P-box*. This is designed so that, after expansion, each S-box's output bits are spread across 6 different S-boxes in the next round.

The alternation of substitution from the S-boxes, and permutation of bits from the P-box and E-expansion provides so-called "confusion and diffusion" respectively, a concept identified by Claude Shannon in the 1940s as a necessary condition for a secure yet practical cipher.

RC2-Rivest Cipher: - In cryptography, RC2 is a symmetric-key block cipher. Designed by Ronald Rivest in 1987. "RC" stands for "Rivest Cipher", or alternatively, "Ron's Code".

RC2 is a 64-bit block cipher with a variable key size and using 18 rounds.

Rounds are arranged as a source-heavy feistel network, with 16 rounds of one type called "*mixing rounds*" interleaved by two rounds of another type called "*mashing rounds*".

The 18 rounds are performed using the following interleaved sequence:

1. perform 5 mixing rounds.
2. perform 1 mashing round.
3. perform 6 mixing rounds.
4. perform 1 mashing round.
5. perform 5 mixing rounds.

RC2 uses *key-expansion algorithm* by which an expanded key consisting of 64 (16-bit words) is produced depending in a complicated way on every bit of the supplied "*variable-length*" input key. A mixing round consists of four applications of the "*mix-up*" transformation, as shown in the diagram. A round is "*mashed*" by adding to it one of the 16-bit words of the expanded key.

- **Encryption algorithm**
 1. Mix up R[i]
 2. Mixing round

3. Mash $R[i]$
4. Mashing round
5. Encryption operation
- **Decryption algorithm**
 1. R-Mix up $R[i]$
 2. R-Mixing round
 3. R-Mash $R[i]$
 4. R-Mashing round
 5. Decryption operation

AES-Advanced Encryption Standard (Rijndael):

1. KeyExpansion—round keys are derived from the cipher key using Rijndael's key schedule
 1. Initial Round-
 1. AddRoundKey—each byte of the state is combined with the round key using bitwise xor.
 2. Rounds -
 1. SubBytes—a non-linear substitution step where each byte is replaced with another according to a lookup table.
 2. ShiftRows—a transposition step where each row of the state is shifted cyclically a certain number of steps.
 3. MixColumns—a mixing operation which operates on the columns of the state, combining the four bytes in each column.
 4. AddRoundKey
 3. Final Round (no MixColumns)-
 1. SubBytes
 2. ShiftRows
 3. AddRoundKey

3DES-Triple DES: Triple DES uses a "key bundle" which comprises three DES keys, K_1 , K_2 and K_3 , each of 56 bits (excluding parity bits). The encryption algorithm is:

Ciphertext = $E_{K_3}(D_{K_2}(E_{K_1}(\text{plaintext})))$

I.e., DES encrypts with K_1 , DES decrypt with K_2 , then DES encrypt with K_3 .

Decryption is the reverse:

Plaintext = $D_{K_1}(E_{K_2}(D_{K_3}(\text{ciphertext})))$

I.e., decrypt with K_3 , encrypt with K_2 then decrypt with K_1 .

Each triple encryption encrypts [one block](#) of 64 bits of data.

In each case the middle operation is the reverse of the first and last. This improves the strength of the algorithm when using [keying option 2](#), and provides [backward compatibility](#) with DES with keying option 3.

Keying options:-The standards define three keying options:

- Keying option 1: All three keys are independent.
- Keying option 2: K_1 and K_2 are independent, and $K_3 = K_1$.
- Keying option 3: All three keys are identical, i.e. $K_1 = K_2 = K_3$.

Keying option 1 is the strongest, with $3 \times 56 = 168$ independent key bits.

Keying option 2 provides less security, with $2 \times 56 = 112$ key bits. This option is stronger than simply DES encrypting twice, e.g. with K_1 and K_2 , because it protects against [meet-in-the-middle attacks](#).

Keying option 3 is equivalent to DES, with only 56 key bits. This option provides backward compatibility with DES, because the first and second DES operations cancel out. It is no longer recommended by the National Institute of Standards and Technology (NIST), and is not supported by ISO/IEC 18033-3.

Multicrypt v1.0 Options:

Single File Processing: In this option we can select a file for encryption and decryption by using browsing option.

Drag & Drop File Processing: In this option we can drag a drop a file to encrypt or decrypt.

Remove Original Files After Encryption: By using this option we can remove original version of encrypted file.

Security:

Password (Key): In cryptography, a **key** is a piece of information that determines the functional output of a cryptographic algorithm or cipher. Without a key, the algorithm would produce no useful result. In encryption, a key specifies the particular transformation of plaintext into ciphertext, or vice versa during decryption. Keys are also used in other cryptographic algorithms, such as digital signature schemes and message authentication codes.

Initial Vector (IV):

In cryptography, an **initialization vector (IV)** is a fixed-size input to a cryptographic primitive that is typically required to be random or pseudorandom. Randomization is crucial for encryption schemes to achieve semantic security, a property whereby repeated usage of the scheme under the same key does not allow an attacker to infer relationships between segments of the encrypted message. For block ciphers, the use of an IV is described by so-called modes of operation. Randomization is also required for other primitives, such as universal hash functions and message authentication codes based thereon.

Some cryptographic primitives require the IV only to be non-repeating, and the required randomness is derived internally. In this case, the IV is commonly called a nonce (*number used once*), and the primitives are described as stateful as opposed to *randomized*. This is because the IV need not be explicitly forwarded to a recipient but may be derived from a common state updated at both sender and receiver side. (In practice, a short nonce is still transmitted along with the message to consider message loss.) An example of stateful encryption schemes is the counter mode of operation, which uses a sequence number as a nonce.

The size of the IV is dependent on the cryptographic primitive used; for block ciphers, it is generally the cipher's block size. Ideally, for encryption schemes, the unpredictable part of the IV has the same size as the key to compensate time-memory-data trade-off attacks. When the IV is chosen at random, the probability of collisions due to the birthday problem must be taken into account. Traditional stream ciphers such as RC4 do not support an explicit IV as input, and a custom solution for incorporating an IV into the cipher's key or internal state is needed. Some designs realized in practice are known to be insecure; the WEP protocol is a notable example, and is prone to related-IV attacks.

III. PROCESS AND IDEA

This paper compare two algorithms, namely single encryption and multicrypt (Combination of more than 1 encryption algorithm) encryption and analyze the results in form of advantages and disadvantages. Idea behind this paper is to find how multiple time encryptions are better than single time encryption and vice-versa.

Choose AES for single type encryption and RC2, DES, AES & 3DES for Multicrypt encryption scheme. In single type encryption take a document and use one encryption algorithm to encrypt the same while Multicrypt uses two or more algorithm for encryption of the same document.

Multicrypt is more secure but it is a time taking process and also we have to memorize so many password/Keys and initial vectors while single encrypt is less secure but a fast process.

IV. STUDIES AND FINDINGS

Table I: Comparison between Single & Multicrypt Encryption Scheme

S.n	Component	Single Encryption scheme	Multicrypt Encryption scheme
1.	Computational Overhead/ Time complexity	It takes less time compares to Multicrypt	It takes more time cause of more than one encryption.
2.	Encryption Used	AES	RC2, DES, 3DES, AES
3.	Password and Initial Vector memorization complexity	Easy to memorize one password and IV	Difficult to memorize more than one passwords and IVs
4.	Security	Less Secure	More Secure
5.	Breakable	Easy to break	Difficult to break
6.	Attacks	Known attack, side channel attacks	Anyway it is breakable when we use one encryption method but when we use combination of any two or more than two then it is difficult to compromise
7.	Accessibility	Not Accessible after encryption	Not Accessible after encryption

V. CONCLUSION

After the analysis of comparison of both type of encryption scheme multicrypt is much better than single type encryption because it is very secure cause of many layers (level) of security and authentication (each encryption algorithm contain one password and initial vector for security and authentication purpose). For security of personnel document, single type encryption is enough while for corporate and business purpose multicrypt is better option to secure important files and

documents.

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Weather Report Calculation using Suffix Trees

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Abstract- A time series is a collection of data values are gathered. Periodic pattern mining or periodicity detection has a number of applications, such as prediction, forecasting, detection of unusual activities, etc. The problem is not trivial because the data to be analyzed are mostly noisy and different periodicity types (namely symbol, sequence, and segment) are to be investigated. The whole time series or in a subsection of it to effectively handle different types of noise (to a certain degree) and at the same time is able to detect different types of periodic pattern. This can detect symbol, sequence (partial), and segment (full cycle) periodicity in time series. The algorithm uses suffix tree as the underlying data structure; symbol means particular area in time series, sequence means particular time period and segment it is used half day temperature. In this paper we are using noise resilient and which can be used two nodes. So we are using sensor network, it works on heat temperature measuring. The temperature is varied from normal condition some incident occur in this place and we have to send an alert message to people.

Index Terms- time series, periodicity detection, suffix tree, symbol periodicity, segment periodicity, sequence periodicity noise resilient, sensor networks.

I. INTRODUCTION

A time series is a collection of data values gathered. Generally at uniform interval of time to reflect certain behavior of an entity. Real life has several examples of time series such as weather conditions of a particular location, spending patterns, stock growth, transactions in a superstore, network delays, power consumption, computer network fault analysis and security breach detection, earthquake prediction, gene expression data analysis [1],[10], etc. A time series is mostly characterized by being composed of repeating cycles. For instance, there is traffic jam twice day when the schools are open; number of transactions in a superstore is high at certain periods during the day, certain days during the week, and so on. In other words, periodicity detection is a process for finding temporal regularities within the time series, and the goal of analyzing a time series is to find whether and how frequent a periodic pattern (full or partial) is repeated within the series. Let $T = \{e_0; e_1; e_2; \dots; e_{n-1}\}$ be a time series having n events, where e_i represents the event recorded at time instance i ; time series T maybe discredited by considering m distinct ranges such that all values in the same range are represented denoted by Σ . In general, three types of periodic

patterns can be detected in a time series: 1) symbol periodicity, 2) sequence periodicity or partial periodic patterns, and 3) segment or full-cycle periodicity. A time series is said to have symbol periodicity if at least one symbol is repeated periodically. For example, in time series =abd acb aba abc, symbol a is periodic with periodicity $p = 3$, starting at position zero (stP os = 0). Similarly, a pattern consisting of more than one symbol maybe periodic in a time series; and this leads to partial periodic patterns. Finally, if the whole time series can be mostly represented as a repetition of a pattern or segment, then this type of periodicity is called segment or full-cycle periodicity. For instance, the time series $T = \text{abcab abcab abcab}$ has segment periodicity of 5 ($p = 5$) starting at the first position (stP os = 0), i.e., T consists of only three occurrences of the segment abcab. 1) Identifying the three different types of periodic patterns, 2) handling asynchronous periodicity by locating periodic patterns that may drift from their expected positions up to an allowable limit, and 3) investigating periodic patterns in the whole time series as well as in a subsection of the time series insertion, deletion, or any mixture of these types of noise [24].

It can also detect periodicity within a subsection of a time series and applies various redundant period pruning techniques to output a small number of useful periods by removing most of the redundant periods. The algorithm looks for all periods starting from all positions which have confidence greater than or equal to the user-provided periodicity threshold. Finally, the different aspects of the algorithm, its applicability, and effectiveness have been demonstrated using both real and synthetic data.

1. The development of suffix-tree-based comprehensive algorithm that can simultaneously detect the symbol, sequence, and segment periodicity;
2. Finding periodicity within subsection of the series;
3. Identifying and reporting only useful and non redundant periods by applying pruning techniques to eliminate redundant periods.
4. Detailed algorithm analysis for time performance and space consumption by considering three cases, namely the worst case, the average case, and the best case;
5. A number of optimization strategies are presented; they do improve the running time as demonstrated in the related experimental results, although they do not improve the time complexity;

II. RELATED WORK

The first category includes algorithms that require the user to specify the period, and then look only for patterns occurring with that period. The second classes, on the other hand, are algorithms which look for all possible periods in the time series. In this paper could be classified under the second category; it does more than the other algorithms by looking for all possible periods starting from all possible positions within a pre specified range, whether the whole time series or a subsection of the time series. User to provide the expected period value which is used to check the time series for corresponding periodic patterns. For example, in power consumption time series, a user may test for weekly, biweekly, or monthly periods. However, it is usually difficult to provide expected period values; and this approach prohibits finding unexpected periods, which might be more useful than the expected ones.

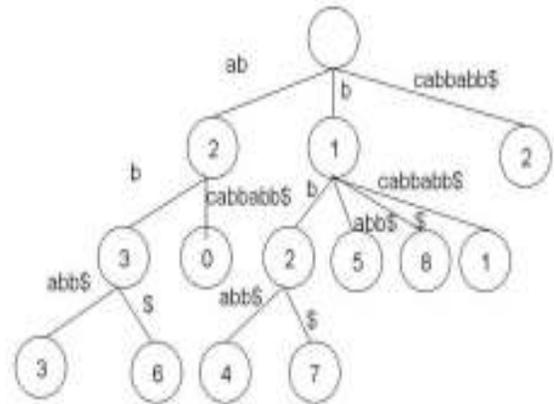


Fig. 1: The suffix tree for the string abcabbab\$.

- In this paper, we concentrate on the first case; we need to develop an algorithm capable of detecting in an encoded time series (even in the presence of noise) symbol, sequence, and segment periodicity, which are formally defined next. We start by defining confidence because it is not always possible to achieve perfect periodicity and hence we need to specify the degree of confidence in the reported result.
- **Definition 1 (Perfect Periodicity):** Consider a time series T, a pattern X is said to satisfy perfect periodicity in T with period p if starting from the first occurrence of X until the end of T every next occurrence of X exists p positions away from the current occurrence of X. It is possible to have some of the expected occurrences of X missing and this leads to imperfect periodicity.
- **Definition 2 (Confidence):** The confidence of a periodic pattern X occurring in time series T is the ratio of its actual periodicity to its expected perfect periodicity. Formally, the confidence of pattern X with periodicity p starting at Position.
- $$Con f(p, stops, x) = \frac{Actualperiodicity(p, stPos, x)}{Perfect Periodicity (p, stops, x)}$$
- **Definition 3 (Symbol Periodicity):** A time series T is said to have symbol periodicity for a given symbol s with period p and starting position stP os if the periodicity of s in T is either perfect or imperfect with high confidence.
- **Definition 4 (Sequence Periodicity):** A time series T is said to have sequence periodicity (or partial periodicity) for a pattern (partial periodic pattern) X starting at position stP os, if $|X| \geq 1$ and the periodicity of X in T is either perfect or imperfect with high confidence.
- **Definition 5 (Segment Periodicity):** A time series T of length n is said to have segment periodicity for a pattern X with period p and starting position stP os if $p = |X|$ and the periodicity of X in T is either perfect or imperfect with high confidence.

A. Periodicity Detection

In the first phase, we build the suffix tree for the time series and In the second phase, we use the suffix tree to calculate the periodicity of various patterns in the time series. One important aspect of our algorithm is redundant period pruning.

The benefit of redundant period pruning, the algorithm does not waste time to investigate a period which has already been identified as redundant.

B. First Phase—Suffix-Tree-Based Representation

A suffix tree for a string represents all its suffixes; for each suffix of the string there is a distinguished path from the root to a corresponding leaf node in the suffix tree. The path from the root to any leaf represents a suffix for the string. Since a string of length n can have exactly n suffixes, the suffix tree for a string also contains exactly n leaves..

C. Periodicity Detection in Presence of Noise

Three types of noise generally considered in time series data are replacement, insertion, and deletion noise. In replacement noise, some symbols in the discredited time series are replaced at random with other symbols. In case of insertion and deletion noise, some symbols are inserted or deleted, respectively, randomly at different positions (or time values). Noise can also be a mixture of these three types; for instance, RI type noise means the uniform mixture of replacement (R) and insertion (I) noise.

- The distance between the current occurrence and the current reference starting position;
- B represents the number of periodic values that must be passed from the current reference starting position to reach the current occurrence.
- Variable C represents the distance between the current occurrence and the expected occurrence.

Algorithm 2. Noise Resilient Periodicity Detection Algorithm

Input: a time series of size n and time tolerance value tt;

Output : positions of periodic patterns;

```

1. for each occurrence vector occur_vec of size k
   for pattern, repeat
1.1 for j=0;j<n/2;j++
1.1.1 p=occur_vec[j+1]-occur_vec[j];
1.1.2 StPos=Occur_vec[j];endPos=occur_vec[k];
1.1.3 for i=j;i<k;i++;
1.1.3.1 A=occur_vec[i]-currStpos;
1.1.3.2 B=Round(A/p);
1.1.3.3 C=A-(p*B);
1.1.3.4 If((-tt<=C<=tt)AND
(Round((preOccur-currSTPos)p)!=B))
1.1.3.4.1 currStPos=Occur_vec[i];
1.1.3.4.2 preoccur=occur_vec[i];
    
```

```

1.1.3.4.3 increment count(p);
1.1.3.4.4 sumPer+=(p+C);
1.1.4     end for
1.1.5     mean p=SumPer-(p/(count(p)-1));
1.1.6     conf(p)=count(p)/(perfect_periodicity(p,StPos,
x)
1.1.7     if(conf(p)≥threshold)add p to the period list;
1.2     end for
2.     end for
End Algorithm

```

Algorithm 2 contains three new variables, namely A, B, and C;

Periodicity Detection in a Subsection of Time Series

The periodicity detection algorithm calculates all patterns which are periodic starting from any position less than half the length of the time series ($stPos < \frac{n}{2}$) and continues till the end of the time series or till the last occurrence of the pattern pattern to be part of the same periodic section. Consequently, having the distance between two occurrences more than d_{max} may potentially mark the end of one periodic section and/or the start of new periodic section for the same pattern.

Redundant period pruning techniques

Periodicity detection algorithms generally do not prune or prohibit the calculation of redundant periods; the immediate drawback is reporting a huge number of periods, which meaningful periodic patterns within the large pool of reported periods.

Optimization Strategies Of The Algorithm

There are some optimization strategies that we selected for the efficient implementation of the algorithm. These strategies, though simple, have improved the algorithm efficiency significantly. We do not include these into the algorithm pseudo code so as to keep it simple and more understandable. Some of these strategies are briefly mentioned in the text below.

1. Recall that each edge connecting parent node v to child node u has its own occurrence vector that contains values from leaf nodes present in the sub tree rooted at u . Accordingly, edges are sorted based on the number of values they have to carry in their occurrence vectors; and edges that qualify to be processed in each step of the algorithm are visited in descending order based on the size of their occurrence vectors.
2. The occurrence vector for each intermediate edge as that would mostly result in huge number of redundant sub vectors. Rather, a single list of values is maintained and each intermediate edge keeps the starting and ending index positions of its occurrence list, and sorts only its concerned portion of the list. As the sorting might also require a huge number of shifting of elements, we maintain the globally unified occurrence vector as a linked list of integers so that the insertion and deletion of values do not disturb large part of the list.
3. Periodicity detection at the first level (for edges directly connected to the leaves) is generally avoided because experiments have shown that in most cases, the first level does not add any new period. This is based on the observation that in time series periodic patterns mostly consist of more than one symbol.
4. Intermediate edges (directly or indirectly) connected to significantly small number of leaves can also be ignored. For example, if the subtree rooted at the child node connected to an edge contains less than 1 percent leaves, there is less chance to find a significant periodic pattern there.
5. Very small periods (say less than five symbols) may also be ignored. Periods which are larger than 30 percent (or 50 percent) of the series length are also ignored so that the infrequent patterns do not pollute the output. Sequences which are smaller than or equal to half the length of the series.
6. Similarly, periods smaller than edge value (the length of the sequence so far) are ignored..
7. The collection of periods is maintained with two levels indexing; separate index is maintained on period values and starting positions. This facilitates fast and efficient search of periods because we check the existing collection of periods a number of times.

Algorithm Analysis

The algorithm requires only a single scan of the data in order to construct the suffix tree; and the suffix tree is traversed only once to find all periodic patterns in the time series.

III. PROPOSED SYSTEM

A. Sensor Network

i. Procedure

Procedure is a description of how a sensor works, i.e., how a certain type of stimuli is transformed to a digital representation, perhaps a description of the scientific method behind the sensor. Consequently, sensors can be thought of as implementations of sensing methods where different methods can be used to derive information about the same type of observed property. Sensing methods can also be used to describe how observations were made: e.g., how a sensor was positioned and used. Simplifying, one can think of sensing as recipes for observing.

It is a collection of specialized transducers with a communications infrastructure planned to check and record conditions at various locations. Normally verify issues are direction of wind, pollutant levels, and illumination intensity. In addition to one or more sensors, every node in a sensor network is typically prepared with a radio transceiver, small microcontroller or other wireless transmission device, and battery as an energy source. The cost of sensor nodes is also variable, ranging from thousands of dollars to a small number of pennies, depending on the actual size of the network and the complexity required of individual sensor nodes as well as their applications. Size and cost constraints on sensor nodes result in equivalent constraints on resources such as energy, computational speed, memory and bandwidth.

This network consists of many detection stations called sensor nodes, each of which is small, lightweight and moveable. Each sensor node is set in a transceiver, transducers, and source of power. They generates electrical signals basis on sensed physical effects and phenomena. The microcomputers are manages and keep the sensor output. The transceiver may be hard wired or wireless. They accept commands from a central computer and

transmitting data to that system. The power for every sensor node is derived from the electric utility or from a battery.

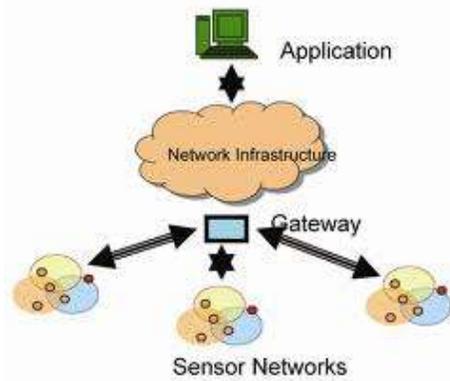
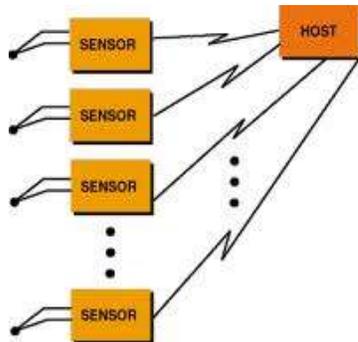


Fig. 1: Sensor Networks

This type of network is a worldwide exchange for sensor information. It permits researchers and scientists to split data with authorized partners. Authorized client can manages the sensor installations, visualize collected data and divide up it with trusted partners. This sensor networks are currently used in many resident application areas, such as environment and traffic control, healthcare applications, home automation. This network generally creates a wireless ad-hoc network, means that every sensor supports a multi-hop routing algorithm where nodes function as forwarders, transmitting data packets to a base station.



A landslide finding system, make use of this type of network to find out the small movements of soil that may happen during a landslide. And through the data collection, it is easy to know the occurrence of landslides long before it really happens

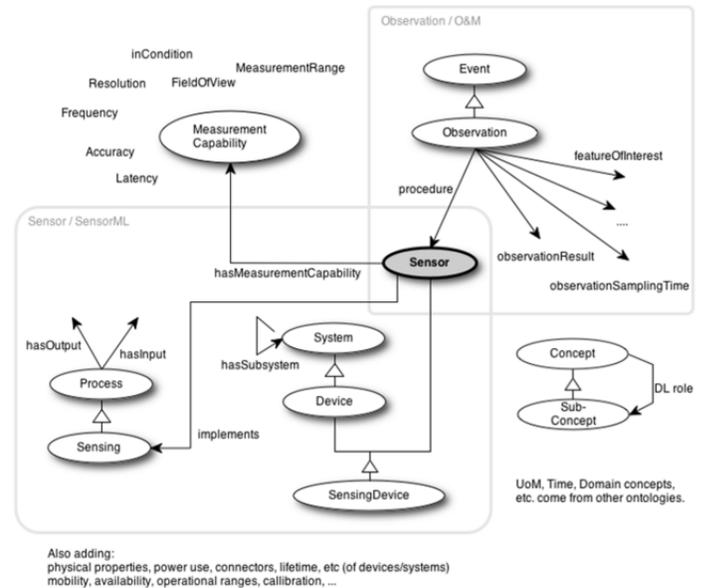


Fig. 2: Sensor network view

Sensors are physical objects that perform observations, i.e., they transform an incoming stimulus into another, often digital, representation. Sensors are not restricted to technical devices but also include humans as observers. A clear distinction needs to be drawn between sensors as objects and the process of sensing. We assume that objects are sensors while they perform sensing, i.e., while they are deployed. Furthermore, we also distinguish between the sensor and a procedure, i.e., a description, which defines how a sensor should be realized and deployed to measure a certain observable property. Similarly, to the capabilities of particular stimuli, sensors can only operate in certain conditions. These characteristics are modelled as observable properties of the sensors and include their survival range or accuracy of measurement under defined external conditions. Finally, sensors can be combined to sensor systems and networks. Many sensors need to keep track of time and location to produce meaningful results and, hence, are combined with further sensors to sensor systems such as weather stations.

ii. Observations

Observations act as the nexus between incoming stimuli, the sensor, and the output of the sensor, i.e., a symbol representing a region in a dimensional space. Therefore, we regard observations as social, not physical, objects. Observations can also fix other parameters such as time and location. These can be specified as parts of observation procedure. The same sensor can be positioned in different ways and, hence, collect data about different properties. In many cases, sensors perform additional processing steps or produce single results based on a series of incoming stimuli. Therefore, observations are rather contexts for the interpretation of the incoming stimuli than physical events.

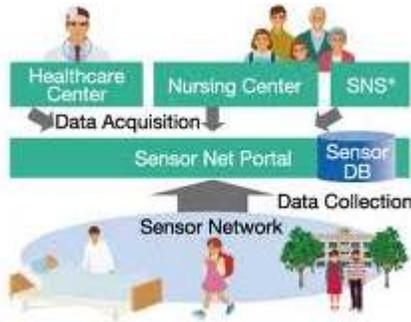
iii. Observed Properties

Properties are qualities that can be observed via stimuli by a certain type of sensors. They inhere in features of interest and do not exist independently. While this does not imply that they do not exist without observations, our domain is restricted to those observations for which sensors can be implemented based on

certain procedures and stimuli. To minimize the amount of ontological commitments related to the existence of entities in the physical world, observed properties are the only connection between stimuli, sensors, and observations on the one hand, and features of interests on the other hand.

iv. *Application of Sensor Networks*

- Traffic monitoring
- Air Traffic control
- Video surveillance
- Industrial automation
- Medical device monitoring
- Monitoring of weather conditions



B. *DNA Sequence Mining*

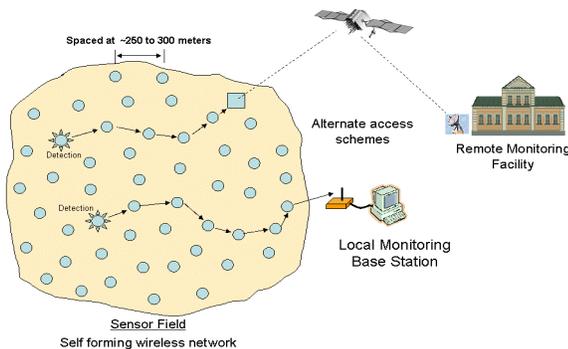


Fig. 3: DNA Sequence Mining

i. *Accuracy*

The first sets of tests are dedicated to demonstrate the Completeness of STNR in the sense that it should be able to find a period once it exists in the time series. We test how STNR satisfies this on both synthetic and real data.

ii. *Synthetic Data*

The synthetic data have been generated in the same way as done. The parameters controlled during data generation are data distribution (uniform or normal), alphabet size (number of unique symbols in the data), size of the data (number of symbols in the data), period size, and the type and amount of noise in the data.

iii. *Real Data*

For real data experiments, we have already used the Walmart data in testing a previous version of the algorithm and the results reported in demonstrated the efficiency of the algorithm for the general case where the period lasts till the end of the time series;

C. *Wireless Sensor Technology*

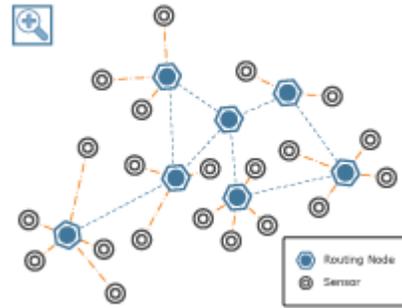


Fig. 4: Wireless Sensor Technology.

Wireless sensor networks are constituted from clusters of devices using sensor technologies deployed over a specific area, wirelessly communicating data to a central system. Sensor networks continually monitor physical properties, processes, chemical or magnetic properties, using viable and emerging communication infrastructures. With a range of software which enhances business intelligence through data extraction and mining, sensor networks will allow an entire class of systems to be designed and deployed with breakthrough results in diverse marketplaces.

Wireless sensor networks rely on emerging technologies such as communication technologies (RF communication, ad hoc networking routing), semiconductor technologies (MEMS CMOS microprocessor), embedded systems and micro sensor technologies.

Wireless sensor networks possess the potential to revolutionize business in a similar way to the emergence of the internet by providing a large number of users with various forms of information. In fact, sensor networking enjoys an enormous application potential in various fields, including:

- Environmental and healthcare: sensing ocean temperature, gathering information about a patient's condition
- Critical industrial areas: monitoring oil containers, verifying chemical gas substance concentration
- Warehouse and supply chain: monitoring currents states and history of goods with critical conservation conditions
- Military: surveillance and reconnaissance

A wireless sensor network consists of a large number of tiny sensor nodes, each of which is equipped with a radio transceiver, a small microprocessor and a number of sensors. These nodes are able to autonomously form a network through which sensor readings can be propagated. Since the sensor nodes have some intelligence, data can be processed as it flows through the network.

Given the hardware limitations and physical environment in which the nodes must operate, along with application-level requirements, the algorithms and protocols must be designed to provide a robust and energy-efficient communications mechanism. Design of physical-layer methods such as modulation, and source and channel coding also fall in this

category. Channel access methods must be devised, and routing issues and mobility management solved.

IV. TIME PERFORMANCE

This section reports the results of the experiments that measure the time performance of STNR compared to Par Per, CONV, and WARP. We test the time behavior of the compared algorithms by considering three perspectives: varying data size, period size, and noise ratio.

Varying Data size

The periodic patterns for a specific period. The synthetic data used in the testing have been generated by following uniform distribution with alphabet size of 10 an embedded period value of 32. This is because Par Per (and other similar algorithm(s)) have been designed to find only patterns with a specified periodicity while STNR is general and finds the periodicity for all the patterns which are periodic for any period value starting and ending anywhere in the time series. Par Per only finds partial periodic patterns while STNR can find all the three types of periodic patterns in the data, namely symbol, sequence, and segment periodicity.

Varying Period Size

This set of experiments is intended to show the behavior of STNR by varying the embedded period size. For this experiment, we fixed the time series length and the number of alphabets in the series and vary the embedded period size.

Varying Noise Ratio

The next set of experiments measure the impact of noise ratio on the time performance of STNR. For this experiment, we fixed the time series length, period size, alphabet size, and data distribution and measured the impact of varying noise ratio on time performance of the algorithm. We tested two sets of data; one contains replacement noise and the other contains insertion noise.

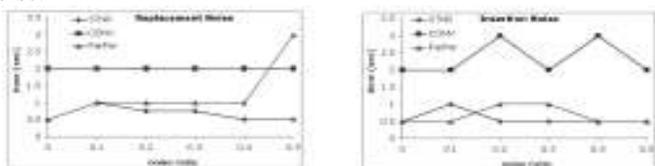


Fig. 5: Time performance of the algorithm by varying noise ratio.

Which carry less than 1 percent leaf nodes (or patterns which appear rarely), mostly noise is caught into these infrequent patterns and does not affect the time performance of STNR by reasonable margin.

Effect of Data Distribution

The data distribution seems to take less amount of time compared to the normal distribution. Since the shape of the suffix tree depends on the data distribution, it is very understandable that the different data distributions would take different amounts of time.

Optimization Strategies

we will present three experiments to show the effect of the employed optimization techniques; we mainly test for: 1) sorted and unsorted occurrence vectors of edges in terms of number of values they carry 2) calculating the periodicity and executing STNR by including/excluding the edges at the first level of the suffix tree ignoring or considering the edges whose occurrence vectors carry fewer values.

Tree Traversal Guided by Sorted Edges

The tree traversal is guided by the number of leaves a nodes (or edge) carry. The edge which leads to more leaves (i.e., the sub tree rooted at the immediate child following the edge has more leaves) is traversed first and the edge which leads to fewer number of leaves is traversed later.

Periodicity Detection at First Level

Periodicity detection can be avoided for occurrence vectors at the first level of the suffix tree for many data sets because usually the patterns at first level are subsets of the larger patterns. But this depends heavily on the data set and the periodic pattern size (or length).

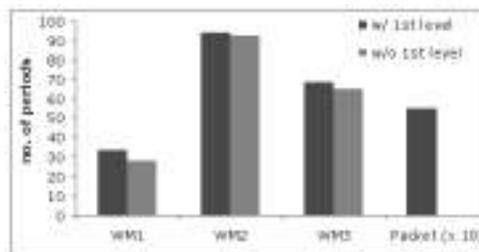


Fig - Periodicity detection at first level

Table 5 Periodic Pattern Found in P14593

Per	stpos	StPosMod	EndPos	confidence	pattern	repetitions
4	106	2	162	0.33	d	5
4	108	0	369	1	gn	66
4	115	3	369	1	agn	64
4	122	2	369	0.94	aagn	58

For the second experiment, we applied STNR on the protein sequence P14593 which is the code for circus porosities protein. It is the immune dominant surface antigen on the sporozoite. The sequence of this protein has interesting Both protein sequences studied are antigen proteins which are used for immune responses. The repeating sequence is used to allow the antibodies to detect the antigens. To further analyze the antigen protein sequences, all antigen protein sequences are analyzed to discover similar patterns among difference sequences.

V. CONCLUSION

The periodic detection can find symbol, sequence (partial periodic), and segment (full cycle) periodicity in the time series. It can also find the periodicity within a subsection of the time series. We performed several experiments to show the time behavior, accuracy, and noise resilience characteristics of the data. The reported results demonstrated the power of the employed pruning strategies. Currently, we are working on online periodicity detection where the suffix tree is constructed

online, i.e., extended while the algorithm is in operation. This type of stream mining has a large number of applications especially in sensor networks, ubiquitous computing, and DNA sequence mining. We are also implementing the disk-based solution of the suffix tree to extend capabilities beyond the virtual memory into the available disk space.

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Multidimensional Sequential Pattern Mining

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Abstract- Data mining is the task of discovering interesting patterns from large amounts of data. There are many data mining tasks, such as classification, clustering, association rule mining, and sequential pattern mining. Sequential pattern mining is the process of finding the relationships between occurrences of sequential events, to find if there exists any specific order of the occurrences. It is a data mining task which finds the set of frequent items in sequence database. It is applicable in a wide range of applications since many types of data sets are in a time related format. Besides mining sequential patterns in a single dimension, mining multidimensional sequential patterns can give us more informative and useful patterns. Due to the huge increase in data volume and also quite large search space, efficient solutions for finding patterns in multidimensional sequence data are nowadays very important. In this paper, we discuss about sequential pattern mining, sequential pattern, methods used in sequential pattern mining and we will see how sequential pattern mining is not applicable for mining item set from multidimensional data. And why multidimensional pattern mining is necessary.

Index Terms- sequential pattern mining, sequential pattern, sequential methods, multidimensional pattern mining

I. INTRODUCTION

Data mining is the non trivial process of identifying valid, novel, potentially useful, and ultimately understandable patterns in data. It is the extraction of the hidden predictive information from large databases is a powerful new technology with great potential to analyze important information in the data warehouse. data mining, a branch of computer science and artificial intelligence, is the process of extracting patterns from data. Data mining is seen as an increasingly important tool by modern business to transform data into business intelligence giving an informational advantage. It is currently used in a wide range of profiling practices, such as marketing, surveillance, fraud detection, and scientific discovery.

One of the data mining methods is sequential pattern discovery introduced in [1]. Informally, sequential patterns are the most frequently occurring subsequences in sequences of sets of items. Among many proposed sequential pattern-mining algorithms, most of them are designed to discover all sequential patterns exceeding a user specified minimum support threshold. Frequent pattern mining is Sequences are an important kind of data which occur frequently in many fields such as medical, business, financial, customer behavior, educations, security, and other applications. In these applications, the analysis of the data needs to be carried out in different ways to satisfy different application

requirements, and it needs to be carried out in an efficient manner. Sequence mining is a topic of Data Mining concerned with finding statistically relevant patterns between data examples where the values are delivered in a sequence. It is usually presumed that the values are discrete, and thus Time series mining is closely related, but usually considered a different activity. Sequence mining is a special case of structured data mining. One of the most important data mining problems is discovery of frequently occurring patterns in sequence data. There are many domains where sequence mining has been applied, which include analysis of telecommunication systems, discovering customer buying patterns in retail stores, analysis of web access databases, and mining DNA sequences and gene structures.

In this paper we introduce sequential pattern mining and discuss how sequential pattern mining is not applicable for multidimensional information.

II. SEQUENTIAL PATTERN MINING

Frequently occurring patterns ordered by time are found by sequential pattern mining. Sequential pattern mining has wide application since the data has a time component attached with them. For example, medical domain can determine a correct diagnosis from the sequence of symptoms experienced; over customer data to help target repeat customers; and with web-log data to better structure a company's website for easy accessibility of most popular links.

There are several known methods for discovering general sequential patterns at present. Still in specific domain of web-log analysis more methods exist.

Sequential pattern is a sequence of item sets that frequently occurred in a specific order, all items in the same item sets are supposed to have the same transaction- time value or within a time gap. Usually all the transactions of a customer are together viewed as a sequence, usually called customer-sequence, where each trans- action is represented as an item sets in that sequence, all the transactions are list in a certain order with regard to the transaction-time. Sequences are an important kind of data which occur frequently in many fields such as medical, business, financial, customer behavior, educations, security, and other applications. In these applications, the analysis of the data needs to be carried out in different ways to satisfy different application requirements, and it needs to be carried out in an efficient manner. It is obvious that time stamp is an important attribute of each dataset, and it can give us more accurate and useful information and rules. A database consists of sequences of values or events that change with time are called a time series database. This type of database is widely used to store historical data in a

diversity of areas. One of the data mining techniques which have been designed for mining time series data is sequential pattern mining. Sequential pattern mining is trying to find the relationships between occurrences of sequential events for looking for any specific order of the occurrences. In the other words, sequential pattern mining is aiming at finding the frequently occurred sequences to describe the data or predict future data or mining periodical patterns. To gain a better understanding of sequential pattern mining problem, let's start by looking at an example. From a shopping store database, we can find frequent sequential purchasing patterns, for example "70% customers who bought the TV typically bought the DVD player and then bought the memory card with certain time gap." It is conceivable that achieving this pattern has great impact to better advertisement and better management of shopping store.

Example- An example of a sequential pattern is "A positive response in trade-in option is expected from a customer who purchased a new Ford Explorer two years ago". If X is the clause "purchased a new Ford Explorer" and Y be the clause "a positive response in trade-in". Then notice that the pattern XY, is different from pattern YX which states that "A customer shall purchase a Ford Explorer now, who responded positively to a trade-in two years ago". The order in which X and Y appear is important, and hence XY and YX are mined as two separate patterns.

III. METHODS FOR SEQUENTIAL PATTERN MINING

There are two types of methods used in sequential pattern mining. First is Apriori based approaches and second is Pattern growth based approaches.

Apriori based approaches- There are two algorithms in this approach GSP and SPADE.

A) GSP

GSP Algorithm (Generalized Sequential Pattern algorithm) is an algorithm used for sequence mining. The algorithms for solving sequence mining problems are mostly based on the a priori (level-wise) algorithm. One way to use the level-wise paradigm is to first discover all the frequent items in a level-wise fashion. It simply means counting the occurrences of all singleton elements in the database. Then, the transactions are filtered by removing the non-frequent items. At the end of this step, each transaction consists of only the frequent elements it originally contained. This modified database becomes an input to the GSP algorithm. This process requires one pass over the whole database.

B) SPADE

SPADE is a fundamentally different sequential pattern algorithm. In place of repeated database scans, this method uses lattice-search techniques and simple join operations to discover all sequence patterns. First a vertical id-list is created to associate with each item, a list of the sequences in which it occurs, along with the appropriate time-stamps.

Pattern Growth based approaches- There are two algorithms in this approach Free SPAN and Prefix Span.

C) Free Span

FreeSpan was developed to substantially reduce the expensive candidate generation and testing of Apriori, while maintaining its basic heuristic. In general, FreeSpan uses frequent items to

recursively project the sequence database into projected databases while growing subsequence fragments in each projected database. Each projection partitions the database and confines further testing to progressively smaller and more manageable units. The trade-off is a considerable amount of sequence duplication as the same sequence could appear in more than one projected database. However, the size of each projected database usually (but not necessarily) decreases rapidly with recursion.

D) Prefix Span

Prefix Span was developed to address the costs of Free Span. Its general idea is that, instead of projecting sequence databases by considering all the possible occurrences of frequent subsequences, the projection is based only on frequent prefixes because any frequent subsequence can always be found by growing a frequent prefix.

IV. WHY SEQUENTIAL PATTERN MINING IS NOT ENOUGH

The answer is very simple current sequential pattern algorithms mine only one dimension. For example in case of mining for user-access patterns from a web-log we track for the in time order accessed pages. For date there is no sequential algorithm that can allow efficient mining of ordered and unordered data together, along with the elimination of the trivial solution of simply creating a larger set of individually specific items.

Example- Presume one of the sequential items is web-page A, and there is extra information in the form of IP addresses 1, 2 and 3. Then inclusion of the IP dimension can be done by way of creating the new items A1, A2 and A3. This is one of the ways, but it unnecessarily increases the number of items sequential mining, and since it is already expensive method, this is not efficient.

V. NEED OF MULTIDIMENSIONAL PATTERN MINING

As we have seen above Sequential pattern mining uses only single dimensional data set. All the methods used in sequential pattern mining works on only single dimensional data set. Because of this drawback multidimensional sequential pattern mining is necessary for mining item sets from multidimensional data set.

VI. MULTIDIMENSIONAL PATTERN MINING

When one or more dimensions of information is mined and the order of the dimension values is not important, it is known as Multi-dimensional sequential pattern mining. Besides mining sequential patterns in a single dimension, which means while finding the frequent patterns we only consider one attribute together with time stamps, mining multiple dimensional sequential patterns can give us more informative and useful patterns. For example we may get the frequent pattern from the supermarket database that most people who buy package 1 also buy package 2 in a defined time interval by employ in general sequential pattern mining. However using multiple dimensional sequential pattern mining we can further end different groups of people have different purchase patterns. For example, students always buy A within a week after they buy B, while those sequential rules do not hold for other groups. Multi-dimensional

sequential pattern mining is first introduced in [1]. In multi-dimensional sequential pattern mining, different attributes of the transaction ID were introduced and formed a multi-dimensional sequential data sets as shown in Table VI. The aim of this special mining is to get more interesting sequential patterns with different dimensional attributes. One direct extension of Prefix Span algorithm and two approaches combined with Prefix Span and BUC (Bottom up Computation)-like algorithms will be briefly introduced.

It can be expressed with the help of an example. Consider a dataset D who purchase records for people who live in Canada, which shall include their province of residence, occupation and education level. On the base of this dataset, following query can be answered.

Question- What shall be the purchasing pattern for entrepreneurs who reside in BC and possess a graduate degree?

Example- Three dimensions in dataset D are relevant for this problem: Province (P), Occupation (O) and Education (E). These are called the task-relevant dimensions. Further assumption is that these dimensions have the following individual values.

- Province: BC (P_1) AB (P_2) ON (P_3)
- Occupation: Entrepreneurs (O_1) Op. Managers (O_2) Teachers (O_3)
- Education: Graduate (E_1) Under-graduate (E_2) High-school (E_3)

To find the suitable subset of records for mining task-related dimensions are used. One record stands for the series of purchase transactions made by one customer, over a precise time period (week/month/year/etc.) For example, $P_1 \cap O_1 \cap E_1$ represent the subset of records required to answer the above query. Assume that the chronological patterns mined from $P_1 \cap O_1 \cap E_1$ are $\langle \text{Moore's suit, silk shirts} \rangle: 7$, $\langle \text{TV, VCR} \rangle: 11$... The first pattern can be interpreted as there are 7 customers, who bought a Moore's suit and a silk shirt together in one transaction. The second pattern interprets that 11 customers in this category bought a TV in first transaction, and then a VCR in later transaction.

Noticeable fact is that there is only one ordered dimension of purchase transactions themselves. All the other dimensions (P, O, and E) are unordered and has no relevance in specification given $P_1 \cap O_1 \cap E_1$ or $P_1 \cap E_1 \cap O_1$; it still describes the same set. When the transactions alone shall be mined would be sequential pattern mining. To mine the transactions along with the other unordered dimensions is multi-dimensional sequential pattern mining. User can gain much more about the conditions when these other unordered dimension values are present which enriches the discovered sequential patterns.

VII. CONCLUSION

The research area of sequential pattern mining has focused on multidimensional sequential pattern mining. In this paper we discussed about sequential pattern mining then what sequential pattern is, methods which used in sequential pattern mining GSP, SPADE, FreeSpan, Prefix Span. We have seen that sequential pattern mining and its entire methods only works on single dimension of information. Then we have discussed about the drawbacks of sequential pattern mining or we can say that why sequential pattern mining is not suitable for multidimensional

data set. Then we have discussed about the need of multidimensional pattern mining and then multidimensional pattern mining.

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Extracting Knowledge from User Access Logs

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Abstract- As the size of web increases along with number of users, it is very much essential for the website owners to better understand their customers so that they can provide better service, and also enhance the quality of the website. To achieve this they depend on the web access log files. It is a file to which the Web server writes information each time a user requests a resource from that particular site. In this paper we will study web access log files and the information we can mine from logs which is useful in understanding user behavior. This information is used in restructuring and redesigning of the website.

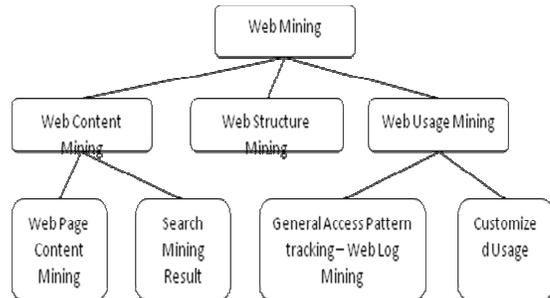
Index Terms- web mining, usage mining, server logs, pattern mining.

I. INTRODUCTION

In this world of Information Technology, accessing information is the most frequent task. Every day we have to go through several kind of information that we need and what we do? Just browse the web and the desired information is with us on a single click. Today, internet is playing such a vital role in our everyday life that it is very difficult to survive without it. The World Wide Web (WWW) has influenced a lot to both users (visitors) as well as the web site owners. The web site owners are able to reach to all the targeted audience nationally and internationally. They are open to their customer 24X7. On the other side visitors are also availing those facilities. the growth in number of web sites and visitors to those web sites has increased exponentially Due to this growth a huge quantity of web data has been generated. To mine the interesting data from this huge pool, data mining techniques can be applied. But the web data is unstructured or semi structured. So we can not apply the data mining techniques directly. Rather another discipline is evolved called web mining which can be applied to web data. Web mining is the use of data mining techniques to automatically discover and extract information from

Web mining is categorized into 3 types.

1. Content Mining (Examines the content of web pages as well as results of web Searching)
2. Structure Mining (Exploiting Hyperlink Structure)
3. Usage Mining (analyzing user web navigation)



E) Web usage mining

Web usage mining is a research field that focuses on the development of techniques and tools to study users web navigation behavior. Understanding the visitors navigation preferences is an essential step in the study of the quality of an electronic commerce site. In fact, understanding the most likely access patterns of the users allows the service provider to customize and adapt the site's interface for the individual user, and to improve the site's static structure within the underlying hypertext system.

When web users interact with a site, data recording their behavior is stored in web server logs. These log files may contain invaluable information characterizing the users experience in the site. In addition, since in a medium size site log files amount to several megabytes a day, there is a necessity of techniques and tools to help take advantage of their content.

Five major steps followed in web usage mining are

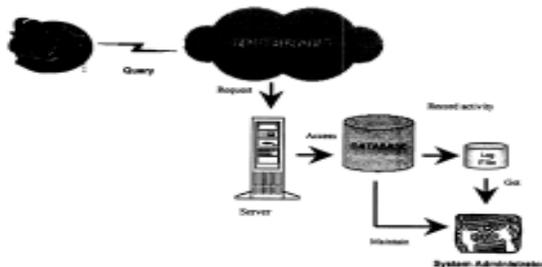
1. Data collection – Web log files, which keeps track of visits of all the visitors
2. Data Integration – Integrate multiple log files into a single file
3. Data preprocessing – Cleaning and structuring data to prepare for pattern extraction
4. Pattern extraction – Extracting interesting patterns
5. Pattern analysis and visualization – Analyze the extracted pattern
6. Pattern applications – Apply the pattern in real world problems

II. SERVER LOGS

A **server log** is a log file (or several files) automatically created and maintained by a server of activity performed by it. It is a file to which the Web server writes information each time a user requests a resource from that particular site. Log file data can offer valuable information insight into web site usage. It represents the activity of many users over a potentially long period of time .A Web server when properly configured, can record every click that users make on a Website. For each click in the visit path, the server adds to the log file information about user request.

The logs collect data on the server in the files of specific format. Measures hold information about web site usage by recording how users visit the web site and how active they are. Depending on the log format structure, different data is stored. Usually logs contain data such as: client's IP address, URL of the page requested, time when the request was sent to the server etc. This data is used later as the basis of usage behavior discovery. Depending on server settings log files format can differ. The form of web logs files standard changes over years as there was more requirements for the web log processing.

A. How Log Files are Created



When a user sends queries to the server, requested databases will be retrieved. At the same time, the user session including the URL, Client's IP address, accessing date and time, query stem will be recorded in the server logs. These server logs can be preprocessed and mined in order to get some insight into the usage of a server site as well as the user's behavior.

B. Information in Server Logs

Server logs can be used to glean a certain amount of quantitative usage information. Compiled and interpreted properly, log information provides a baseline of statistics that indicate usage levels and support and growth comparisons among parts of a site or overtime. Such analysis also provides some technical information regarding server load, unusual activity, or unsuccessful requests, as well as assisting in marketing and site development and management activities.

Web server logs are plain text(ASCII) files, that is independent from server platform. There are some differences between server software, but traditionally there are four types of server logs:

1. Common log or access log
2. Agent Log
3. Error Log
4. Referer Log

The first two types of log files are standard. The referrer and agent logs may or may not be "turned on" at the server or may be added to the transfer log file to create an "extended" log file format. Each HTTP protocol transaction, whether completed or not, is recorded in the logs and some transactions are recorded in more than one log.

1. Access Logs

The first of the three logs is Common log, sometimes referred to as the access log, which is identical in format and syntax to the NCSA Common log format. There are 19 attributes in this type of log file.

a) Date – the date from GMT are recorded for each hit.

b) Time – the time of transaction.

c) Client IP Address – Client IP is the number of computer who access or request the site.

d) User Authentication – some web sites are set up with a security feature that requires a user to enter username and password. Once a user logs on to a website, that user's "username" is logged in the fourth field of the log file.

e) Server name – Name of the server.

f) Server IP address – server IP address is a static provided by Internet Service Provider. This IP will be a reference for access the information from the server.

g) Server Port – This is used for data transmission, usually port 80.

h)Server Method (HTTP Request) – the word request refers to an image, movie sound, pdf, txt, HTML file and more. Currently, there are three formats that Web servers send information in GET, POST, and Head.

i) URI Stem – URI Stem is path from the host. It represents the structure of the websites.

j) Server URI Query – URI-Query usually appears after sign "?". This represents the type of user request and the value usually appears in the Address Bar.

k) Status – This is the status code returned by the server. There are four classes of codes:

Success(200 series) Redirect(300 series) Failure(400 series) Server Error(500 series)

l) Bytes Sent – amount of data returned by the server, not counting the header line.

m) Bytes Received – amount of data sent by the client to the server.

n) Time stamp – is used to determine how long a visitor spent on a given page.

o) Protocol version – HTTP protocol being used.

p) Host – is either the IP address or the corresponding host name of the remote user requesting the page.

q) User Agent – is reported by the remote user's browser. Typically is the string describing the type and version of browser software being used.

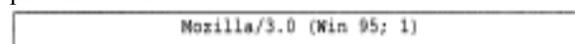
r) Cookies – can be used to track individual users thus make the sessionizer task easier.

s) Referer – the referring page, if any, as reported by the remote user's browser. It is possible to analyze the following variables in the access log:

The data from Access Logs provides a broad view of a Web server's and users. Such analysis enables server administrators and decision makers to characterize their server's audience and usage patterns.

2. Agent Log

The agent log provides data on a user's browser, browser version, and operating system. This is the significant information, as the type of browser and operating system determines what a user is able to access on a site. Sample is presented below:



Browser: The type of browser used to access a website. There are several different Web browsers on the market today, each of which has different viewing capabilities.

Browser version: Each browser has its own capabilities.

Operating System: The type of computer and operating system used to determine the Graphical User Interface (GUI) of a website depending on the computer platform.

The Agent log information is essential for the design and development of Websites. Without such information, server administrator could design sites that require viewing capabilities that vast majority of the site's users do not possess. This could lead to wasted effort by the server administrators. Worst still, this can lead to improperly displayed web content, thus effectively rendering the site useless to the user.

3. Error Log

The average Web user will receive an "Error 404 File Not Found" message several times a day. When a user encounters this message, an entry is made in the Error Log. The analysis of Error log data can provide important server information such as missing files, erroneous links, and aborted downloads. This information can enable server administrators to modify and correct server content, thus decreasing the number of errors users encounter while navigating a site.

4. Referrer Log

The referrer log indicates what other sites on the Web link to a particular server. Each link made to a site generates a Referrer Log entry, The Referrer Log entry provides the following data:

Example:-

[10/Oct/1999:21:15:05 +0500]

"http://www.ibm.com/index.html"

a) date:time timezone ([10/Oct/1999:21:15:05 +0500] in the example)

The date and time stamp of HTTP request

b) Referral: **referrer** ("http://www.ibm.com/index.html" in the example)

The referrer is the URL of the HTTP resource that referred the user to the resource request. If a user is on a site, and clicks on a link to another site, then another entry will receive an entry in their Referrer Log. The log will show that the user came to the other site via first link.

III. LOG ANALYSIS



Fig. 3: Steps for realization of logs

Logs are processed to extract statistical information. Web logs are link of past activities left behind by the previous users of a website. These historical logs are embedded with significant information about the users and how a website is being used on a day-to-day basis. Such information are invaluable in today's world of customer-oriented businesses, especially for companies that depend on the web to advertise their services and to web designers who wish to maintain a constant flow of visitors to their website. Various steps are involved in identifying the information extracted from the logs are shown below: first data is collected which is known as web logs then preprocessing techniques are applied to that web log so that we can get relevant information.

A. Findings

After pattern mining we get several findings:-

1. General Statistics- This provide the summary of whole log file. Usually it gives provides the total hits,page views and total visitors
2. Access statistics- this provide information such as most popular access page and most downloadable files
- 3.visitors statistics – provide the information such as most active country which accesses the website
4. Referrer- This will provide information such as the most used search engines and phrases and keyword used
5. Error- Error is important for the system administrator's website in order to improve the site as well as to reduce the error.

IV. CONCLUSION

Web usage mining is the process of applying statistical and data mining methods to Web log data in order to extract useful patterns concerning the users' navigational behavior, user and page clusters, as well as possible correlations between Web pages and user groups. The web is a most important medium to conduct business and commerce. Therefore the design of web pages is very important for the system administrator and web designers. These features have great impact on the number of visitors. So the web analyzer has to analyze with the data of server log file for detecting pattern. In this paper we tried to give a clear understanding of the web server logs, their types and interesting patterns extracted from the web logs. discovering such information that can be used to improve a business's performance or increase the effectiveness of a particular website. By this we can shorten the pages which are not in the user pattern, also we can record the information of the user, This will also help in evaluating address campaigns, restructuring and redesigning of website. Since this is a huge area, and there a lot of work to do, we hope this paper could be a useful starting point for identifying opportunities for further research

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Detection of Wormhole Attack using Hop-count and Time delay Analysis

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Abstract- MANET, due to the nature of wireless transmission, has more security issues compared to wired environments. In this paper we specifically considering Tunneling attack which does not require exploiting any nodes in the network and can interfere with the route establishment process. Instead of detecting suspicious routes as in previous methods, we implement a new method which detects the attacker nodes and works without modification of protocol, using a hop-count and time delay analysis from the viewpoint of users without any special environment assumptions. The proposed work is simulated using OPNET and results showing the advantages of proposed work.

Index Terms- Ad hoc network, hop-count analysis, network security, Tunneling attack.

I. INTRODUCTION

The mobile ad-hoc network, MANET [1], is a developing wireless technology that has been discussed in many academic research projects in the last decade. An ad-hoc network is inherently a self-organized network system without any infrastructure. Typically, the nodes act as both host and router at the same time, i.e., each node in the network can be independent and based on different hardware, but when communication is needed it serves as a data transmitting router after a route discovery procedure. So far, many routing protocols have been proposed for MANET, such as DSDV (Destination Sequence Distance Vector) [2], DSR (Dynamic Source Routing) [3] and AODV (Ad-hoc On-Demand Vector) [4] and so on. To the best of our knowledge, most previous research has focused on protocol establishment and its efficiency in MANET, but secure routing is very important, and some secure routing protocols based on DSR and AODV [5-7] have been proposed in these years. Recently, a novel exploit called wormhole attack was introduced [8]. In a wormhole attack, attackers “tunnel” packets to another area of the network bypassing normal routes as shown in Figure 1. In practice, attackers can use high power antennas or a wired link, or other methods. The resulting route through the wormhole may have a better metric, i.e., a lower hop-count than normal routes. With this leverage, attackers using wormholes can easily manipulate the routing priority in MANET to perform eavesdropping, packet modification or perform a DoS (Denial of Service) attack, and so on. The entire routing system in MANET can even be brought down using the wormhole attack. Its severity and influence has been analyzed in [9].

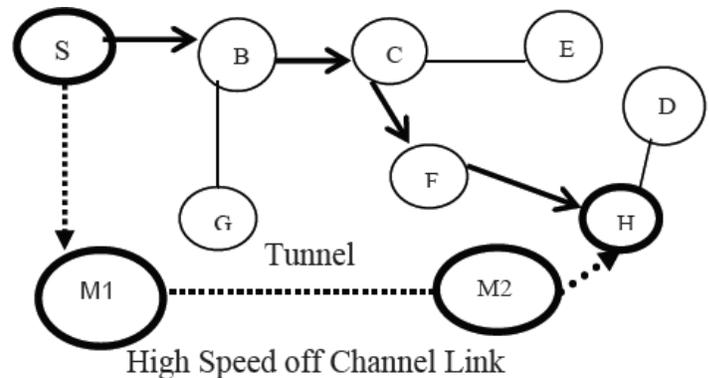


Figure 1: The wormhole attack in MANET

Mobile wireless ad hoc networks are fundamentally different from wired networks, as they use wireless medium to communicate, do not rely on fixed infrastructure, and can arrange them into a network quickly and efficiently. In a Mobile Ad Hoc Network (MANET), each node serves as a router for other nodes, which allows data to travel, utilizing multi-hop network paths, beyond the line of sight without relying on wired infrastructure. Security in such networks, however, is a great concern [1, 2, 7, 8]. The open nature of the wireless medium makes it easy for outsiders to listen to network traffic or interfere with it. Lack of centralized control authority makes deployment of traditional centralized security mechanisms difficult, if not impossible. Lack of clear network entry points also makes it difficult to implement perimeter-based defense mechanisms such as firewalls. Finally, in a MANET nodes might be battery-powered and might have very limited resources, which may make the use of heavy-weight security solutions undesirable [2, 3, 7, 8, 13]. A wormhole attack is a particularly severe attack on MANET routing where two attackers, connected by a high-speed off-channel link, are strategically placed at different ends of a network, as shown in figure 1. These attackers then record the wireless data they overhear, forward it to each other, and replay the packets at the other end of the network. Replaying valid. Our method selects routes and “avoids” rather than “identify” the wormhole resulting in low cost and overhead. We propose a multipath routing protocol called Multipath Hop-count Analysis efficient protocol which does not require any special supporting hardware. Furthermore, MHA is designed to use split multipath routes, so the transmitted data is naturally split into separate route. An attacker on a particular route can not completely intercept (and subvert) our content. The rest of the paper is organized as

follows: We review related works regarding wormhole attack in Section 2. In Section 3, the proposed work. The simulations are given in Section 4, and Finally, we present our conclusions in Section 5.

II. RELATED WORK ON WORMHOLE ATTACK

In this section, we introduce the mechanism for detecting the wormhole attacks. To identifies misbehaving nodes and avoids routing through these nodes, watchdog and pathrater is proposed in [11]. In this technique, watchdog identifies misbehavior of nodes by copying packets and maintained a buffer for recently sent packets. The overheard packet is compared with the sent packet, if there is a match then discards that packet. If the packet is timeout, increment the failure tally for the node. And if the tally exceeds the thresholds, then node will misbehave. The implementation of watchdog technique is shown in Fig.2.

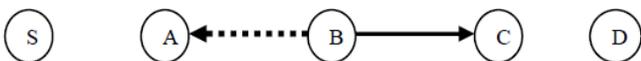


Figure 2: Watchdog implementation

In this figure, it is assumed that bidirectional communication symmetry on every link between nodes that want to communicate. If a node can receive a message from a node at time , then node could instead have received a message from node at the time will implement the watchdog. It maintain a buffer of recently sent packets and compares each overheard packet with the packet in the buffer, when forwards a packet from to with the help of , can overhear transmission and capable of verifying that has attempted to pass the packet towards . But this approach has some limitations and it is not detect the misbehaving node during ambiguous collisions, receiver collisions, false misbehavior and collusion.

The approach is used directional antenna to detect and prevent the wormhole attack [12]. The technique is assumed that nodes maintain accurate sets of their neighbors. So, an attacker cannot execute a wormhole attack if the wormhole transmitter is recognized as a false neighbor and its messages are ignored. To estimate the direction of received signal and angle of arrival of a signal it uses directional antennas. This scheme works only if two nodes are communicating with each other, they receive signal at opposite angle. But this scheme is failed only if the attacker placed wormholes residing between two directional antennas.

Statistical analysis scheme [13] is based on relative frequency of each link which is part of the wormhole tunnel and that is appears in the set of all obtained routes. In this techniques, it is possible to detect unusual route selection frequency by using statistical analysis detected and will be used in identifying wormhole links. This method do not requires any special hardware or any changes in existing routing protocols. It does not require even the aggregation of any special information, since it uses routing data that is already available to a node the main idea behind this approach resides in the fact that the relative

frequency of any link that is part of the wormhole tunnel, will be much higher than other normal links.

In [14] is discussed graph theoretic model that can characterize the wormhole attack and can ascertain the necessary and sufficient conditions for the candidate solution to prevent wormhole attack. This scheme is also discussed a cryptographic based solution through local broadcast key and to set up a secure wireless ad hoc network against wormhole attacks. In this scheme, there are two types of nodes in the network named as: guards and regular nodes. Guards access uses GPS to access the location information or other localization method like secure range independent localization for wireless sensor network is presented in [15] and rebroadcast location data. Regular nodes need to calculate their location relative to the guards' beacons, thus they are able to distinguish abnormal transmission due to beacon retransmission done through the wormhole attackers. In this scheme, sender is encrypted all transmissions from local broadcast key and these information must be decrypted at the receiver end. But this scheme will be suffer the time delay to accumulate per node traveled and special localization equipment is needed to guard nodes for detecting positions.

To mitigate the wormhole attack in mobile ad hoc network, cluster based technique is proposed in [15]. In this approach clusters are formed to detect the wormhole attack. The whole network is divided into clusters. These clusters can either be overlapped or disjoint. Member nodes of cluster pass the information to the cluster head and cluster head is elected dynamically. This cluster heads maintains the routing information and sends aggregated information to all members within cluster. In this scheme, there is a node at the intersection of two clusters named as guard node. The guard node has equipped with power to monitor the activity of any node and guard the cluster from possible attack. The network is also divided into outer layer and inner layer. The cluster head of outer layer is having the responsibility of informing all nodes of the inner layer about the presence of the malicious node.

To prevent and detect the wormhole attack most common approach is discussed in [1] and [13], known as packet leases mechanism. In this paper, they are presented two types of leases: geographic leases and temporal leases also presented an authentication protocol. The authentication protocol is named as TESLA [13] with instant key disclosure and this protocol, for use with temporal leases. In, geographic leases each node access GPS information and based on loose clock synchronization. Whereas temporal leases require much tighter clock synchronization (in the order of nanoseconds), but do not tightly depend on GPS information and temporal leases that are implemented with a packet expiration time. The observation of this scheme is geographic leases are less efficient than temporal leases, due to broadcast authentication, where precise time synchronization is not easily achievable.

Other temporal leases wormhole prevention technique is discussed in [13] based on time of flight of individual packets. This scheme is to measure round-trip travel time with its acknowledgment. This technique is used merkle hash tree and hash chains as explained in TESLA.

An efficient detection method known as delay per hop indication (DelPHI) for wormhole attack prevention is discussed in [14]. The protocol is developed for hidden wormhole attack and

exposed wormhole attack. In this scheme, sender will check whether there are any types of malicious nodes presented in the routing path by that they will receive and implement the wormhole attacks. This scheme will not require clock synchronization, position information of nodes and any special types of hardwares. Pathrater technique [11] calculates path metric for every path. By keeping the ratings of each node in the network, the path metric is calculated by using the node rating and connection reliability which is obtained from previous experience. Once the path metric has been calculated for all accessible paths, Pathrater will select the path with the highest metric. The path metrics would enable the Pathrater to select the shortest path. Thus it avoids routes that may have misbehaving nodes.

III. PROPOSED WORK

We have performed the simulation of the proposed scheme in Opnet Network Modeler 14.0 to prove practical efficiency of the scheme; the physical parameter considerations are same as taken in mathematical modeling. The steps of modeling in FSM (Finite State Machine) of Proposed Algorithm are as follows:

- Step1.** Randomly Generate a Number in between 0 to maximum number of nodes.
- Step2.** Make the Node with same number as transmitter node.
- Step3.** Generate the Route from selected transmitting node to any destination node with specified average route length.
- Step4.** Send packet According to selected destination and start timer to count hops and delay.
- Step5.** Repeat the process and store routes and their hops and delay.
- Step6.** Now if the hop count for a particular route decreases abruptly for average hop count then at least one node in the route must be attacker.
- Step7.** Now check the delay of all previous routes which involve any on node of the suspicious route. Now the node not encounter previously should be malicious let there are N such nodes.
- Step8.** In $N = 1$ then it is the attacker else wait for future sequences which shows deviation and involve only one of N nodes.
- Step9.** These nodes are black listed by the nodes hence they are not involved in future routes.
- Step10.** Whole process (from step1 to step9) is repeated until we didn't get the specified goal (goal can be
 1. To get complete list of malicious nodes.
 2. To run for specified time.
 3. To run for specific number of packets etc.

IV. SIMULATION ANALYSIS AND RESULT

For the simulation we have created node models, process models, & packet models, we also used some predefined node models from library. The details of models with their technical parameters are as follows

Total Nodes = 50
 Infected node=6

Packet size = 1024 bits constant
 Applying protocol=DSDV
 Packet inter arrival time = 1sec. constant
 Data Rate = 11 Mbps.
 Area = 20 square Km.
 Destination Address = Random.
 Modulation = BPSK
 Antenna = Omni Directional

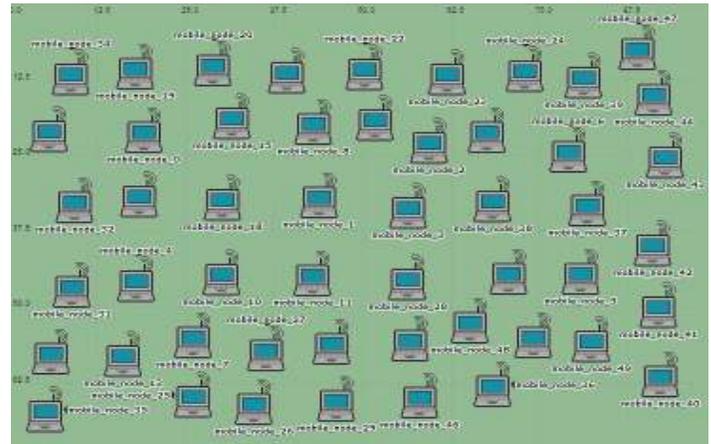


Figure: 4.1 node distribution without worm hole attack

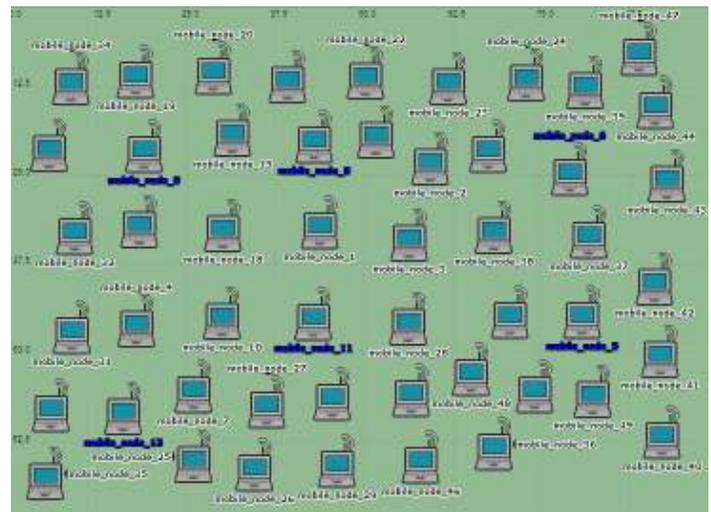


Figure: 4.2 node distribution with 6 wormhole infected node

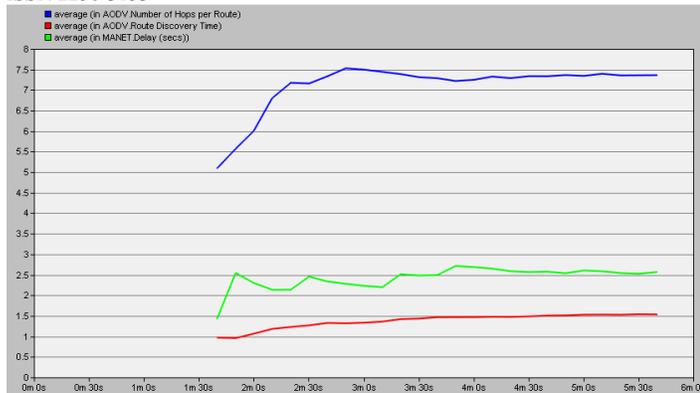


Figure: 4.3 Average Hop count per route comparison.

Attack reduces the average hop count by 25% (shown in blue) from normal condition (shown in red) which shows the selection of attaching node in route, the proposed algorithm significantly regains the hop counts by avoiding the attacker (shown in green)

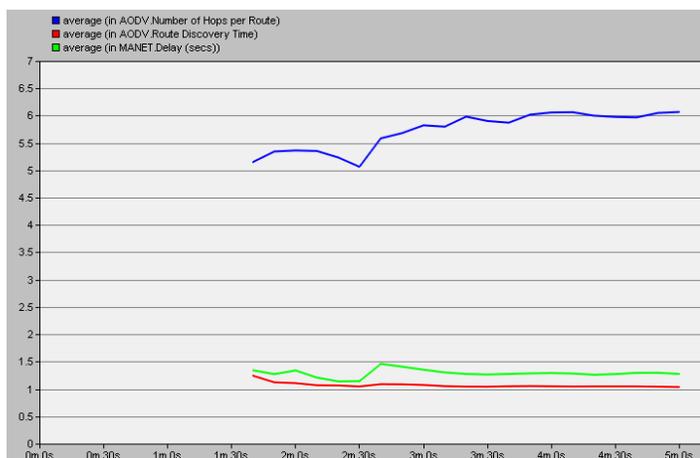


Figure: 4.4 Average delays per route comparison.

Attack reduces the average delay by 75% (shown in blue) from normal condition (shown in red) which shows the shorting of route by attacking route, the proposed algorithm have much better delay which presents the elimination of attacker (shown in green).

V. CONCLUSION

Our method provides good performance for detecting tunneling attacks it detects 75 percent of attackers within five minutes, In addition, since we only select part of the searched routes for multi-path transmission, the probability that attacks can occupy the route are further reduced. In another scenario, attackers may maliciously modify other nodes instead of itself in the graylist. Thus the nodes that have been modified would be reported as modifiers and be blocked by the source node. To counter this, some ID-based cryptographic methods [15] such as digital signatures can be adopted to prevent this.

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Video Enhancement Algorithms on System on Chip

Dr.Ch. Ravikumar, Dr. S.K. Srivatsa

Abstract- This paper presents a way to improve the computational speed of video enhancement using low-cost FPGA-based hardware. To design real-time adaptive and reusable image enhancement architecture for video signals based on a statistical processing of the video sequence. The VHDL hardware description language has been used in order to make possible a top-down design methodology. Generic design methodology has been followed by means of two features of the VHDL: global packages and generic pass. Video processing systems like this one require specific simulation tools in order to reduce the development time. Real time image processing in an application environment needs a set of low cost implementations of various algorithms. This paper presents a median filter based on a system on chip and working at video rate. It includes its own memory and can be used without any image memory for on line processing. The architectural choices have made it possible to design a small size chip with a high performance level. A VHDL test bench has been designed specifically for Video processing applications to facilitate the simulation process. A video enhancement processor concept is proposed that enables efficient hardware implementation of enhancement procedures and hardware software co-design to achieve high performance, low-cost solutions. The processor runs on an FPGA prototyping board.

Index Terms- SOC, FPGA, VHDL, video enhancement, Video enhancement comparison

I. FIR AND MEDIAN FILTERING

One of the most common video-enhancement blocks is the FIR (finite-impulse-response) filter. A FIR filter multiplies and sums a sequence of received-video-data impulses, creating a 2-D convolution process. A 2-D FIR filter can perform 2-D convolution using matrices of 3×3 , 5×5 , or 7×7 coefficients. A 2-D FIR filter's key provides sharpening, smoothing, and edge detection of a video image. By designing the proper coefficients and applying the correct matrix, you can produce a crystal-clear video output. However, the electrical system can introduce video noise into a video stream during transmission in any channel. A median filter provides a simple and effective noise-filtering process. The median value of all the pixels in a population—that is, a selected neighborhood block—determines each video pixel. The median value of a population is that value in which one-half of the population have smaller values than the median and the other half has larger values than the median value.

II. IMAGE/VIDEO PROCESSING ON FPGAS

Image and Video Processing on embedded devices is a growing trend in the industry today where security is depended on cameras placed everywhere, replacing people behind monitors. FPGAs are preferred for their parallel pixel processing power over sequential microprocessors. Newer FPGAs are packing more gates and requiring lower power, which is certainly attractive features for embedded designers. Instead of a trial-run on an expensive ASIC fabrication process of a custom design, FPGAs offer a cost effective alternative, or at least a prototype before millions of dollars are invested and sometimes to find out the ASIC doesn't perform as expected from simulation on a computer with software.

Image and Video Processing often requires DSP algorithms on multiple rows/columns of pixels/data concurrently. A typical TI DSP processor may have two ALUs (Arithmetic Logic Units) that perform MAC (Multiply & Accumulate) operations, an FPGA can have, for example, 200 MAC blocks processing pixels in parallel.

Some FPGAs now have dedicated hard-core DSP/MAC silicon blocks in an FPGA for faster processing power than FPGA fabric designed as MACs.

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IV. THE FPGA IS THE HEART OF THE SYSTEM

In the past, dedicated DSP chips were an option, but even with high internal clock frequencies, massive I/O capacity and advanced graphics accelerators these are no longer adequate, because they are limited to a certain number of operations per clock frequency. Dedicated graphics processors provide higher performance and are more specialised, though they still have the same limitations.

Modern FPGAs do not suffer from such limitations. The capacity has been greatly increased, all of the most recent high-speed interfaces to memory etc. are fully supported, and the number of parallel operations is limited only by the total capacity of the FPGA. Even with lower internal clock frequencies versus dedicated CPUs, this is compensated for by the massive parallelisation that is achievable. The most recent FPGAs with dedicated DSP chips are ideal for this type of project, and they function as the heart of the application.

Most current DSP algorithms for video processing are fundamentally composed of multiply-accumulate operations (MACs) that are carried out in both dimensions according to the desired resolution. The DSP chips implement the MACs directly at the desired word width and high clock frequency. For applications with fixed processing paths, the separate processing units are connected together in a streaming architecture, where the processing time is the same for all the units in the processing chain and the intermediate results can be buffered internally in the FPGA.

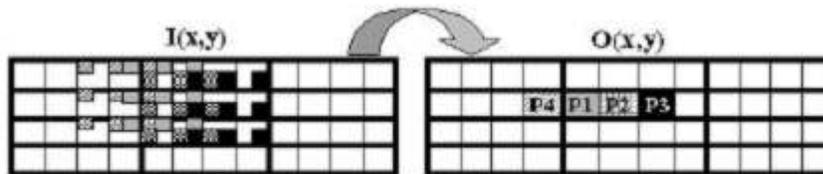


Fig 2. simultaneous computation of output pixel

The fact that we have a 32-bit data bus has a very large influence in the necessary hardware architecture for implementing image processing operations, because it causes that in each read/write operation we obtain/send four image pixels (supposing 8-bit pixels). We have gained benefit from this situation replicating the functional units in order to apply the median filter simultaneously on four pixel neighbourhoods. In this way we take advantage of the inherent neighbourhood parallelism, and we accelerate the operation four times. Figure 2 presents the approach followed for the simultaneous computation of these four output pixels.

Images are divided in pixels (squares) that are grouped in 32-bit words (4 pixels). The value of each output pixel $O(x,y)$ is

V. MODIFIED ADAPTIVE MEDIAN FILTER

The Modified Adaptive Median Filter is designed to eliminate the problems faced with the standard median filter. The basic difference between the two filters is that, in the Adaptive Median Filter, the size of the window surrounding each pixel is variable. This variation depends on the median of the pixels in the present window. If the median value is an impulse, then the size of the window is expanded. Otherwise, further processing is done on the part of the image within the current window specifications. „Processing“ the image basically entails the following: The center pixel of the window is evaluated to verify whether it is an impulse or not. If it is an impulse, then the new value of that pixel in the filtered image will be the median value of the pixels in that window. If, however, the center pixel is not an impulse, then the value of the center pixel is retained in the filtered image. Thus, unless the pixel being considered is an impulse, the gray-scale value of the pixel in the filtered image is the same as that of the input image. Very diverse FPGA-based custom-computing boards are appearing in the market. These boards possess different interfaces for their communication with the host. But in general, boards devoted to real-time image processing have a USB interface, because it gives them the necessary speed to work as coprocessors. Also, USB bus has a growing popularity due to its interesting properties.

computed using the 9 pixels of the image I that are inside the 3×3 mask with centre in $I(x,y)$. Each mask application has been represented with a different texture.

Note that the pixel $P4$ of the previous word is computed and not that of the current word. In this way, it is only necessary to read six words in the input image instead of nine, reducing the number of read operations, and therefore increasing the performance. Pipelining this approach using two stages it is possible to get an architecture that writes four pixels (one word) in the output image in each clock cycle, only reading three input image words by cycle

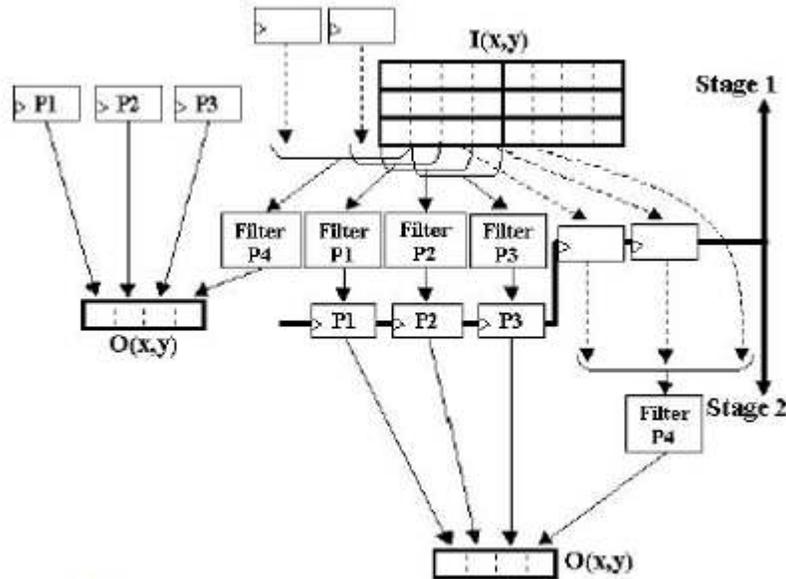


Fig 3. Pipelining approach using two stages

3. Moving Window Architecture In order to implement a moving window system in VHDL, a design was devised that took advantage of certain features of FPGAs. FPGAs generally handle flip -flops quite easily, but instantiation of memory on chip is more difficult. Still, compared with the other option, off-chip memory, the choice using on-chip memory was clear. It was determined that the output of the architecture should be vectors for pixels in the window, along with a data valid signal, which is used to inform an algorithm using the window generation unit as to when the data is ready for processing. Since it was deemed necessary to achieve maximum performance in a relatively small space, FIFO Units specific to the target FPGA were used.

Importantly though, to the algorithms using the window generation architecture, the output of the window generation units is exactly the same. This useful feature allows algorithm interchangeability between the two architectures, which helped significantly, cut down algorithm development time. A window size was chosen because it was small enough to be easily fit onto the target FPGAs, and is considered large enough to be effective for most commonly used image sizes. With larger window sizes, more FIFOs and flip -flops must be used, which increases the FPGA resources used significantly. Figure 1, 2 shows a graphic representation of the FIFO and flip flop architecture used for this design for a given output pixel window.

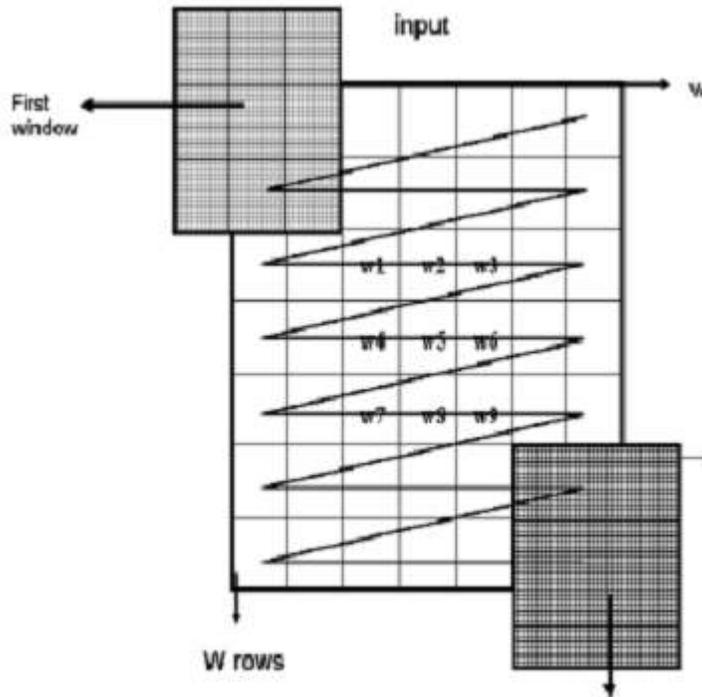


Fig.4 Moving Window Architecture

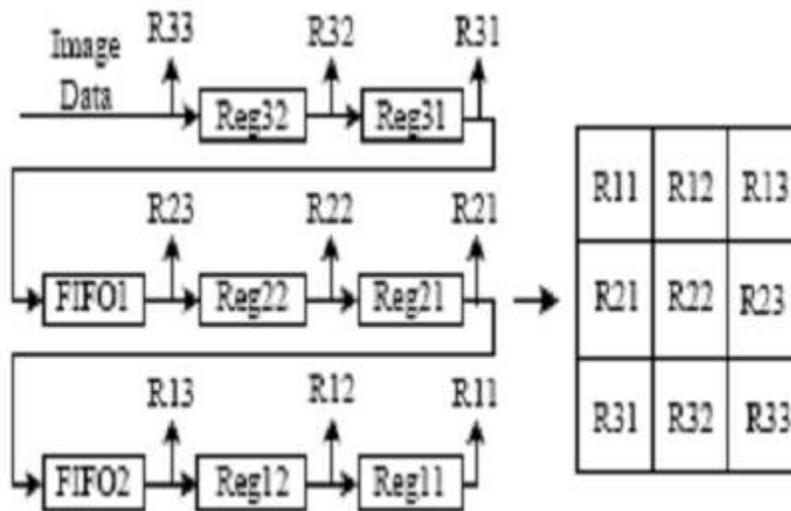
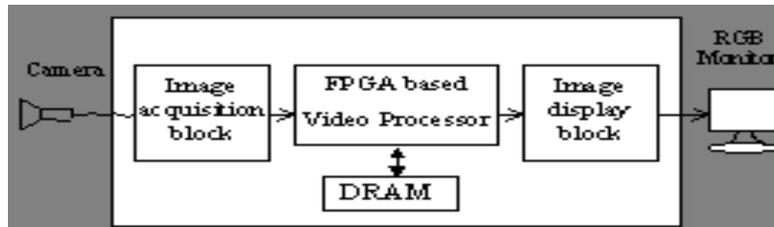


Fig. 5 Reading Pixels from Window.

VI. HARDWARE IMPLEMENTATION ON A FPGA BASED VIDEO BOARD

To assess the effectiveness of our skeleton-based approach, we have implemented our system on a FPGA based video

processing board. A functional block diagram of the FPGA board is given by figure



Bit parallel arithmetic has been chosen to implement the IP operations on the onboard FPGA. This choice is motivated by the fact that bit parallel architectures often lead to a better time-hardware product than bit serial ones. This is mainly due to the existence of dedicated fast carry logic on Xilinx FPGAs. However, in the context of processing real time video, the FPGA board influences the choice of the arithmetic. If bit serial arithmetic is to be used, there is a need to generate a bit clock from the pixel clock. The bit clock frequency is 'N' times the pixels' clock (for an 'N'-bit pixel). This implies a bit clock frequency of 108 MHz for 8-bit length pixel processing, and 216 MHz for 16-bit length pixel processing. Thus the architectures used will be implemented from bit parallel-based skeletons. A parallel implementation is easier to implement and can be efficiently implemented using dedicated fast carry logic.

Image processing is usually performed on pictures stored in an image memory. Achieving global transformations, such as a FF1, requires that one faces difficulties in communication with the computation unit (address processing, high data rates). On the

other hand, most low-level image processing is performed on a $m \times n$ work window involving pixels of n adjacent image lines. If the image is provided on video format (line by line scanning), on-line processing can be performed, if one assumes that $n-1$ lines are bufferized, whatever the image height. No random access image memory is therefore necessary.

VII. RESULT

The adaptive median filter for video enhancement is designed to remove impulsive noise from video. Therefore, our algorithm's performance was first tested with basic salt and pepper noise with a noise density of 0.25. The next test involves processing images that contain impulsive and/or non-impulsive noise. It is well known that the median filter does not provide sufficient smoothening of non-impulsive noise. Therefore, Gaussian and 'salt and pepper' noise were added to the video which was then processed by the algorithm. The Fig a, b show the performance of the adaptive median filter.



Fig 4 : Results of filtering with a 3×3 median and conditional median filter. From left to right, first row: original Image, noisy image; second row: standard median filter, Adaptive median filter.

VIII. CONCLUSION

The architecture is pipelined which processes one pixel per clock cycle, thus to process an image of size 256 x 256 it requires 0.65 ms when a clock of 100 MHz is used and hence is suitable for real time applications. The adaptive median filter successfully removes impulsive noise from images. It does a reasonably good job of smoothening images that contain non-impulsive noise. Overall, the performance is as expected and the successful implementation of the adaptive median filter is presented. Specifically, the project requirements include achieving throughput suitable for real-time video, reducing area as needed for implementation in the given FPGA, and producing a noticeable reduction in the artifacts present in the input frame of video.

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Low Power Different Sense Amplifier Based Flip-flop Configurations implemented using GDI Technique

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Abstract- In this paper, Sense Amplifier based Flip-flop (SAFF) is implemented in three different configurations using Gate Diffusion Input (GDI) Technique. Experimental Results verified that proposed designs have reduced power consumption, reduced area & Temperature sustainability. Both single edge triggered SAFF (SET-SAFF) & double edge triggered SAFF (DET-SAFF) are presented here. Considerable reduction in power consumption is observed in DET-SAFF design as compared to SET-SAFF. The simulation has been carried out on Tanner EDA tool on BSIM3v3 90nm technology.

Index Terms- CMOS digital integrated circuits, double edge triggered, flip-flops, GDI Technique, latch topology, low power sense amplifier based flip-flop, single edge triggered, Tanner EDA.

I. INTRODUCTION

Traditional CMOS logics had been modified using different low power techniques to achieve reduced power consumption[1]. A new technique known as Gate diffusion input (GDI) technique for low-power digital circuit design is described in this paper. This technique allows reduced power consumption, reduced area of digital circuits while maintaining low complexity of logic design. In this paper we focus on a sense-amplifier flip-flop (SAFF) that has lower power consumption compared to other conventional flip-flops. SAFF incorporates a precharged sense amplifier in the first stage to generate a negative pulse, and a Set-Reset (SR) latch in the second stage to capture the pulse and hold the results. Since our proposed design is based on SAFF, let us first consider the operation of sense-amplifier flip-flop in more detail. The GDI approach allows implementation of a wide range of complex logic functions using only two transistors. Data dependent SAFF (DD-SAFF) utilizes data dependency to lower power consumption. Dual edge triggering results in halving the clock frequency, so again reducing power consumption [2][3][4][5].

II. SENSE AMPLIFIER BASED FLIP-FLOP

In general, a flip-flop consists of two stages: a pulse generator (PG) and a slave latch (SL). The SAFF consists of the SA in the first stage and the slave set-reset (SR) latch in the second stage as shown in Figure1. Sense Amplifier based Flip-flop (SAFF) is a flip-flop where the SA stage provides a negative pulse on one of the inputs to the slave latch, depending whether the output is to be set or reset[6]. It senses the true and complementary differential inputs. The SA stage produces monotonic transitions

from one to zero logic level on one of the outputs, following the leading clock edge[7]. Any subsequent change of the data during the active clock interval will not affect the output of the SA. The SR latch captures the transition and holds the state until the next leading edge of the clock arrives [8]. After the clock returns to inactive state, both outputs of the SA stage assume logic one value [9]. Therefore, the whole structure acts as a flip-flop. This flip-flop has differential inputs and is suitable for use with differential and reduced swing logic [10].

III. SAFF TOPOLOGIES

A. Conventional SAFF with CMOS NAND Latch Design

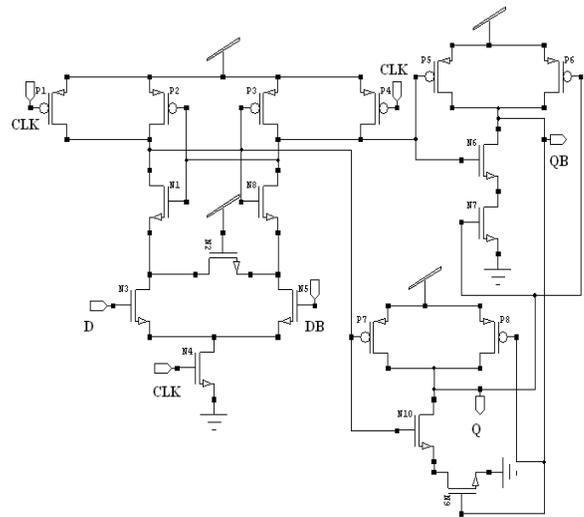


Figure 1: SAFF with CMOS-NAND Latch Design

B. Conventional SAFF with CMOS Symmetric Latch Design

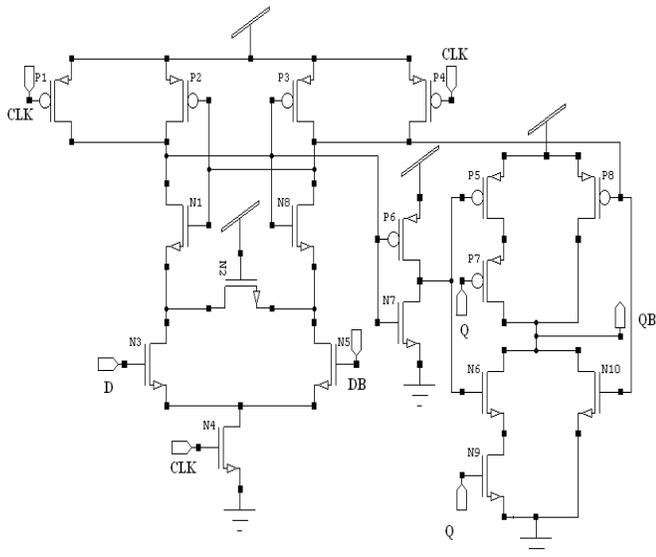


Figure 2: SAFF with CMOS-Symmetric Latch

C. Proposed SAFF with Latch using GDI Technique Design

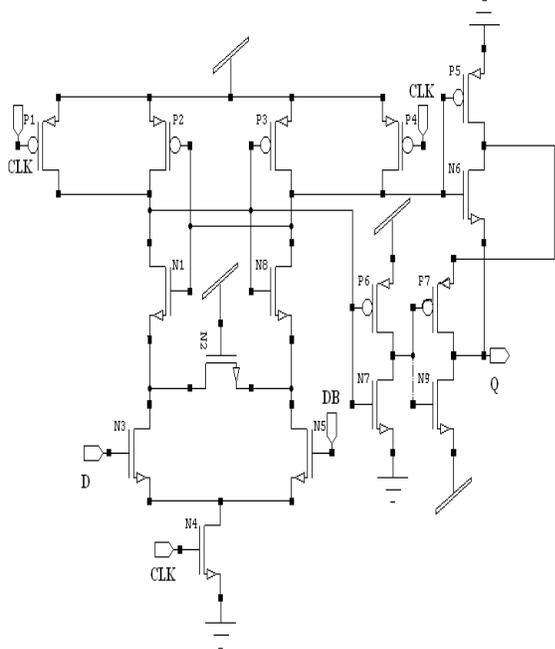


Figure 3: SAFF with latch implemented with GDI Technique

D. Conventional Data-Dependent SAFF with CMOS-NAND Latch Design

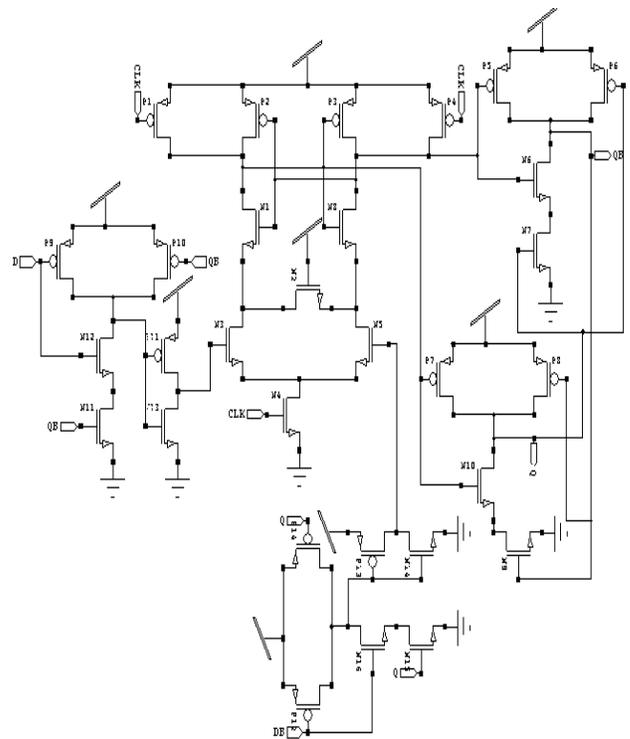


Figure 4: Data-Dependent SAFF with CMOS-NAND Latch Design

E. Proposed Data-Dependent SAFF with Latch implemented with GDI Technique

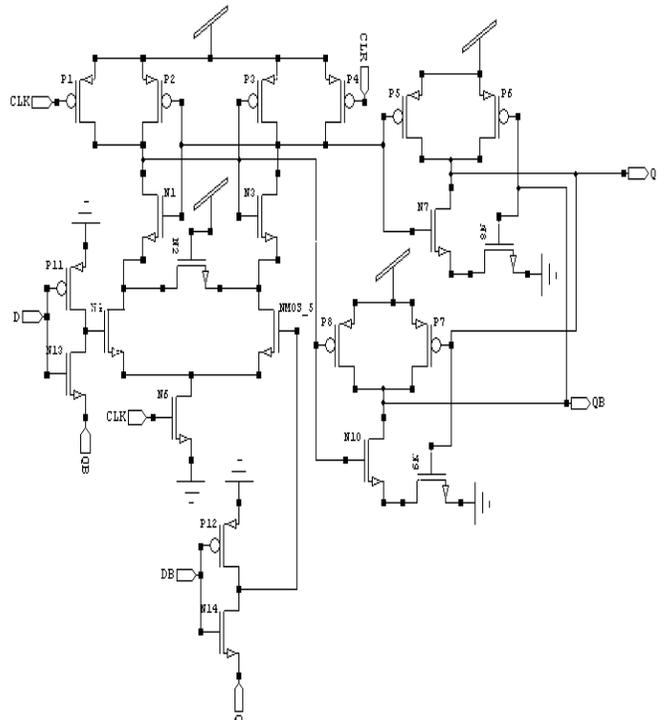


Figure 5: Data-Dependent SAFF with Latch implemented with GDI Technique

F. Conventional Dual Edge Triggered SAFF with CMOS-NAND Latch Design

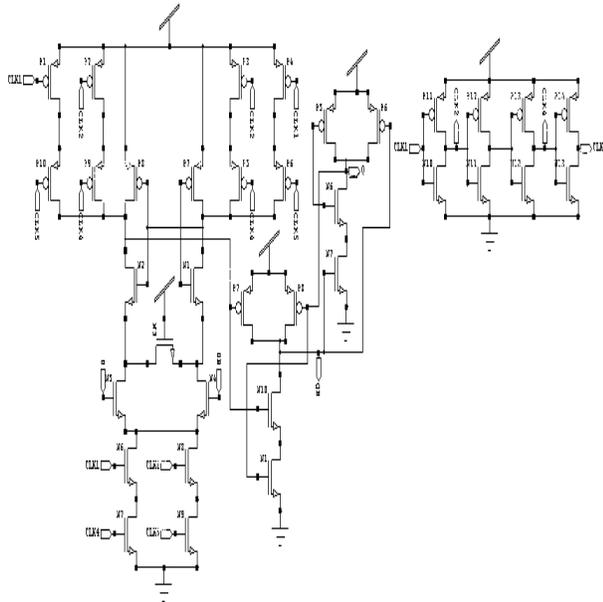


Figure 6: Dual Edge Triggered SAFF with CMOS-NAND Latch Design

G. Proposed Dual Edge Triggered SAFF with Latch implemented with GDI Technique

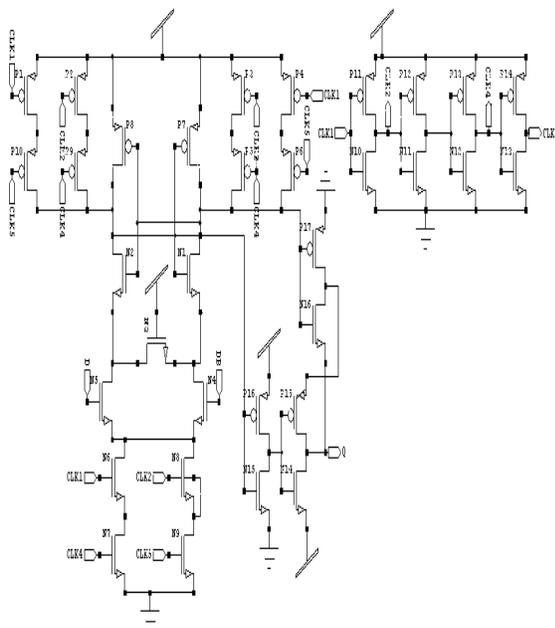


Figure 8: Dual Edge Triggered SAFF with implemented with GDI Technique

IV. SIMULATIONS AND ANALYSIS

A. Simulation Environment

All the circuits have been simulated using BSIM3V3 90nm technology on Tanner EDA tool. To make the impartial testing environment all the circuits has been simulated on the same input patterns.

B. Simulation Comparison

In this section, proposed designs using low power technique is consuming low power and has high performance as compared with conventional SAFF topologies in terms of power, delay and temperature at varying supply voltages. All the circuits have been simulated with supply voltage ranging .8 V to 1.6 V. Following graphs are shown between Power Consumption Vs Operating Temperature, Delay Vs V_{DD} , Power Consumption Vs V_{DD} for different SAFF topologies. Power consumption variation with different operating range of temperatures is shown at $V_{DD}=1V$. Following tables represent the quantitative approach showing the variation of power consumption for all topologies given above over different operating range of temperature, V_{DD} , and delay variation with V_{DD} . Finally, power-delay product comparison is shown in tabular form which reflects that our proposed circuit has least PDP and hence it is more efficient for low power VLSI designs.

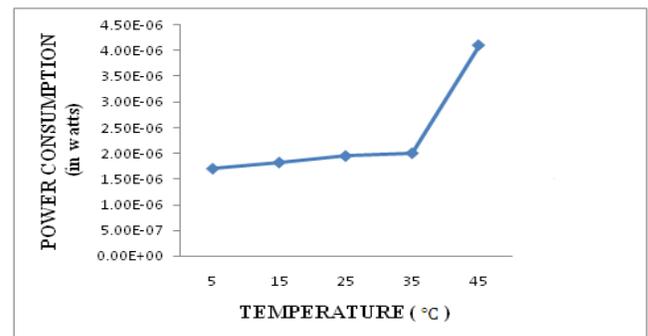


Figure 9: Power consumption variation of SAFF with CMOS-NAND latch over different operating range of temperatures at $V_{DD}=1V$

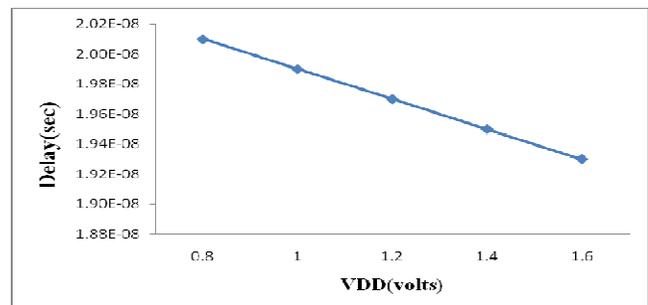


Figure 10: Delay Variation of SAFF with CMOS-NAND latch, SAFF with CMOS-Symmetric Latch & SAFF with Latch implemented with GDI technique over different operating range of V_{DD}

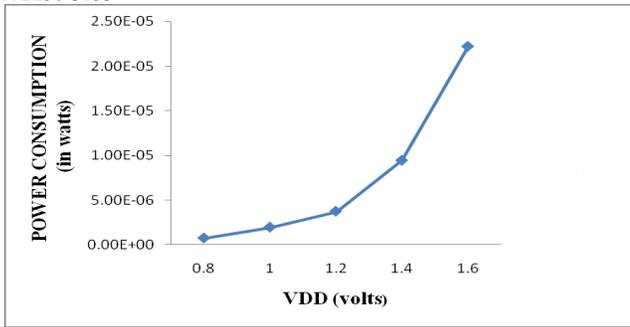


Figure 11: Power consumption variation of SAFF with CMOS-NAND latch over different operating range of V_{DD}

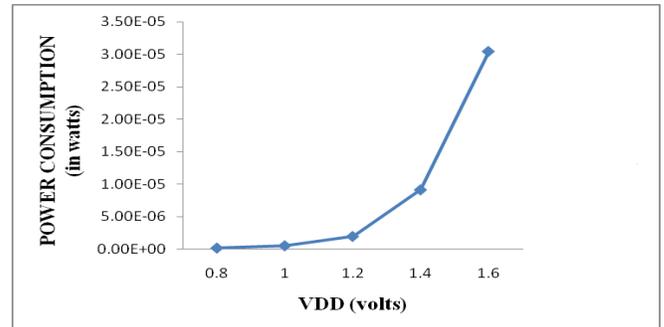


Figure 15: Power consumption variation of SAFF with Latch implemented with GDI technique over different operating range of V_{DD}

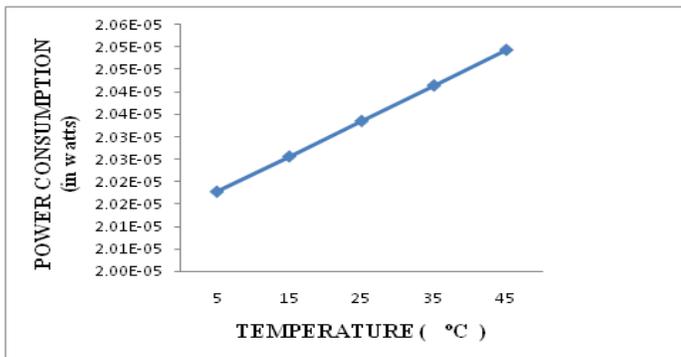


Figure 12: Power consumption variation of SAFF with CMOS-Symmetric Latch over different operating range of temperature at $V_{DD}=1V$

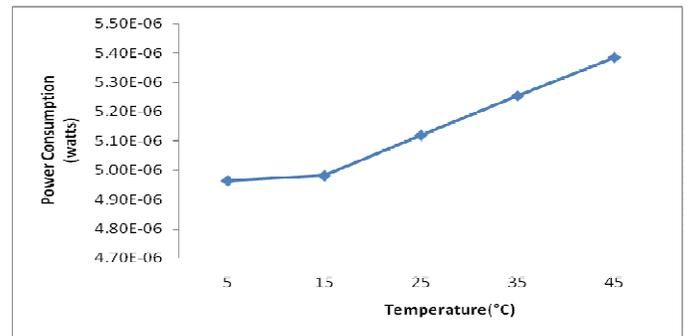


Figure 16: Power consumption variation of DD-SAFF with CMOS-NAND Latch over different operating range of temperature at $V_{DD}=1V$

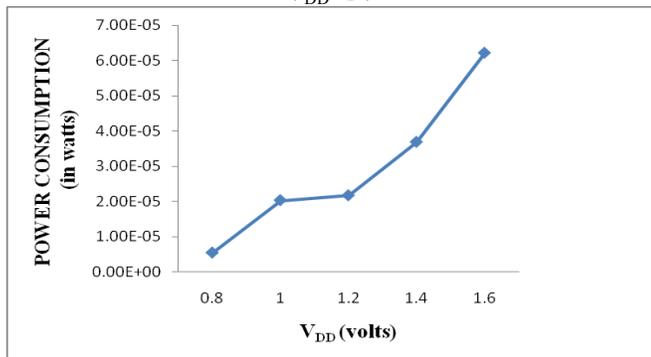


Figure 13: Power consumption variation of SAFF with CMOS-Symmetric Latch over different operating range of V_{DD}

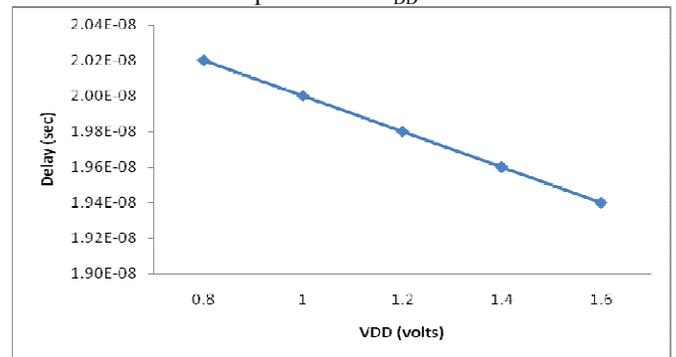


Figure 17: Delay variation of DD-SAFF with CMOS-NAND Latch & DD-SAFF with Latch implemented with GDI Technique over different operating range of V_{DD}

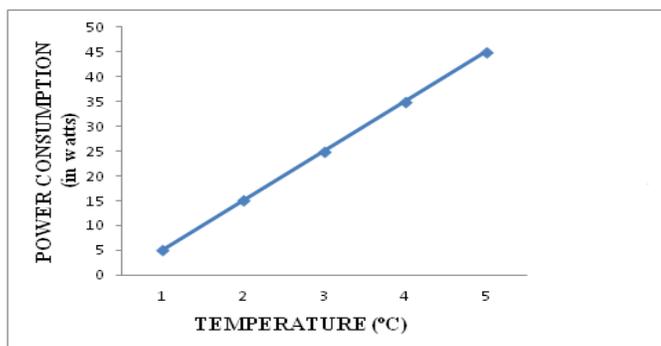


Figure 14: Power consumption variation of SAFF with Latch implemented with GDI technique over different operating range of temperature at $V_{DD}=1V$

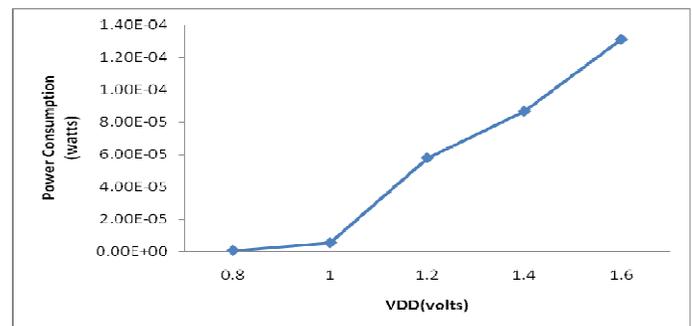


Figure 18: Power consumption variation of DD-SAFF with CMOS-NAND Latch over different operating range of V_{DD}

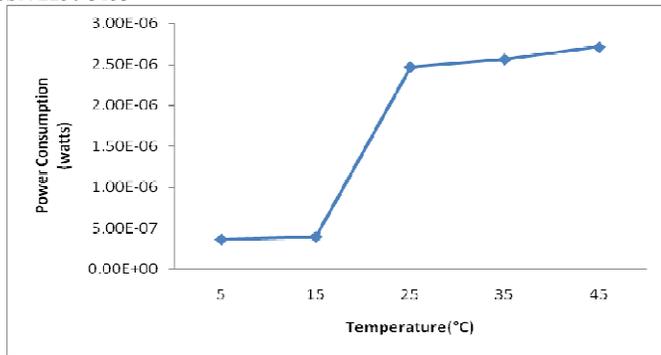


Figure 19: Power consumption variation of DD-SAFF with Latch implemented with GDI Technique over different operating range of temperature at $V_{DD}=1V$

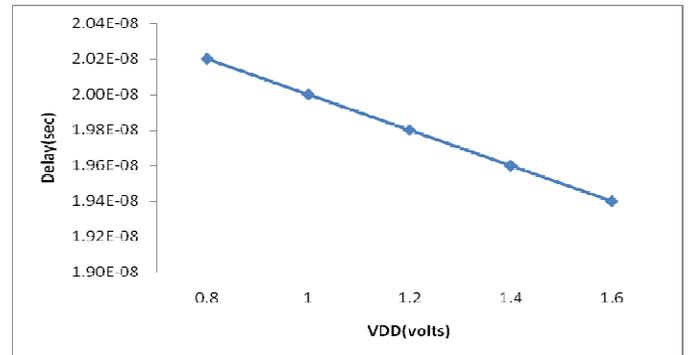


Figure 23: Delay variation of DET-SAFF with CMOS-NAND & DET-SAFF with Latch implemented with GDI Technique Latch over different operating range of V_{DD}

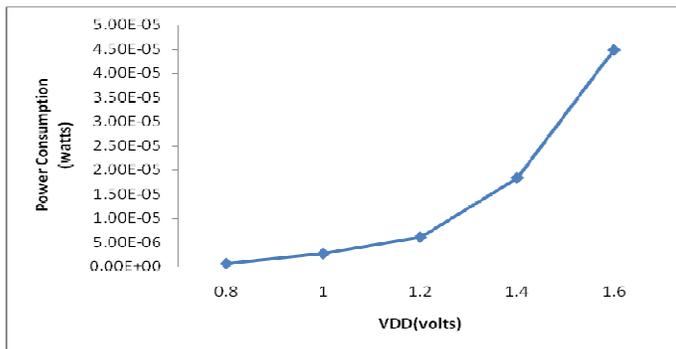


Figure 20: Power consumption variation of DD-SAFF with Latch implemented with GDI Technique over different operating range of V_{DD}

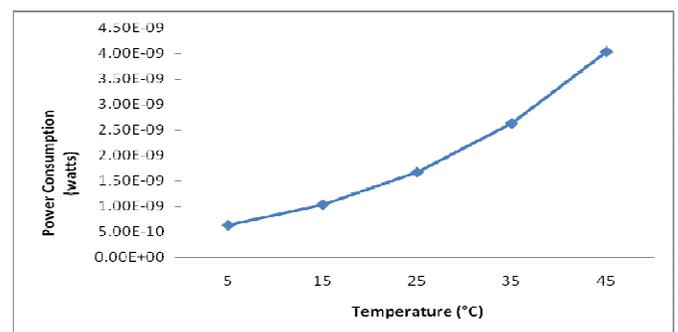


Figure 24: Power consumption variation of DET-SAFF with Latch using GDI Technique over different operating range of temperature at $V_{DD}=1V$

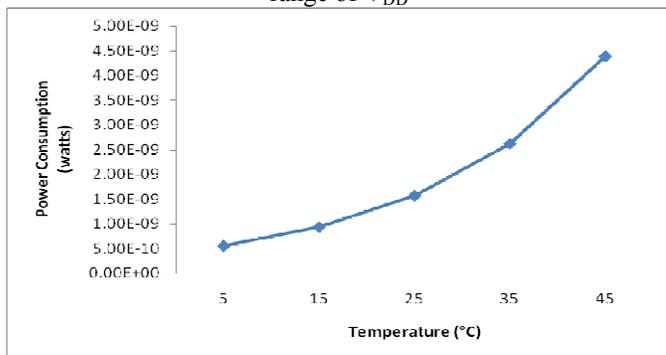


Figure 21: Power consumption variation of DET-SAFF with CMOS-NAND Latch over different operating range of temperature at $V_{DD}=1V$

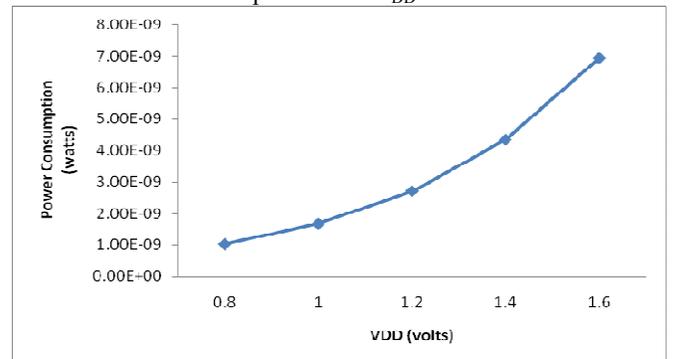


Figure 25: Power consumption variation of DET-SAFF with Latch using GDI Technique over different operating range of V_{DD}

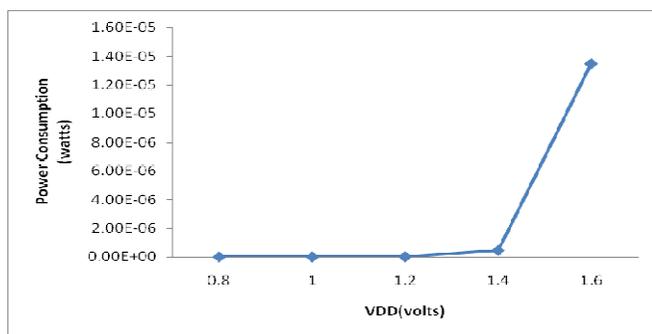


Figure 22: Power consumption variation of DET-SAFF with CMOS-NAND Latch over different operating range of V_{DD}

Table I: Power consumption variation of SAFF with CMOS-NAND latch over different operating range of temperatures at $V_{DD}=1V$

Temperature(°C)	Power consumption (watts)
5	1.703004e-006
15	1.825101e-006
25	1.951543e-006
35	2.005288e-006
45	4.109265e-006

Table II: Delay Variation of SAFF with CMOS-NAND latch, SAFF with CMOS-Symmetric Latch & SAFF with Latch using GDI technique over different operating range of V_{DD}

V_{DD} (volts)	Delay (sec)
.8	2.0100e-008
1	1.9900e-008
1.2	1.9700e-008
1.4	1.9500e-008
1.6	1.9300e-008

Table III : Power consumption variation of SAFF with CMOS-NAND latch over different operating range of V_{DD}

V_{DD} (volts)	Power consumption(watts)
.8	7.440419e-007
1	1.951543e-006
1.2	3.737754e-006
1.4	9.428828e-006
1.6	2.219050e-005

Table IV: Power consumption variation of SAFF with CMOS-Symmetric Latch over different operating range of temperature at $V_{DD}=1V$

Temperature($^{\circ}C$)	Power consumption (watts)
5	2.017781e-005
15	2.025651e-005
25	2.033558e-005
35	2.041484e-005
45	2.049415e-005

Table V: Power consumption variation of SAFF with CMOS-Symmetric Latch over different operating range of V_{DD}

V_{DD} (volts)	Power consumption (watts)
.8	5.448861e-006
1	2.033558e-005
1.2	2.172743e-005
1.4	3.689852e-005
1.6	6.221658e-005

Table VI: Power consumption variation of SAFF with Latch implemented with GDI technique over different operating range of temperature at $V_{DD}=1V$

Temperature($^{\circ}C$)	Power consumption (watts)
5	4.965438e-007
15	5.258306e-007
25	5.685602e-007
35	6.184802e-007

45	6.823192e-007
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Table VII: Power consumption variation of SAFF with Latch implemented with GDI technique over different operating range of V_{DD}

V_{DD} (volts)	Power consumption (watts)
.8	2.222364e-007
1	5.685602e-007
1.2	2.008319e-006
1.4	9.164612e-006
1.6	3.044173e-005

Table VIII: Power consumption variation of DD-SAFF with CMOS-NAND Latch over different operating range of temperatures at $V_{DD}=1V$

Temperature($^{\circ}C$)	Power consumption (watts)
5	4.964329e-006
15	4.981085e-006
25	5.119591e-006
35	5.253684e-006
45	5.384218e-006

Table IX: Delay variation of DD-SAFF with CMOS-NAND Latch & DD-SAFF with Latch implemented with GDI Technique over different operating range of V_{DD}

V_{DD} (volts)	Delay(sec)
.8	2.0200e-008
1	2.0000e-008
1.2	1.9800e-008
1.4	1.9600e-008
1.6	1.9400e-008

Table X: Power consumption variation of DD-SAFF with CMOS-NAND Latch over different operating range of V_{DD}

V_{DD} (volts)	Power consumption (watts)
.8	7.032634e-007
1	5.384218e-006
1.2	5.784314e-005
1.4	8.666246e-005
1.6	1.311404e-004

Table XI: Power consumption variation of DD-SAFF with Latch implemented with GDI Technique over different operating range of temperatures at $V_{DD}=1V$

Temperature($^{\circ}$ C)	Power consumption (watts)
5	3.615623e-006
15	3.947903e-006
25	2.467942e-006
35	2.562132e-006
45	2.711823e-006

Table XII: Power consumption variation of DD-SAFF with Latch implemented with GDI Technique over different operating range of V_{DD}

V_{DD} (volts)	Power consumption (watts)
.8	6.390936e-007
1	2.711823e-006
1.2	6.082062e-006
1.4	1.831317e-005
1.6	4.477793e-005

Table XIII: Power consumption variation of DET-SAFF with Latch implemented with GDI technique over different operating range of temperatures at $V_{DD}=1V$

Temperature($^{\circ}$ C)	Power Consumption (watts)
5	5.513358e-010
15	9.325290e-010
25	1.566601e-009
35	2.619674e-009
45	4.388632e-009

Table XIV: Delay variation of DET-SAFF with Latch using GDI technique over different operating range of V_{DD}

V_{DD} (volts)	Delay(sec)
.8	2.0200e-008
1	2.0000e-008
1.2	1.9800e-008
1.4	1.9600e-008
1.6	1.9400e-008

Table XV: Power consumption variation of DET-SAFF with Latch implemented with GDI technique over different operating range of V_{DD}

V_{DD} (volts)	Power Consumption (watts)
.8	8.775947e-010

1	9.325290e-010
1.2	1.046875e-008
1.4	4.564270e-007
1.6	1.346978e-005

Table XVI: Power consumption variation of DET-SAFF with CMOS-NAND Latch over different operating range of temperature at $V_{DD}=1V$

Temperature($^{\circ}$ C)	Power Consumption (watts)
5	6.269663e-010
15	1.032274e-009
25	1.666052e-009
35	2.624420e-009
45	4.030583e-009

Table XVII: Power consumption variation of DET-SAFF with CMOS-NAND Latch over different operating range of V_{DD}

V_{DD} (volts)	Power Consumption (watts)
.8	1.009834e-009
1	1.032274e-009
1.2	2.701417e-009
1.4	4.345485e-009
1.6	6.947572e-009

Table XVIII: PDP comparison of all above mentioned configurations

SAFF latch configurations	VDD(volts)	PDP(volts-sec)	No. of transistors
NAND - CMOS	1	3.388*10 ⁻¹⁴	18
CMOS-Symmetric	1	2.039*10 ⁻¹³	18
SAFF with GDI Technique	1	9.870*10 ⁻¹⁵	16
DD-SAFF	1	1.076*10 ⁻¹³	30
DD-SAFF with GDI Technique	1	5.422*10 ⁻¹⁴	22
DET-SAFF	1	2.064*10 ⁻¹⁷	35
DET-SAFF with GDI Technique	1	1.865*10 ⁻¹⁷	33

V. CONCLUSION

This paper proposes three new configurations of SAFF with latch using GDI Technique, which resulted in better performance in terms of power consumption, number of transistors and, temperature sustainability. Above all the configurations, double edge triggered SAFF have least power consumption due to low frequency of output. The differential input signal nature of the flip-flop makes it compatible with the logic utilizing reduced signal swing. GDI Technique contributed in improved PDP of new design also. Hence, the proposed design can be used for other complex designs. All the simulations are carried out at Tanner EDA tool at BSIM3v3 90nm technology.

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Applications of Dynamic Program Analysis in a CRM Process: A Futuristic Concept

Debabrata Das, Prasenjit Kundu

Abstract- Being a much talked about topic in today's business environment, Customer Relationship Management is an area of modern marketing management where there is wide scope for conceptual and empirical research. Recent empirical study has resulted in the development of a CRM process model viz; PREMASA Model, which attempts to integrate the aspects of relationship marketing with consumer behaviour by incorporating the concept of cognitive dissonance. Implementing PREMASA model requires lots of practical considerations including developing an application software program which can measure, track, store and retrieve key parameters related with CRM. In this paper, first a measurement module which will be an important part of future CRM software, has been conceptualized and then applying the concept of software reverse engineering and dynamic program analysis a conceptual process has been developed through which the proposed measurement module can be inserted into an existing CRM software without altering its execution at runtime.

Index Terms- customer relationship management, customer satisfaction, PREMASA model, dynamic program analysis, measurement of cognitive dissonance

I. INTRODUCTION

Research on CRM has confined itself on service quality enhancement and betterment of post purchase customer service etc but the effect of consumer behaviour on CRM has been ignored. Major research on CRM has only a single purpose and that is to provide a managerially useful, end-to-end view of the CRM process from a management perspective [1]. In other words, these models focus what the managers need to know about their customers and how that information should be used to develop a complete CRM process[2]. All these models are excellent tools for practicing marketing managers but it lacks the framework on the basis of which marketing analysts and researchers can further improve the CRM process because no such serious effort has been made to explore the relation between consumer behaviour and CRM and also the effect of consumer behaviour on CRM. Recent empirical research with an objective to identify the key factors on which the market and customer relationship depends in services marketing scenario resulted in developing a new model on customer relationship management and this model is PREMASA model[3]. PREMASA model proposes a detailed step by step process in which the level of cognitive dissonance of the consumers need to be measured at certain steps and at certain time intervals to create a cognitive dissonance (CD) profile of the customers and positive

reinforcements need to be administered to the customers in order to minimize their post purchase dissonance and thus building customers' trust, creating satisfaction and ensuring their loyalty & commitment. PREMASA model stresses on developing knowledge repositories in which the customer related data including the cognitive dissonance profiles should be stored for future analysis and application. Dynamic program analysis is the analysis of computer software which is performed by executing programs built from that software system to predict the behaviour of the system as well as to fine tune performance. Dynamic analysis produces output, or feeds into a subsequent analysis, that enables human understanding of the code and makes the design and testing task easy for the developers.

This paper shows a roadmap through which PREMASA Model can be applied in actual practice. This paper also integrates the concepts of marketing management with software engineering thus making a synergistically relevant attempt to pave the way for practical applications of IT in marketing. Application of dynamic program analysis makes the concepts developed in this paper perfect for implementation level algorithm development in future.

II. PREMASA MODEL : A PARADIGM SHIFT IN CRM

PREMASA model proposes total eight steps. Some of these steps have only one activity & some steps have several activities. Out of these ten activities some are needed to be performed simultaneously & some are needed to be performed sequentially. The model is multi dimensional in nature because some of the activities are simultaneous & some of these activities are sequential. The model integrates these sequential & simultaneous activities into eight steps. The steps 4 & 5 have two simultaneous activities each and activities A4 & A4' as well as the activities A5 and A5' are needed to be performed simultaneously. All these ten activities have been arranged into five categories of phases & these are as follows:-

- **Activity A1 & A2 fall into Preparation Phase.**
- **Activity A3, A4, & A4' fall into Measurement Phase.**
- **Activity A5 & A5' fall into Action Phase.**
- **Activity A6 falls into Satisfaction Phase.**
- **Activity A7 & A8 fall into Application Phase.**

The categorization of the activities in five phases has been done on the basis of the tasks performed by the activities. Another important basis of categorization of activities into five unique phases is that activities are grouped together as per their time of execution. Each phase denotes a unique period of time

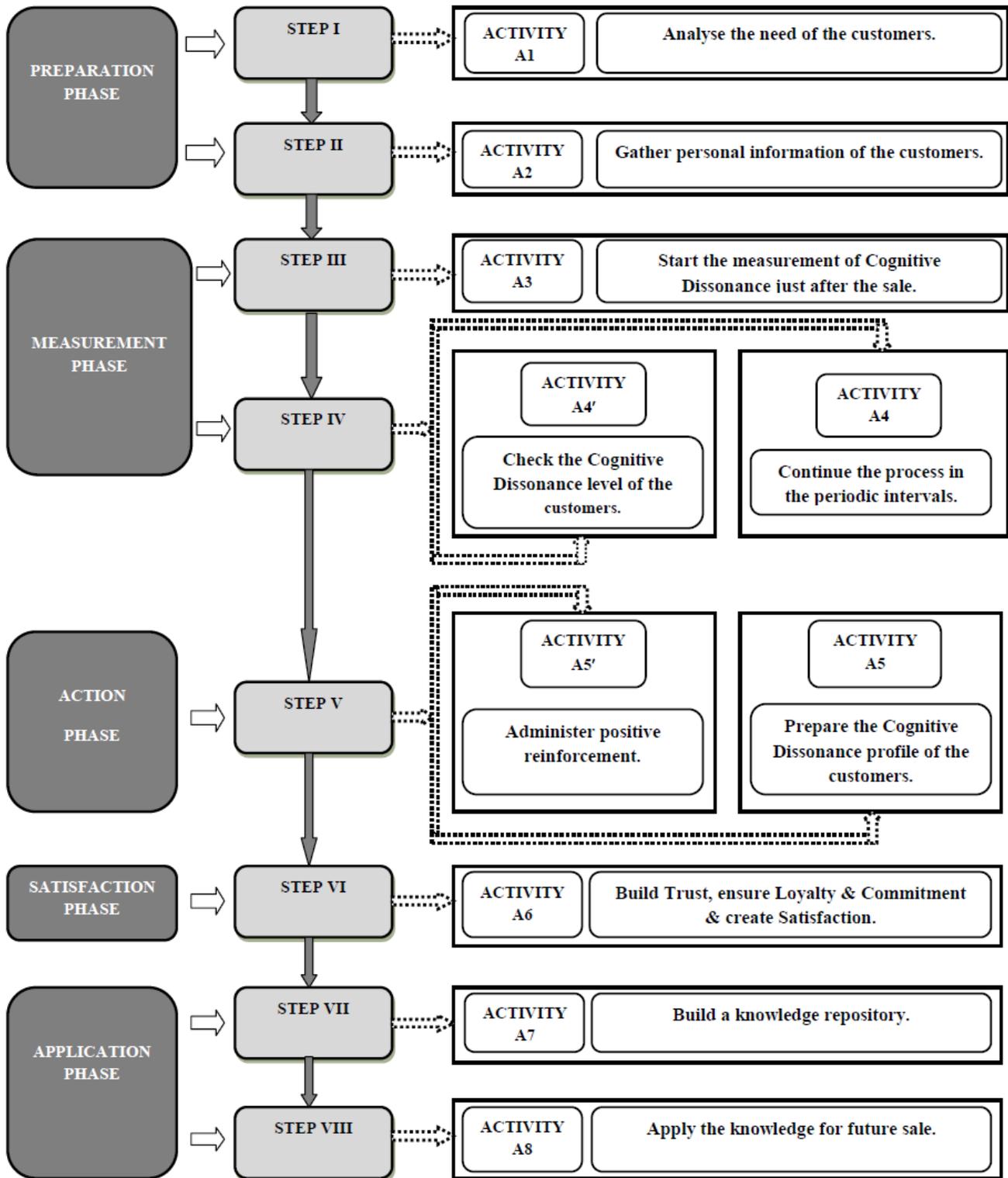


Fig.1 The PREMASA Model

when the activity /activities within that phase are needed to be performed [3]. Fig.1 shows the interrelationship of the activities, steps and phases of the PREMASA model.

In traditional CRM software there is no option to measure the cognitive dissonance and satisfaction levels of the customers and

that is why the activities mentioned in the measurement and action phase of the PREMASA model need to be integrated and arrangements must be made so that these activities can be done through a CRM software.

III. DEVELOPING THE MEASUREMENT MODULE

According to the PREMASA model, in the Measurement Phase the marketer should start measuring the cognitive dissonance level of the customers just after the sale & should continue the process in periodic intervals. In the Action Phase the marketer should introduce some positive reinforcement related to the existing services as added incentives or benefits to the customers so that the customers can be able to reduce their dissonance regarding their purchase. In this phase the marketer should create a cognitive dissonance (CD) profile of the customers on the basis of the measurement done in the previous phase [3]. The measurement module is the part of the proposed CRM software package which follows the PREMASA model guidelines to measure cognitive dissonance of the customers. As specified in the PREMASA model, the cognitive dissonance should be measured in regular intervals i.e. it should be measured in a time dependent longitudinal study. This module must create a cognitive dissonance profile of the customers by comparing the values of cognitive dissonance at different point of time as well as by correlating it with the values of customer satisfaction. Research shows that high level of cognitive dissonance results low levels of customer satisfaction but it also outlines that lowering the cognitive dissonance levels may or may not increase the level of customer satisfaction[4]. Researchers also believe that to counter such dissonance, the marketer's after sale communications should provide evidence and support to help consumers feel good about their brand choices[5]. That is why PREMASA model proposes that the marketer should introduce some positive reinforcement related to the existing services as added incentives or benefits to the customers so that the customers can be able to reduce their dissonance regarding their purchase[3]. Recent empirical study on customer satisfaction in banking services in India has identified key factors of the extended Ps of services marketing i.e. People, Process and Physical Evidence on which the customer satisfaction depends [6]. According to this study the identified factors of 3Ps are as follows:

In terms of People (the 5th P)

- i) Employees' knowledge about services factor. (**Pe₁**)
- ii) Employees' attitude and behaviour factor. (**Pe₂**)
- iii) Employees' service delivery efficiency factor. (**Pe₃**)

In terms of Process (the 6th P)

- i). Time saving factor. (**Pr₁**)
- ii). Convenience factor. (**Pr₂**)

In terms of Physical Evidence (the 7th P)

- i). Ambience and environmental conditions factor. (**Ph₁**)
- ii). Layout and functionality factor. (**Ph₂**)
- iii). Location factor. (**Ph₃**)

This study shows that customer satisfaction can be determined using the following algebraic equations:-

$$Spe = -0.938 + 0.367Pe_1 + 0.459Pe_2 + 0.311Pe_3 \text{ ---- (1)}$$

$$Spr = -0.510 + 0.571Pr_1 + 0.494 Pr_2 \text{ ----- (2)}$$

$$Sph = -1.118 + 0.391Ph_1 + 0.477Ph_2 + 0.292Ph_3 \text{ -- (3)}$$

$$S = -1.171 + 0.369 Spe + 0.532Spr + 0.253Sph \text{ ---- (4)}$$

Where, **Spe** = Customer's satisfaction based on the overall impression he or she has of the employees of the bank; **Spr** = Customer's satisfaction based on the overall impression he or she has of the various processes of the bank through which the bank delivers customer services; **Sph** = Customer's satisfaction based on the overall impression he or she has of the physical evidences present in the bank; **S** = Customer's overall satisfaction on the services of the bank. **Pe₁, Pe₂, Pe₃, Pr₁, Pr₂, Ph₁, Ph₂, Ph₃** are the independent variable indicating customer's satisfaction on the basis of the identified factors of people, process and physical evidence[6]. The proposed measurement module should measure customer satisfaction using equation (1), (2), (3) and (4). Based on this logic the conceptual process within the measurement module has been developed. There is a parent process which first measures the cognitive dissonance of the customers at three different time intervals:

- (1) It measures cognitive dissonance just after the purchase i.e. at time t_0 and labels it as CD_0 ;
- (2) It again measures CD at time t_1 and labels it as CD_1 ; and lastly
- (3) It measures CD at time t_2 and labels it as CD_2 .

Next it checks the variations in the values of CD at different time intervals and segregates the customers in four different categories like

- (1) **Category I:** Customers whose CD level is decreasing continuously i.e. $CD_0 > CD_1 > CD_2$;
- (2) **Category II:** Customers whose CD level is increasing continuously i.e. $CD_0 < CD_1 < CD_2$;
- (3) **Category III:** Customers whose CD level is same at different time intervals i.e. $CD_0 = CD_1 = CD_2$ and
- (4) **Category IV:** Customers whose CD level varies across different time intervals but not in the same ways like $CD_0 > CD_1 > CD_2$ or $CD_0 < CD_1 < CD_2$ i.e. all other cases except $CD_0 > CD_1 > CD_2$, $CD_0 < CD_1 < CD_2$ and $CD_0 = CD_1 = CD_2$.

Based on this categorization the parent process concludes to five different end points and from these end points, five child process starts which completes the measurement process of CD and customer satisfaction and creates CD profile of the customers and in some cases suggests conducting further research (Ref.Fig.2 & Fig.3) The parent process uses the following operational logic and gives birth five child processes:

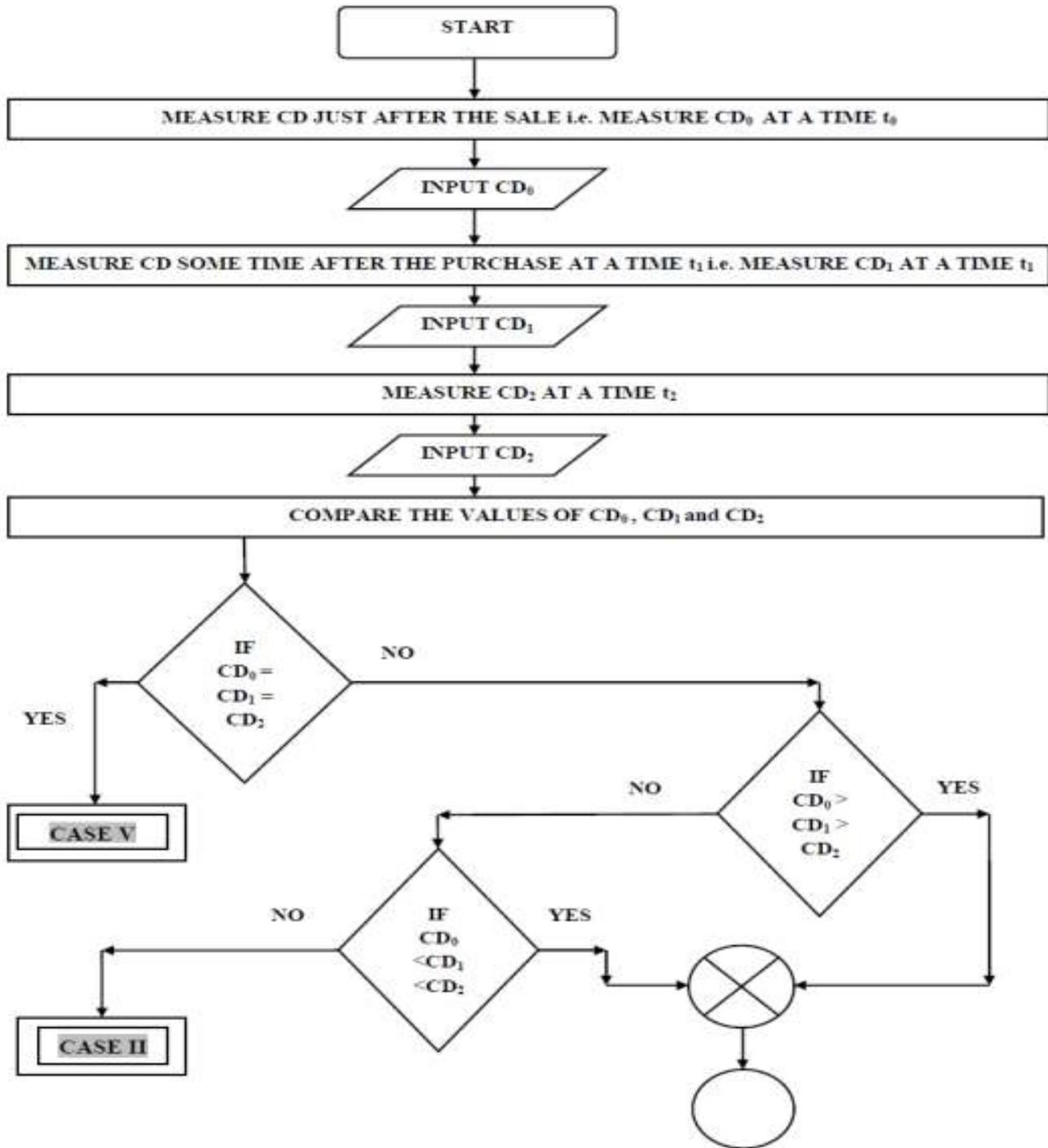


Fig. 2 Flow Diagram of the Parent Process

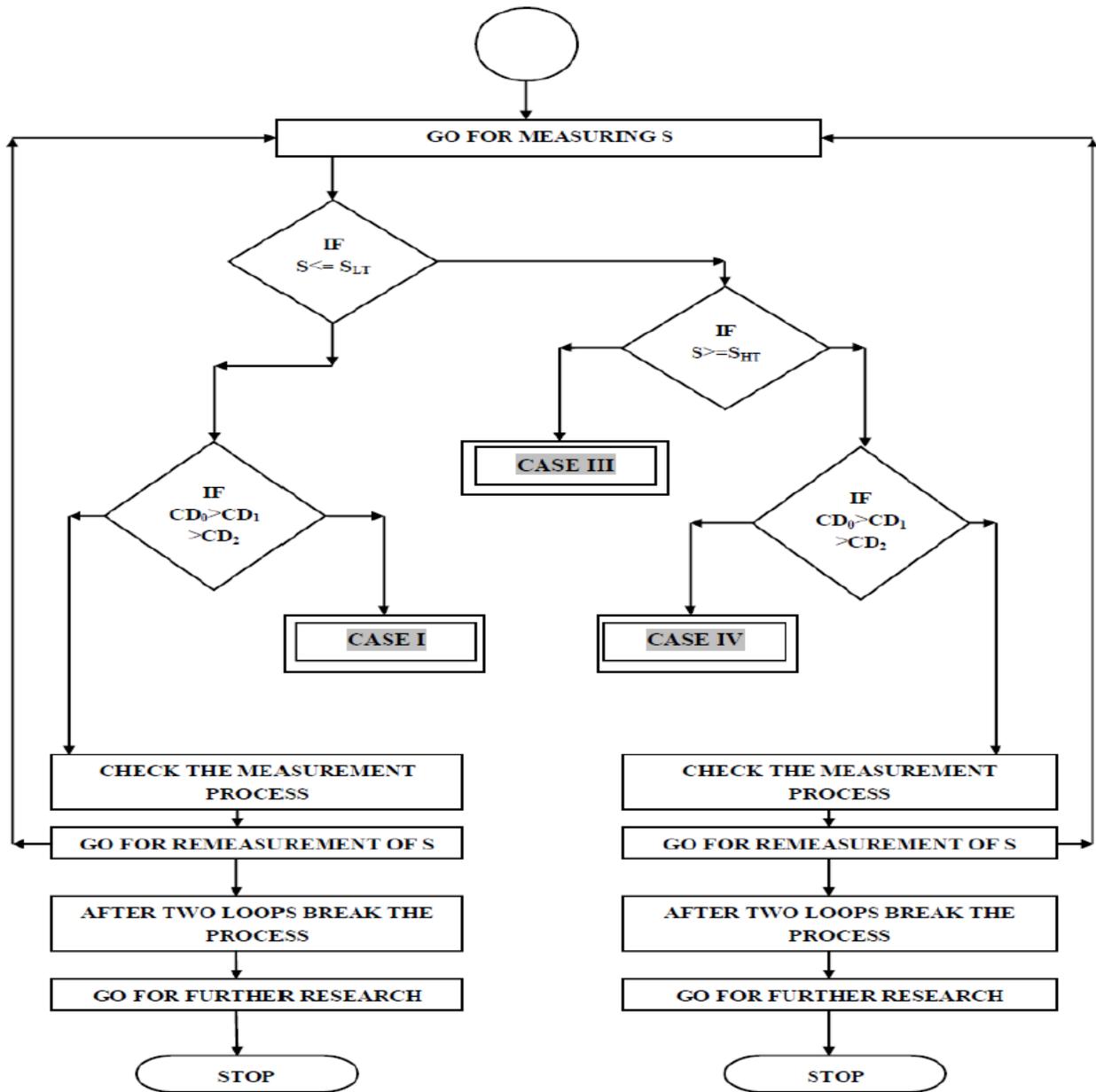


Fig. 3 Flow Diagram of the Parent Process

Logic I: If $CD_0 > CD_1 > CD_2$ then go for measuring customers' satisfaction S

Sub Logic I: If S is low then go for further research.

Sub Logic II: If S is high, administer positive reinforcement.

Logic II: If $CD_0 < CD_1 < CD_2$ then go for measuring customers' satisfaction S

Sub Logic I: If satisfaction S is low, administer positive reinforcement.

Sub Logic II: If satisfaction S is high, check the measurement process and go for remeasurement.

Sub Logic III: If satisfaction S is at medium level, go for positive reinforcement.

Logic III: If $CD_0 = CD_1 = CD_2$, go for administering positive reinforcement.

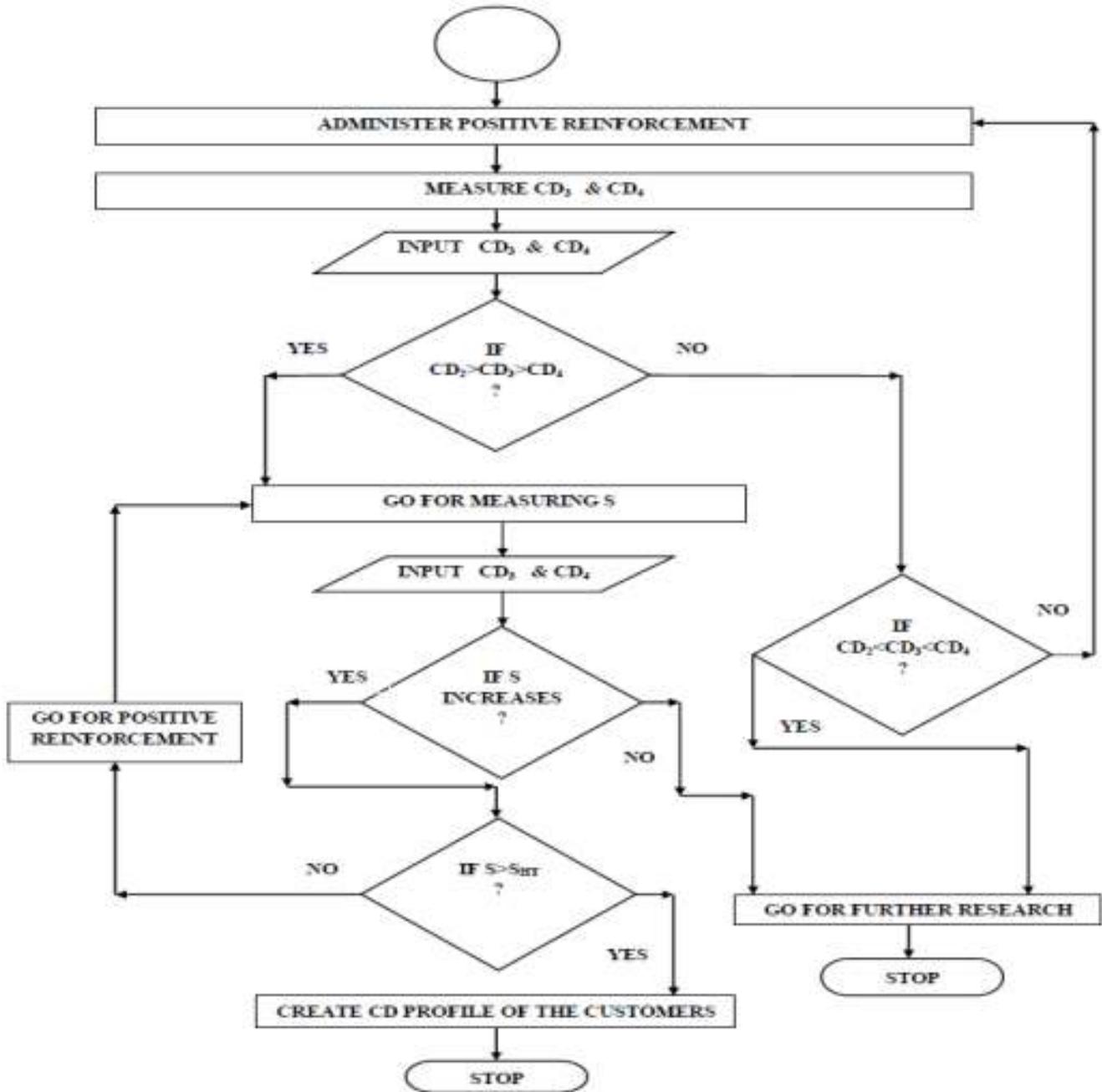


Fig.4 Flow Diagram of the 1st Child Process

The five different cases that denote five different child processes are as follows:-

- **Case I:** Low level of satisfaction S but CD level is increasing over the time.
- **Case II:** All other cases except $CD_0 > CD_1 > CD_2$, $CD_0 < CD_1 < CD_2$ and $CD_0 = CD_1 = CD_2$
- **Case III:** Medium level of satisfaction S.

- **Case IV:** High level of S but CD level is decreasing over the time.
- **Case V:** CD at same level over the time i.e. $CD_0 = CD_1 = CD_2$

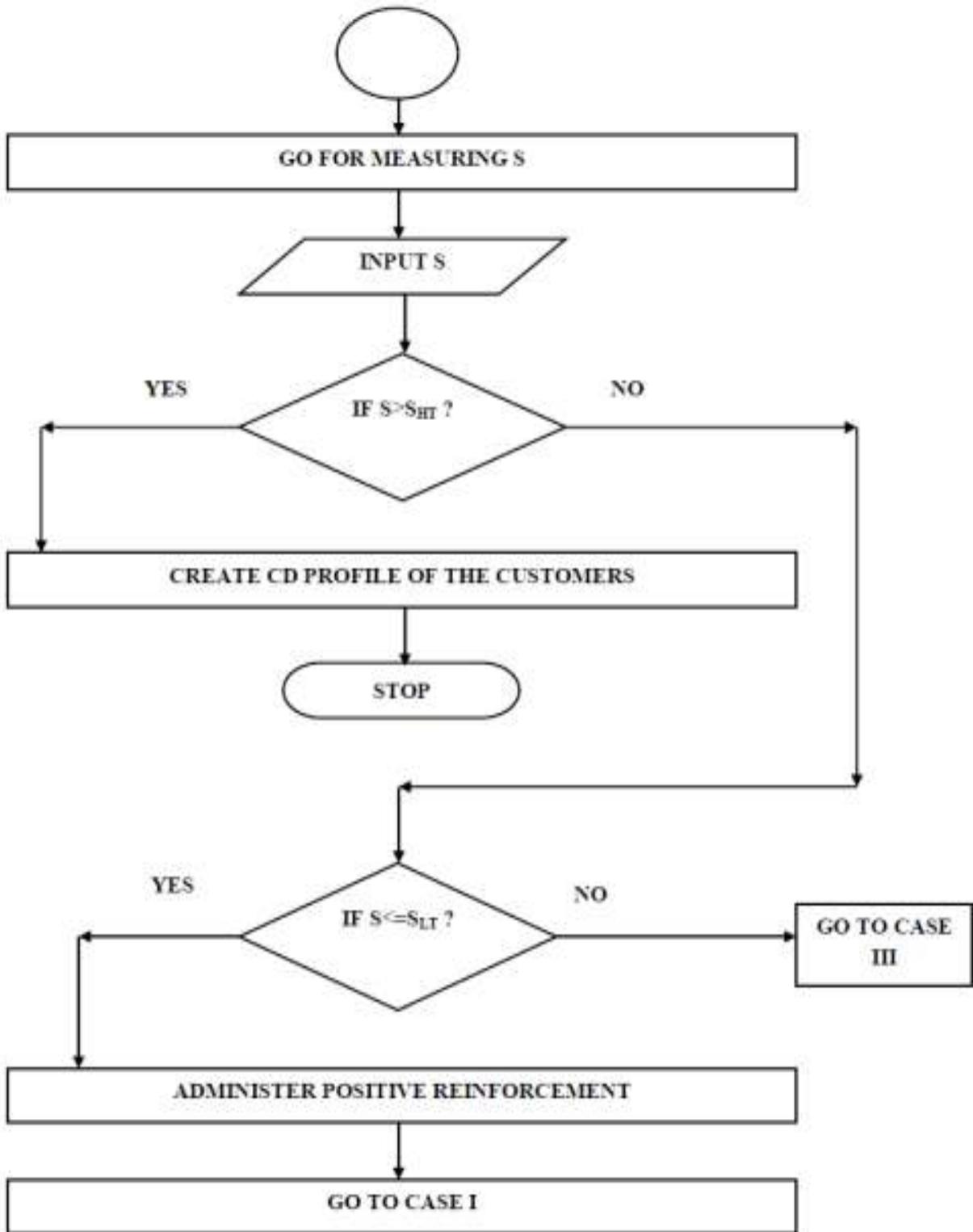


Fig.5 Flow Diagram of the 2nd Child Process

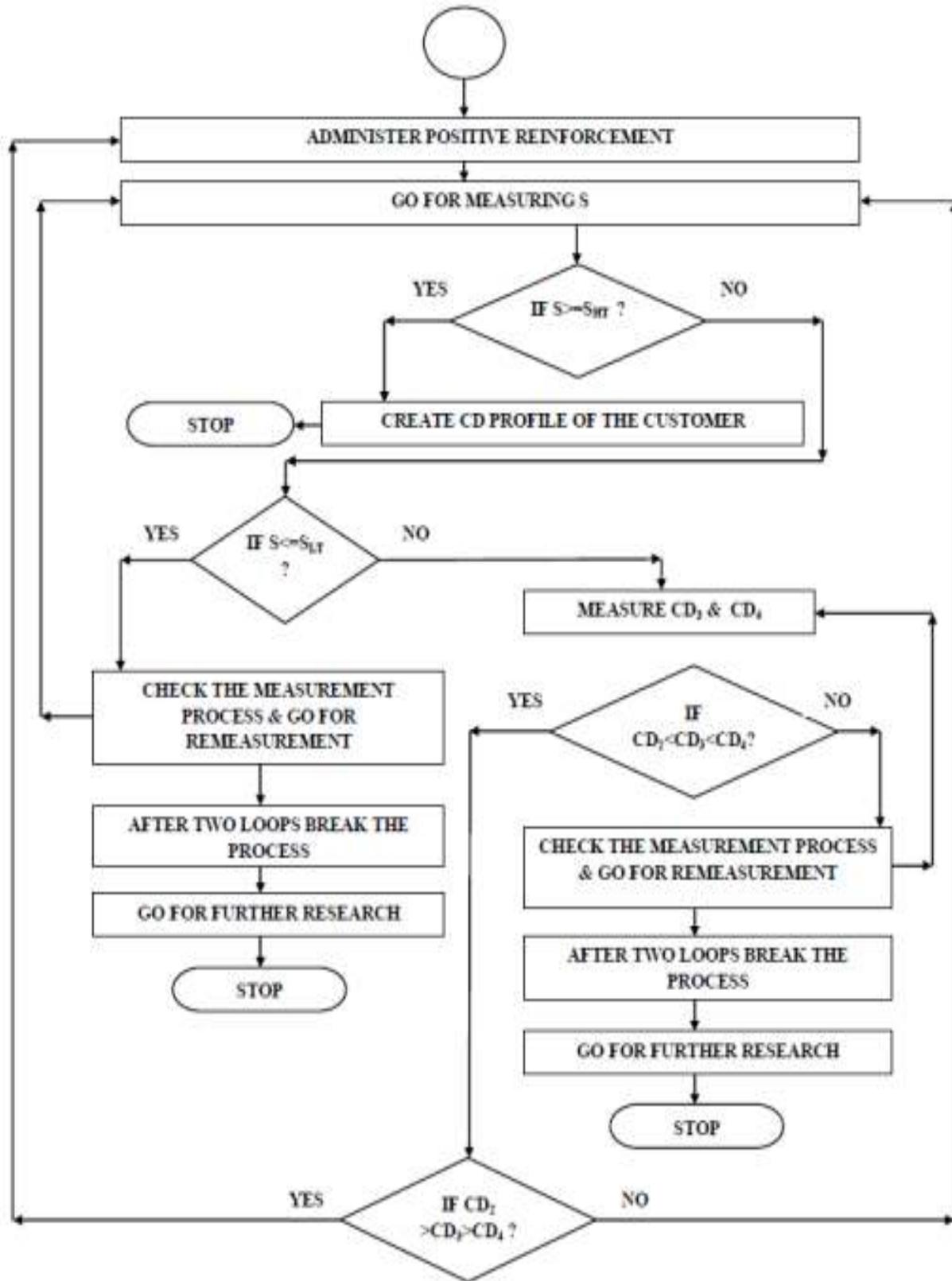


Fig.6 Flow Diagram of the 3rd Child Process

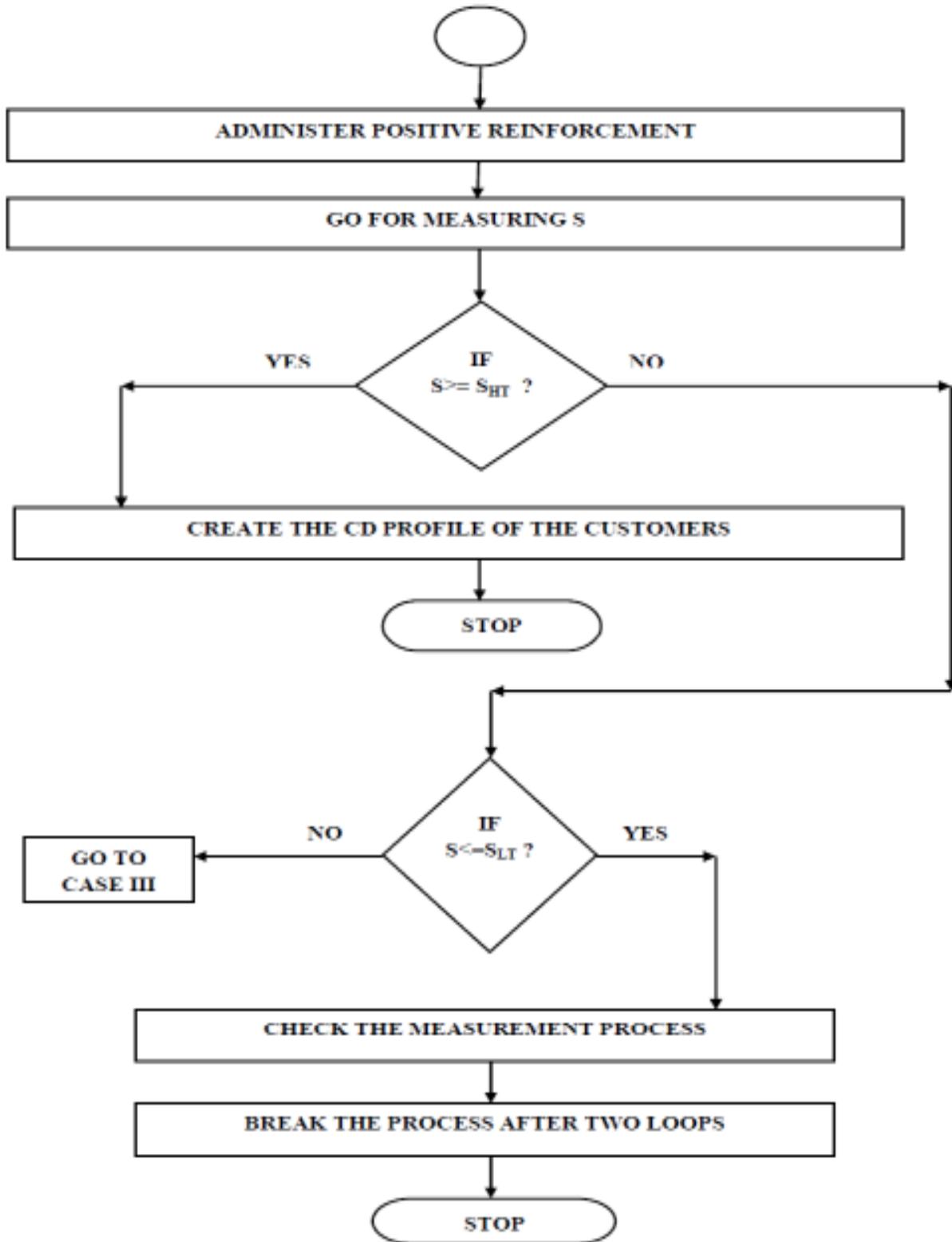


Fig.7 Flow Diagram of the 4th Child Process

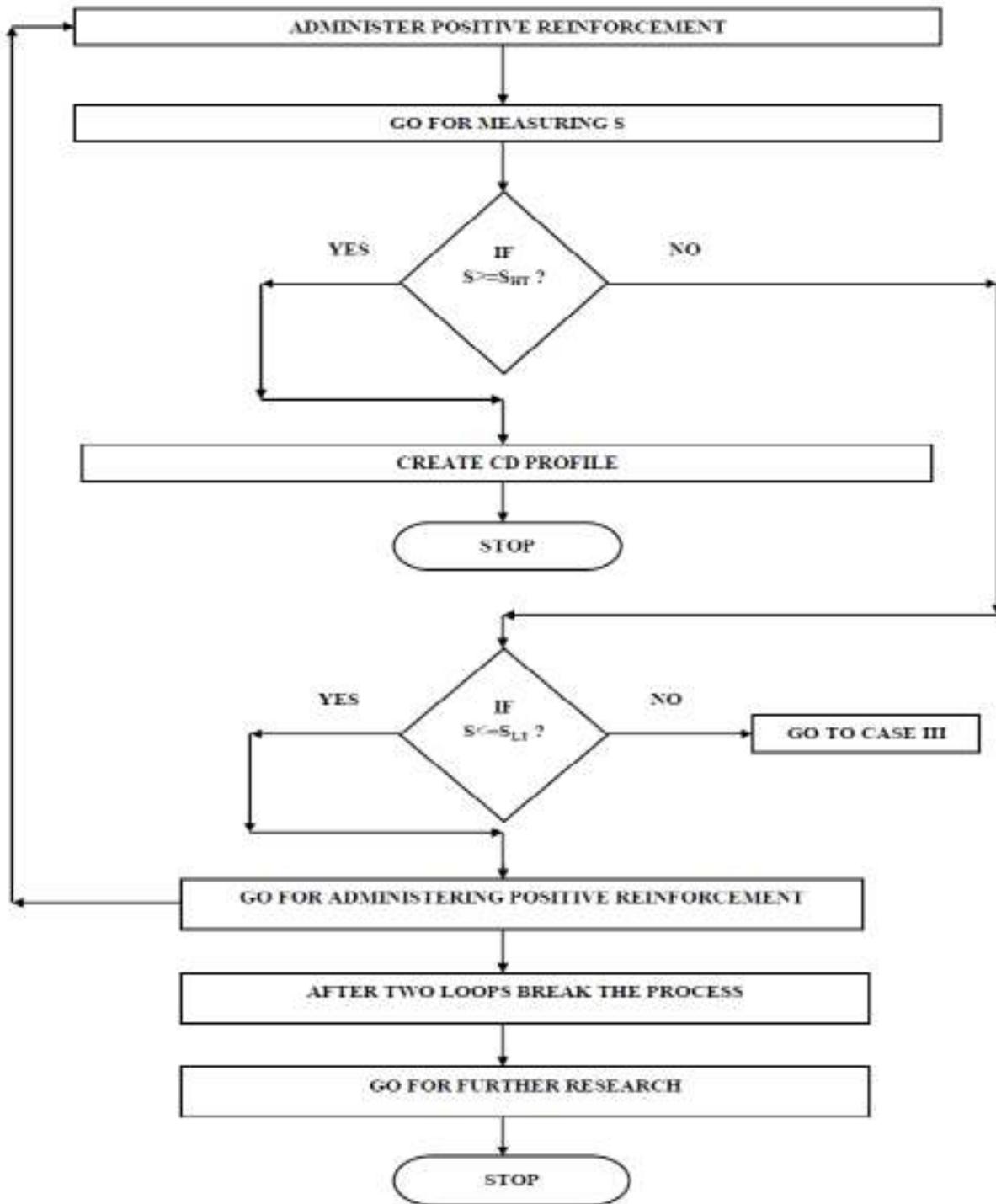


Fig.8 Flow Diagram of the 4th Child Process

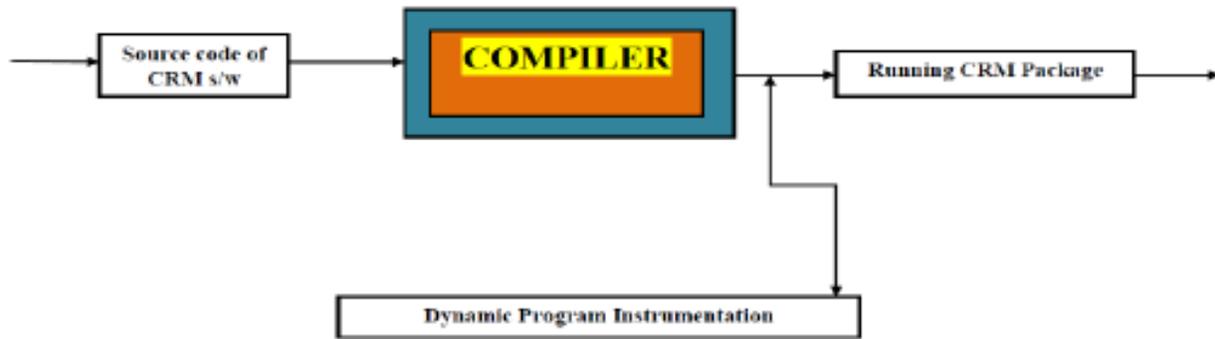


Fig.9 Program Instrumentation

The child processes also conceive the idea of threshold in measuring customer satisfaction level. Based on the equations (1), (2), (3) and (4), customer satisfaction level can be measured and based on the actual data a lower and higher threshold level of customer satisfaction (S_{LT} and S_{HT}) can be introduced in the measurement logic. If satisfaction level goes below S_{LT} , it means the customers are actually dissatisfied with the service. On the other hand if satisfaction level increases above S_{HT} , it means that customers are completely satisfied and firms don't need to do anything more to please the customers. If S goes below S_{LT} , it is basically a warning signal for the firms because dissatisfied customers may shift their loyalty to other competitors (Ref.Fig.4, Fig.5, Fig.6, Fig.7, and Fig.8).

IV. OPTIMIZATION OF CRM SOFTWARE USING DYNAMIC PROGRAM ANALYSIS

Dynamic program analysis is the analysis of computer software that is performed by executing programs built from that software system on a real time basis. For dynamic program analysis to be effective, the target program must be executed with sufficient test inputs to extract and produce interesting behaviour. Dynamic program analysis helps to make a computational system reason automatically (or at least with little human assistance) about the behaviour of a program and draws conclusions that are useful to help the software developers to determine exploitability of vulnerabilities or to rapidly develop an exploit code[7]. Dynamic analysis produces output, or feeds into a subsequent analysis, that enables human understanding of the code and makes the design and testing task easy for the developers. Dynamic program analysis approach attempts to tune the application software during execution without stopping, recompiling or even rerunning the application. To achieve this objective it is necessary to use dynamic instrumentation techniques that allow the modification of the application code on the fly [8]. (Ref.Fig.9).

Program instrumentation is a general way to understand what an executing program is doing[9]. The principle of dynamic program

instrumentation involves deferring program instrumentation until it is in execution and then inserts, alter and delete this instrumentation dynamically during the actual program execution. The Paradyn group at the University of Wisconsin and University of Maryland first used this approach to develop a special API that supports dynamic instrumentation and the result of their work was called DynInst API. DynInst is an API for runtime code patching that provides a C++ class library for machine independent program instrumentation during application execution. It allows attaching to an already running process or starting a new process, creating a new piece of code and finally inserting created code into the running process. The next time the instrumented program executes the modified block of code i.e. the new code is executed and the program being modified is able to continue its execution and does not require to be recompiled, re linked or restarted [8]. Now the proposed Measurement Module is needed to be inserted within the existing CRM software by using dynamic program instrumentation by performing the program instrumentation on the binary at runtime. It will eliminate the need to modify or recompile the application's source and it will also support the instrumentation of programs that dynamically generate code[10]. Research shows that it is also possible to change instrumentation at any time during execution by modifying the application's binary image[11]. Since dynamic program analysis is being used to modify an existing software system (CRM package) to make it more powerful and updated, program optimization is the desirable option to achieve faster execution, less memory storage and to draw less power. Dynamic analysis is preferred rather than static analysis for this proposed framework because it has the following advantages [12]:-

- It identifies vulnerabilities in a runtime environment.
- Automated tools provide flexibility on what to scan for.
- It allows for analysis of applications in which the actual code is inaccessible.
- It identifies vulnerabilities that might have been false negatives in the static code analysis.

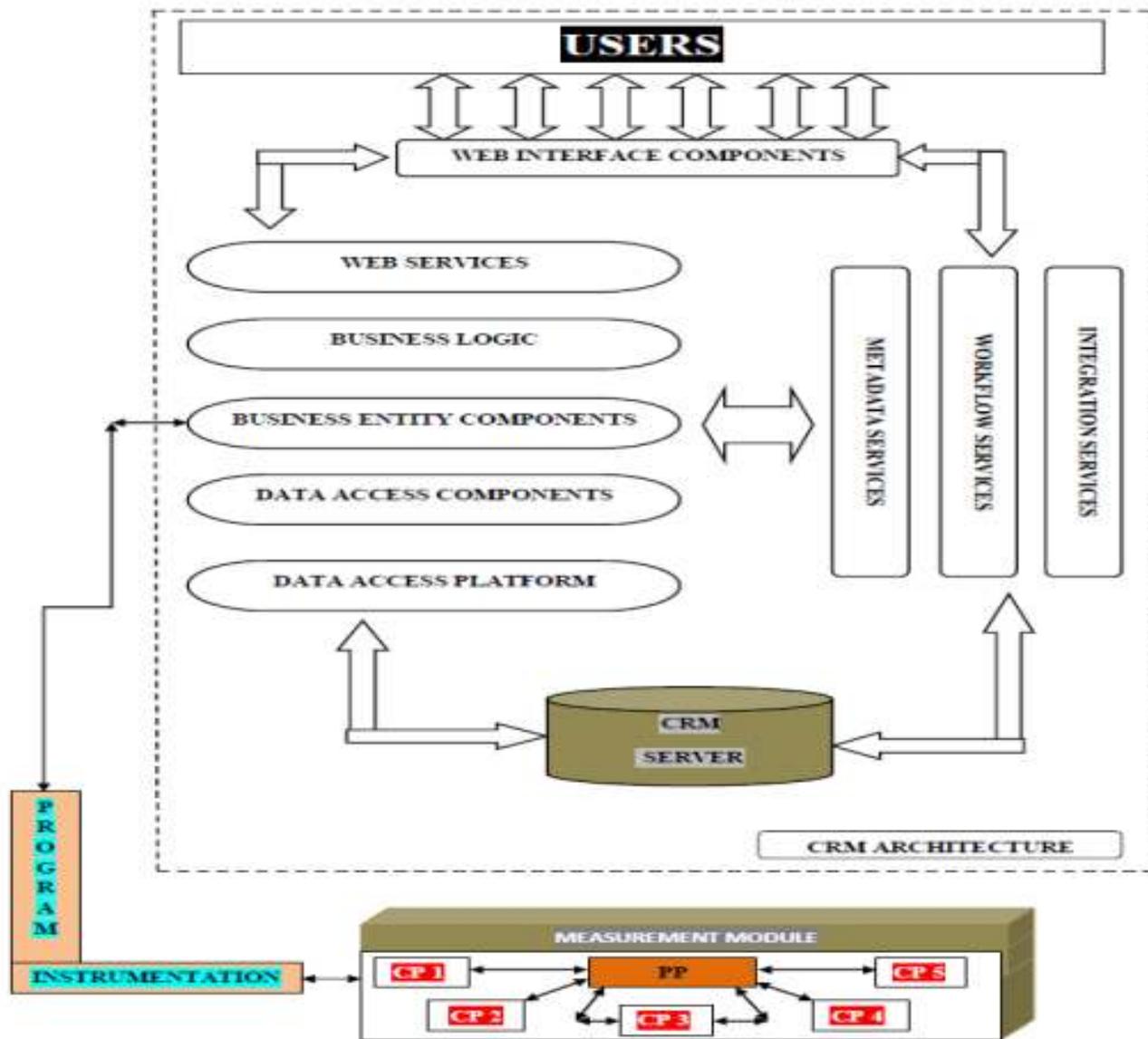


Fig.10 Insertion of Measurement Module within CRM Software through Program Instrumentation

- It permits the developer to validate static code analysis findings.
- It can be conducted in virtually any application.

In fig.10, within the measurement module there are a total of six processes and one of them is the Parent Process (PP) and other five are the Child Processes (CP₁, CP₂, CP₃, CP₄, CP₅). The dynamic program instrumentation shall insert the measurement module within the business entity components without hampering the current execution of the software package. The alteration and updating will be performed on real time basis and during the actual runtime of the CRM software. When finished, the updated package will contain the measurement module and it can perform the predefined task (Ref.Fig.10).

V. LIMITATION & FUTURE DIRECTIONS

First, the logic developed to construct the measurement module need to be universally validated through more empirical

research. Secondly, the parent process and the five child processes constructed actually denote the logical process flow but these do not represent the actual codes that can be implemented as a software program. Thirdly, PREMASA model stresses on measuring cognitive dissonance of the customers and also it gives utmost importance in incorporating the concepts of cognitive dissonance into a CRM process but PREMASA model is silent regarding how the cognitive dissonance of the customers can be measured in practice. The measurement module developed in this paper follows the PREMASA model and also proposes to measure cognitive dissonance levels of the customers but does not tell about how it will be measured. So empirical research is required to construct a quantitative framework through which the cognitive dissonance of the customers can be measured and then only the measurement module can be able to do its work in practice. Fourthly, the dynamic program analysis and program instrumentation is still at the nascent stage and actual application in practice is an uphill task due to lack of

efficient and faster program optimization techniques. Future conceptual and empirical research should address the above limitations. Irrespective of the above limitations the concept and logic developed and outlined in this paper are unique in the sense that this paper focuses on embedding an external component in an existing CRM software package without altering or hampering the normal execution of the software at runtime. Researchers have already proposed to develop CRM processes as services using the concept of Service Oriented Architecture (SOA) [13], and the concept developed in this paper will definitely add value to this work. It will also open up many avenues of research in this domain in future and it will pave the way for practical applications of IT in marketing.

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A Study on Botnet Detection Techniques

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Abstract- A botnet is a network of compromised computers, termed bots that are used for malicious purposes. When a computer becomes compromised typically through a drive-by download, that has embedded malicious software, that computer becomes a part of a botnet. A bot typically runs hidden and uses a covert channel to communicate with its command and control server. Botnets are controlled through protocols such as IRC and HTTP and in protocol-conforming manners. This makes the detection of botnet command and control a challenging problem. In this paper we discuss some of the botnet detection techniques and compare their advantages, disadvantages and features used in each technique.

Index Terms- botnet, command and control, internet relay chat (IRC), nickname, passive anomaly analysis, spam.

I. INTRODUCTION

The recent growth of botnet activity in cyberspace has attracted in a significant way the attention of the research community. Botnets are one of the most dangerous species of network-based attacks today, responsible for a large volume of malicious activities from distributed-denial-of-service (DDoS) attacks to spamming, phishing, identify theft and DNS server Spoofing. The concept of botnet refers to a group of compromised computers remotely controlled by one attacker or a small group of attackers working together called a “botmaster”. These large groups of hosts are assembled by turning vulnerable hosts into so-called zombies, or bots, after which they can be controlled from afar. A collection of bots, when controlled by a single command and control (C2) infrastructure, form what is called a botnet. The botmaster’s ability to carry out an attack from hundreds or even tens of thousands of computers means increased bandwidth, increased processing power, increased memory for storage and a large number of attack sources making botnet attacks more malicious and difficult to detect and defend against.

The botnet detection techniques can be classified into three, namely,

- honeypot
- passive anomaly analysis and
- based on traffic application.

A honeypot [1] is a trap set to detect, deflect, or in some manner counteract attempts at unauthorized use of information systems. Generally it consists of a computer, data, or a network site that appears to be part of a network, but is actually isolated and monitored, and which seems to contain information or a resource of value to attackers.

The passive anomaly based detection is done by monitoring system activity and classifying it as either normal or anomalous. The classification is based on heuristics or rules, rather than patterns or signatures, and will detect any type of misuse that falls out of normal system operation. This is as opposed to signature based detection which can only detect attacks for which a signature has previously been created. In order to determine what traffic attack is, the system must be taught to recognize normal system activity PAYL [2] [http://en.wikipedia.org/wiki/Anomaly based_intrusion_detection_system](http://en.wikipedia.org/wiki/Anomaly_based_intrusion_detection_system) - cite_note-Wang2004-0 and MCPAD [3] are two anomaly based intrusion detection techniques that reduces the high false positive rate.

Botnet detection techniques based on traffic application classification are usually guided by botnet C&C control protocol e.g. if one is only interested in IRC-based botnets then traffic will be classified into IRC and non-IRC groups [4].

The rest of the paper is organized as follows. Section 2 will describe the traffic application classification based detection techniques. Section 3 will describe the anomaly based detection techniques and section 4 describes some botnet detection techniques independent of C&C protocol. Section 5 makes some concluding remarks.

II. TRAFFIC APPLICATION CLASSIFICATION BASED DETECTION METHODS

In [5,6], Strayer et al. use statistical flow characteristics and supervised classifiers to classify traffic into IRC or non-IRC groups. Once IRC traffic is identified, flows that were active at same time are correlated. The last stage detects malicious botnet by finding common IP address endpoint and any evidence of communication between botmaster and the C&C server.

In [5] Strayer et al. use an approach where the traffic that is unlikely to be a part of a botnet is eliminated first, then classifies the remaining traffic into a group that is likely to be part of a botnet, then correlates the likely traffic to find common communications patterns that would suggest the activity of a botnet. The technique begins with simply looking for chat sessions and then examining the content for botnet command. The freely available bot-building source code is used for text-based interaction to implement an IRC. The traces collected through this are used as an initial proxy for botnet traffic. These recorded traces are then fed into a series of quick reduction filters where the traces are classified into good sites (whitelists) and bad sites (blacklists) and also the flow attributes are examined. After the initial filters, the remaining flows are passed through a flow classification engine based on machine learning techniques. The classifiers attempt to group flows into broadly defined categories.

Those flows that appear to have chat-like characteristics are passed on to the correlator stage where correlator performs a pair wise examination looking for flows behaving in similar manner as two flows can be generated from the same application. Flows that are correlated are then passed on to topological analysis to determine which flows share a common controller. The result of this pipeline is a (hopefully) small set of flows that show a fair amount of evidence that they are related and are part of a botnet. This technique is well suited for real-time analysis of traffic data but it requires both legitimate and malicious training traffic and an accurate manner to label it.

Another approach is to use machine learning technique to identify botnet traffic [6] where the detection is done as a two stage process. Initially the IRC and non-IRC traffic are distinguished and then the botnet IRC and real IRC traffics are discerned. In [6] Strayer et al. proposes an approach to identify and detect botnet prior to them being used in cyber attack. This is achieved through a two stage approach where in first stage the communication flows are classified into chats and non-chats and in the second stage the classification of real and botnet chat is performed. For this the flows that are likely to compromise botnet C2 traffic is detected and then these flows are correlated to identify groups of flows that pertain to same botnets. Finally the C2 host is identified which leads to the attack host. One of the challenges faced is obtaining the ground truth. Data modeling is performed by retaining only the TCP packets and characterization of flows are done based on TCP and IP packet headers. These flows are then reduced to machine learning by using a set of heuristics and the flows that are not botnets are discarded.

III. ANOMALY BASED DETECTION TECHNIQUES

In [2] Wang et al. use an n-gram feature on payload for detection purpose. N-gram is a sequence on n adjacent bytes. For modeling a payload it is first classified into clusters according to some criteria like using port numbers or length. A payload model is computed for payloads of different lengths from same port for each direction of payload flow. A sliding window of size n is passed over the payload and the occurrence of each n-gram is counted. When $n=1$, the average byte frequency of each ASCII character 0-255 is obtained. In addition to this mean value, the standard deviation and variance is also calculated. Thus a set of payload models $M_{x,y}$ is computed where $M_{x,y}$ stores the average byte frequency and standard deviation of each byte's frequency of a payload of length x and port y . During detection, each incoming payload is scanned and its byte value distribution is computed. This newly computed payload distribution is then compared against model $M_{x,y}$; if the distribution of the new payload is significantly different from the normal, the detector flags the packet as anomalous and generates an alert.

BotSniffer by Gu [7] is a technique that does not require any prior knowledge of signatures or C&C server addresses and can identify both the C&C servers and infected hosts in the network. The approach makes use of the fact that bots within the same botnet are likely to demonstrate spatial-temporal correlation. BotSniffer has two main components the monitor engine and the correlation engine. The monitor engine is implemented on top of the open-source system Snort [8]. The monitor engine examines

network traffic and collects many attributes from the monitored network. BotSniffer first performs preprocessing to filter out irrelevant traffic to reduce the traffic volume, this is not essential but can improve the efficiency of BotSniffer. Two whitelists are generated in the process. The hard whitelist contains the normal servers that are less likely to serve as botnet C&C servers and the soft whitelist contains those addresses that are declared as "normal" in analysis phase. The soft whitelist is dynamically generated and is for a certain amount of time. The monitor engine also matches the protocol used by the clients that are similar to C&C and is port independent as the bots may use different ports. For correlation purpose the monitor engine also monitors the message and activity response of a bot using Response-Crowd-Density-Check algorithm and Response-Crowd-Homogeneity-Check algorithm respectively. The events observed by the monitor engine are analyzed by the correlation engine where the clients are grouped according to their destination IP and port and within each group perform group analysis of spatial-temporal correlation and similarity of activity or message response behaviors send to or from same server. If any suspicious C&C is found an alarm is triggered. Even for a detection of a single bot the alarm is triggered.

IV. DETECTION TECHNIQUE INDEPENDENT OF C&C CONTROLS

In BotMiner [9] the authors present a botnet detection method which clusters: network flows (C-Plane), which records network flows, and activity traffic (A-Plane), which identifies the activities of each host. A C-Plane flow (C-flow) contains all of the flows over a given time period between a particular internal IP and destination IP and port which use the same transport layer protocol. Some flows are excluded from consideration such as internal flows, and those to trustworthy legal servers such as Google. Certain C-flow characteristics are extracted like flows per hour (fph), packets per flow (ppf), bytes per packet (bpp), and bytes per second (bps). The A-Plane identifies hosts which demonstrate an abnormally high scan rate or weighted failed connection rate, spamming and downloading any Portable Executable binary. Clustering algorithms are applied to group hosts with similar communication patterns and activities patterns. Finally performs cross-plane correlation to identify hosts with similar communications and activities patterns.

V. TECHNIQUES BASED ON SPAM EMAILS

The techniques based on spam emails usually analyses the email patterns and may also derive certain features of these emails such as sender/recipient address etc. In [10] the authors propose a method called EsBod which is an email shape based botnet detector which will classify the email into spam or real email. The shape generator of the Esbod will extract the skeleton of the email that is fed into the system. Using Gaussian kernel density estimator the shape (or template) of the email is derived from the skeleton. The classifier of the EsBod will takes in this derived shape and matches with the botnet signature repository using Hellinger distance.

In [11], Brodsky et al proposes a distributed content independent spam classification method called Trinity which uses source identification along with a peer-to-peer based

distributed database. Trinity first determines the source IP of the received email and then updates the database using this IP. The database is checked for past traces of email sources and number of emails that source recently send within a fixed period and a score is obtained. This score can be used for classification by the MUA (mail user agent). If the score is high and if the sender is not in the sender/recipient address book, then the email must be a spam.

A graph based approach is proposed in [12] by the authors. In this approach large user-user graphs and tightly connected subgraphs are drawn which detects botnet spamming attacks targeting major Web email providers.

VI. NICK NAME BASED DETECTION TECHNIQUE

All the bots communicating with its botmaster will have a nickname. The first step in establishing a botnet connection between the botmaster and the bot is assigning a unique nickname for the bot. Analyzing such nicknames and the similarities between the nicknames can be a useful technique for detection of botnets. In [13] Wang et al. use the similarity between the nicknames and is calculated using channel distance. The nicknames within one channel will have same structure. The channel distance is the Euclidean distance between two similar nicknames.

The detection methods using the nickname will rely on the communication channel between the bot and the Command and Control. The method proposed by Goebel in [14] is a similar one. In [14] Goebel use n-gram feature along with a scoring function for detection of bots that use uncommon communication channels by monitoring network traffic for unusual or suspicious IRC nicknames. The method generates warning emails to administrator to report infected machines. The captures packets are analyzed and some features like time, IP address and port of source and destination, nicknames etc. Then the scoring function checks for occurrence of several criteria. For each successful hit, scoring function points of the nickname are incremented. The final points of the nickname along with other information are stored in the connection object. The higher the connection object, the probability that it is a spam is higher. If the scoring function crosses a particular threshold the system will trigger an alarm.

VII. CONCLUSION

In this paper most of the techniques used for botnet detection so far are reviewed. Other than above mention techniques there are techniques that are based on log correlation which is mentioned in [15] by Masud.

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AN ERGONOMIC DESIGN OF PEDAL OPERATED FLOUR MILL

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Abstract- The socio economic conditions of peoples living in village sides of developing countries like India, ever increasing energy crises, and the increasing awareness to ourselves physically fit are the driving forces for the development of pedal operated mechanisms for performing many day to day activities. Such human energized mechanisms are used to generate power, to operate flour mill etc. But one common oblivious question that stuck in everyone's mind is about the level of comfort that it provide during its operation.

Wheat and wheat flour forms the staple food of majority of population in India. Hence to encompass all these needs and facts, in this paper an attempt is made to develop an pedal operated flour mill with giving due respect to human capabilities. To make this design of pedal operated flour mill is ergonomically viable the structure (geometry) of the flour mill is made by taking into consideration the anthropometric data so as to provide comfortable posture during its operation.

Index Terms- pedal operated flour mill, ergonomics, anthropometric.

I. INTRODUCTION

Wheat and wheat flours are the integral of daily diet of Indian population. The wheat kernels are processed in chakki (flour mill) to produce wheat flour which is then used to make breads, biscuits, pastas etc. In India chapatti and other variants of wheat forms the staple food of majority of population. In manual process the flour is produced by hand cranking the conventional stone wheels. But this method is characterized by slow operation, low production rate. Further this hand cranking process is physically demanding through energy and postural requirements. It may also leads to clinical and anatomical disorders which may affect operator's health.

In order to make it possible to operate the system effectively and efficiently it is necessary to develop this system by giving due respect to human limitation. Hence ergonomic system of pedal operated flour mill is developed. The ergonomic consideration mainly includes the selection of components of system which suits the human capability and develops the posture to operate system to reduce the fatigue and chances of muscletole disorders.

II. PEDAL OPERATED FLOUR MILL- CONSTRUCTION AND WORKING

In construction the pedal operated flour mill basically consists of two units namely the drive unit and processing unit. The drive

unit mainly concerns with transmission of human power to processing unit. This transmission of human power to processing unit is accomplished in two stages. In first stage the operator uses his feet and legs to rotate pedal around the crank axel. The pedals in turn are fixed to chain ring (sprocket) with the teeth's that engages continuous chain. The chain then transmits the pedaling action to cog on the front wheel causing the front sprocket to rotate and then drive shaft on which pulley is mounted. In second stage this power from shaft and pulley is transmitted to processing unit through belt drive.

The processing unit essentially consists of stone wheels, hopper, and hemispherical collector. The stone wheels are operated by power from the belt drive where the wheat kernels which are fed into hopper are crushed and powered wheat flour is collected in hemispherical collector.

III. ERGONOMICS DESIGN OF PEDAL OPERATED FLOUR MILL

Making this design ergonomically viable mainly concerns with developing the posture to provide best possible comfortable posture to operator during its working so as to get maximum throughput. This can be achieved by selecting and arranging the components of system that best suits to human capabilities.

Since the thigh or quadriceps is largest and most powerful muscles in human body with the body in seat and legs can produce pedal work [1]. The person can generate four times more power (1/4 horsepower (hp)) by pedaling than by hand cranking. At the rate of 1/4 hp, continuous pedaling can be done for only short time, about 10 minutes. However pedaling at half of this power (1/8 hp) can be sustained for around 60 minutes Maximum power produced with legs is generally limited by adoptions within the oxygen transportation system. On the other hand the capacity for arm exercise is dependent upon the amounts of muscle mass engaged and that is why a person can generate more power by pedaling than hand cranking [2]. Pedal power enables a person to drive device at same rate as achieved by hand. Thus it makes sense to utilize this human muscle for generating as much as energy from human body.

In order to provide the ergonomically comfortable system it is necessary to locate the various elements of system so that a person can operate the system with less effort and hence the fatigue. As the thigh is being utilized to generate the power continuously it was decided to develop a posture which is similar to cycling posture. And subsequently the ergonomic design mainly concerned with the saddle (seat) position, handle position. Saddle position includes the height of saddle, distance between

saddle and pedal crank center, seat tube angle. Whereas handle position includes handle height, handle width, distance between saddle and handle.

IV. SADDLE DESIGN

A. Saddle height from pedal crank center

It is biomechanically logical that in order to have comfortable posture there should be an optimal saddle height [3]. This saddle height is obtained by keeping in mind certain facts.

The normal pedaling rate for average healthy person is around 70-80 rpm because of optimum oxygen intake [6]. Patellar tendontitis is common injury resulting because of low saddle height. The low saddle height cause the over compression of knee, resulting in anterior knee pain [5]. On the other hand the Biceps tendontitis is injury caused because of saddle height that is too high which causes the over stretching at the bottom of stroke. Hence in order to achieve this balance it recommended that saddle height should be such that knee angle at the bottom of stroke should between 25-35° [5].

This saddle to pedal height is achieved by Greg-lemond method. According to lemond method the distance between saddle and pedal should be 88.3% of inseam length [5]. Now on the basis of anthropometric data for Indian context the average inseam length of an Indian is 76.35cm [5]. And hence the saddle to handle distance according to lemond method will be

$$\text{Saddle height} = 0.883 * \text{inseam length} \\ = 0.883 * 76.35$$

$$\text{Saddle height} = 67.42 \text{ cm}$$

B. Seat tube angle (STA)

For comfortable posture the optimum seat tube angle should be 82°. This angle causes the operator to move forward relative to crank axis. As a result of this forward movement. The hip is more extended during the power phase of pedaling [6]. Brown et al (1996) has observed that this extended movement causes the operator to generate greater hip torque thus enables operator to generate more power. Hence the seat tube angle taken is 82°.

V. HANDLE DESIGN

A. Saddle to handle distance

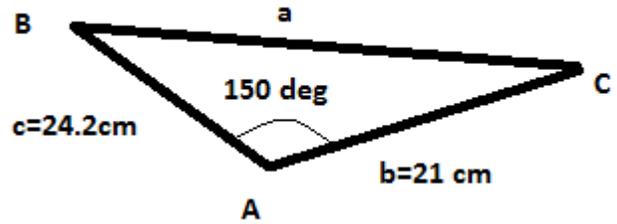
For handle designs following points regarding human comfort were taken into consideration.

- 1) For easy and comfortable riding wrist angle should not be straight. It should be between 170°-190° [7].
- 2) The elbow angle should be between 150°-165° [7].
- 3) The angle between upper arm and trunk should be around 20° to reduce the effect of possible vibration to shoulders [8].
- 4) Further the posture should be such that operator should lean forward approximately 15° w.r.t vertical axis which increases the respiratory volume because it transfers part of shoulders weight to arms and reduces the load to lower back area without overloading the arms and wrist[8].

From the anthropometric data, we have

- Upper arm length = 21 Cm [7].
- Lower arm length = 24.2 Cm [7].
- Hand length = 18.7 Cm [7].

Thus by using cosine rule we can obtained the distance between shoulder and wrist with elbow angle 150°



$$\text{Cos A} = (b^2 + c^2 - a^2) / 2bc \\ \text{Cos } 150^\circ = (21.2^2 + 24.2^2 - a^2) / 2 * 21 * 24.2 \\ \text{Therefore } a = 43.8 \text{ cm.}$$

That is saddle to handle distance = 45cm

As the shoulder angle should be around 20° to reduce the fatigue as stated earlier.

The handle height needs to be calculated. This can be found out by graphical method.

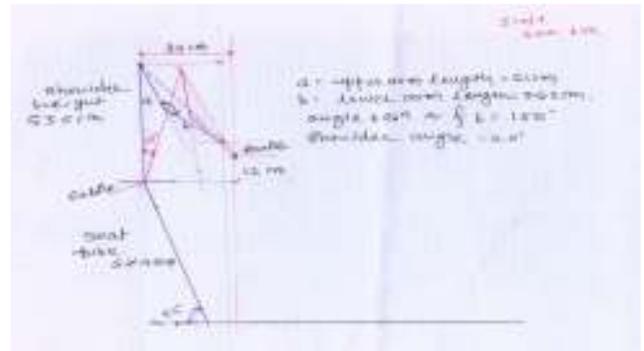


Figure: 1

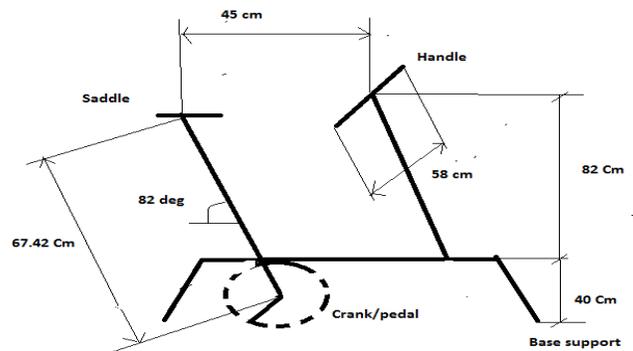
Thus we have following dimensions.

Saddle to handle distance = 45cm

Handle width = 58cm i.e. equal to shoulder width

Handle grip length = 15cm.

Geometry of the structure according to dimensions we obtained is as follows.



VI. RESULT



The pedal operated flour mill is fabricated according to the dimensions which were derived suitable to human anthropometry so as to reduce the possible fatigue during its operation. After fabrication several trials were conducted on it and their corresponding time of pedaling and output rate of flour were taken down for different pedaling rate.

For conducting trials 8 personals from age group 20-35 were selected. The mean (\pm SD) of age, weight, height were 26.5 \pm 3.5 years, 68.62 \pm 21 Kg, 176.8 \pm 3 cm respectively. All the trials started at 10 A.M. in the morning in the laboratory where the room temperature varied from 25-28°C and relative humidity was 50-60% during experiment. In order to find out most efficient, productive way operating the system, the input pedaling rate is set in three stages vise 30-50-rpm, 50-70 rpm, and 70-90 rpm.

For 30-50 rpm, production rate observed was slow but the texture of flour was fine enough. The production rate found to be 25 mins per Kg & average time that subject can maintain the pedaling is 15 mins. For 70-80 rpm the production rate of flour was observed to be maximum but the flour obtained was somewhat coarser and requires regrinding. Further it was finding difficult to maintain this pedaling rate more than 5 mins. When input pedaling rate is set to 50-70 rpm 1 Kg of wheat requires 15 mins. To get required fineness double crushing was required but not to extent as that requiring at higher pedaling rate. So overall for 1Kg requires 20 mins and this pedaling rate found more comfortable than other two.

VII. CONCLUSION

The main objective behind development of pedal operated flour mill was on producing cheap, easy to operate system which can be easily fabricated by readily available material and thus we proposed a simplistic design that can deliver efficient, productive and reliable flour mill which can be used in rural as well as urban areas. this equipment can be easily operated by semi rather low skilled operator. Further this equipment can easily find its place where there is no or limited power supply.

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Food Dyes Decolourized by *pleurotus ostreatus*

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Abstract- This study employed a comprehensive approach to testing the capability of *P. ostreatus* in decolourizing four different food dyes and to investigate the bio-adsorption properties of *P. ostreatus* under the equilibrium state. Decolourization of Carmoisine Red, Tartrazine Yellow, Brilliant Blue FCF and Fast Green FCF were determined by UV-visible spectrophotometric method. Present study had confirmed that *P. ostreatus* provided almost complete decolourization of 10ppm food dyes. Dried *P. ostreatus* along with agitation have a higher efficiency, efficacy and capability during the dye decolourization. As high as 81.34% for Carmoisine, 45.36% for Tartrazine, 19.82% for Brilliant Blue FCF and up to 28.99% for Fast Green FCF are removed by 5g/L of dried *P. ostreatus* in 150rpm agitation speed. The interpretation of results had shown the maximum capacity (Qm) of *P. ostreatus* which range from 0.05 to 0.43mg/L in dyes decolourization. Our data were adequately fitted to Langmuir isotherm and subordinate to Pseudo second kinetic order. Colourless solution of Carmoisine Red was visually transformed by *P. ostreatus* within 5 days of dye treatment.

Index Terms- *Pleurotus ostreatus*, food dye, decolourization, fresh biomass, dried biomass

I. INTRODUCTION

Dyes have been increasingly applied in the industries of cosmetics, textile, manufacturing, and food. With the high stability to light, temperature and resistance to microbial attacks, a range of cost-effective and colourful synthetic food dyes can be manufactured in pilot scale to sustain the limited choice of natural food dyes (Kiseleva *et al.* 2002).

The synthetic food dyes are made up of complex aromatic molecular structures of azo and phenylmethane groups, which are recalcitrant xenobiotic compounds, that resistance to environmental decolourization process (Fu and Viraraghavan 2001). Thus, leaving the unsolved environmental problem to biologists and public.

Chemical and physical wastewater treatments have been widely practiced for the past decades compared to biological approach. Most of the physical approach, however, simply accumulate and concentrate wastewater, left over carcinogenic solid waste (food dyes), that further impede disposal problem. Expensive chemical approach using peroxide or ozone is inapplicable to schedule food industrial wastewater treatment.

To fill in the gap, biological approach using fungi to treat wastewater has received much attention recently. The white rot fungi have proven its capability to degrade synthetic chemicals, such as azo dyes from textile industry (Zhao and Hardin, 2007). The plausibility was this fungi secretes ligninolytic enzyme to degrade complex molecular structure of the synthetic dyes; thus,

it was an alternative to the existing approach (Selvam *et al.*, 2003).

To date, vast majority of fungal strains have involved in biological decolourization approach. There were *Aspergillus spp.*, *Fusarium*, *Phanerochaete chrysosporium*, *Trametes vesicolour*, *Coriolus versicolour*, *Cunninghamella polymorpha*, *Funalia trogii* and *Rhizopus arrhizus*, *Rhizopus oryzae*, *Cyathus bulleri*, *Laetiporus sulphureus*, *Streptomyces sp.*, *Trametes versicolour*, *Polyporus elegans*, *Trametes versicolor*, *Lenzites betulina*, *Mucor mucedo*, *Phanerochaete sordida*, *Pycnoporus sanguineus*, and *Trametes elegans* (Da-Re and Papinutti, 2011; Erum and Ahmed, 2010; Moturi and Singara-Charya, 2009; Seyis and Subasioglu, 2008; Erkut *et al.*, 2007; Nigam *et al.*, 2000)

Pleurotus ostreatus (*P. ostreatus*), is widely available, an edible mushroom for food industry. However, not much attention has been raised for its decolourization ability. This research is to source out the capability, efficacy and efficiency of *P. ostreatus* in decolourizing the food dyes, indirectly contributing knowledge to wastewater treatment in food industries.

II. MATERIALS AND METHODOLOGY

A. Microorganism and Dye Preparation

Fresh *P. ostreatus* bodies were purchased from TESCO Shah Alam, Malaysia. The unlive *P. ostreatus* biomass was dried in the incubator (30°C, overnight) after removed its stipe. Potato Dextrose Agar (PDA) and Potato Dextrose Broth (PDB) (Fluka, Sigma-Aldrich USA) were prepared followed by autoclaving (121°C, 20mins).

P. ostreatus was cultured on PDA. Active mycelium was cut and was transferred to Universal bottles containing 10ml of PDB and incubated at 28°C. Prior to sterilization by autoclaving, the medium was adjusted to pH 6.5 with 20mM acetate buffer. After 3-5 days, the inoculum of each bottle was homogenized.

Four different colour dyes (Nona, Malaysia) were selected and each of their unique properties was further described in Table I.

B. Decolourization Assay

Dye decolourization assay was started on Petri dishes (3 parallel) with different parameter of dyes after inoculated with mycelial plugs cut from actively growing mycelia. Another 3 parallel of *P. ostreatus* that cultivated in the liquid medium was decolourized with the respective dyes. Inoculated universal bottles with the same medium without dye served as control.

Table I: Properties and Characteristic of Food Dyes

Commercial Name	Colour	Chemical Formula	λ max (nm)	Mole- cular Weight (g/mol)	Group
Carmoisine	Red	C ₂₀ H ₁₂ N ₂ Na ₂ O ₇ S ₂	608	502.44	Monoazo
Tartrazine	Yellow	C ₁₆ H ₉ N ₄ Na ₃ O ₉ S ₂	510	534.4	Monoazo
Brilliant Blue FCF	Blue	C ₃₇ H ₃₄ N ₂ Na ₂ O ₉ S ₃	698	792.84	Triphenyl methane
Fast Green FCF	Green	C ₃₇ H ₃₄ N ₂ Na ₂ O ₁₀	664	808.85	Triphenyl methane

C. Adsorption Isotherm and Kinetics Studies

Adsorption studies were carried out by dissolving 10ppm (part per million) of dye. The 5, 10, 50g/L of *P. ostreatus* gills (fresh and dried) were xthoroughly with different concentration of dyes and the suspensions were shaken (150rpm) at room temperature.

D. Spectrophotometric Analysis

Samples of 1.0 mL were collected from the duplicate flasks and were centrifuged for 10,000rp for 5 min. The residual dye concentration in the solutions were measured by Hitachi UV-vis U1900 spectrophotometer at required time intervals 1, 6, 24, 48, 72, 96 and 120 hours. Decolourization was determined by monitoring the absorbance at the wavelength maximum for each dye as shown in Table 1.

III. RESULTS

A. Fungal Morphology and Decolourization Ability

For the spore decolourization studies, the decolourization rate of respective strains was not as efficient as compared to the bio-adsorption studies. Fresh and dried gills of *P. ostreatus* showed its excellence capability in both decolourization and adsorption. However, cultured media condition may be the pitfall for the effectiveness of the cultured *P. ostreatus* dye adsorption activity (Seyis and Subasioglu, 2008). Dye degradation is improved by the active enzymes encoded in *P. ostreatus* biomass (Neelamegam et al., 2004). Therefore, we will emphasis on the biomass usage that is more advantageous in decolourization studies.

Decolourozation assay was chosen on 4 commercially important dyes, with a wide range of applications across the household and food industries. Decolourization in dyes solution was assessed by visual disappearance of colour and reduced in absorbance reading after 5 days. Carmoisine, Tartazine Yellow, Brilliant Blue FCF and Fast Green FCF were decolourized by 0.1g of fresh *P. ostreatus* with a percentage of 30.49±1.3, 12.66±1.2, 5.11±0.2 and 10.43±0.3% respectively (Figure 1). Meanwhile, dried *P. ostreatus* was significantly decolourized the Carmoisine (77.83%±0.9) and red colour was visually disappeared on the fifth days. Tartzine showed 36.45±1.1 % of dye decolourization its appearance was transformed to light

yellow. Decolourization of Brilliant Blue FCF (16.21±0.3%) and Fast Green FCF (21.85±0.5%) were also achieved by 5g/L of dried *P. ostreatus*. Figure 1 illustrated the greater decolourization efficacy for dried biomass than those of fresh biomass in our study.

Percentage for dye decolourization was calculated according to the formula:

$D(\%) = ((C-S)/C) \times 100\%$; where
C -- absorbance of dye in a control sample,
S -- absorbance of dye in samples

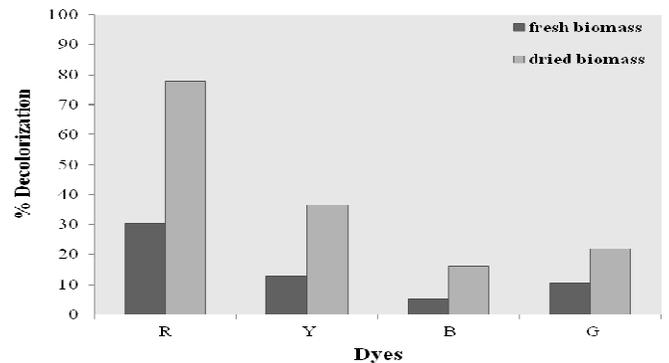


Fig. 1 Total percentage of dyes (R= Carmoisine Red, Y= Tartazine Yellow, B= Brilliant Blue FCF, G= Fast Green FCF) at 10ppm decolourized by 5g/L dried and fresh *P. ostreatus* biomass after 120 hours treatment

B. Effect of Agitation

Shaking at 150rpm, all dyes decolourization was enhanced gradually with the passage of time. After 5 days of treatment, 5g/L of fresh *P. ostreatus* biomass has decolourized 5.72%, 3.8%, 2.1% and 1.59% with respect to Carmoisine, Tartazine Yellow, Brilliant Blue FCF and Fast Green FCF. Agitation has an effect on the dried *P. ostreatus* decolourization efficiency, the percentage of dye adsorption increased to the maximum of 3.51% (Carmoisine), 8.91% (Tartazine), 3.07% (Brilliant Blue FCF) and 7.15% (Fast Green FCF).

C. Langmuir Equilibrium and Absorption Isotherm

The capability of *P. ostreatus* in colour dyes absorption was demonstrated in Table II. The amount of adsorption at equilibrium, q_e (mg/g), was calculated using following formula (Santhi et al., 2010; Hameed et al., 2008; Islek et al., 2008):

$$q_e = \frac{(C_0 - C_e)V}{W}; \text{ where}$$

q_e (mg/g) -- amount of dye adsorbed by *P. ostreatus* biomass at equilibrium state,
 C_0 and C_e (mg/L) -- the initial and equilibrium liquid phase concentration of dye
 V (L) -- total volume of dye solution,
 W (g) -- weight of the biomass

Table II Total bio-adsorption q_e of *P. ostreatus* (Sample Dosage: 5g/L, Dye Concentration: 10mg/L, Speed of Stirring: 150rpm, room temperature)

<i>P. ostreatus</i>	q_e (mg/g)			
	C	Y	B	G

Fresh	7.28	3.16	1.46	2.32
Dried	16.24	8.64	3.98	5.74

Adsorption Isotherms is to investigate the association between the adsorbate concentration and the amount adsorbed on the adsorbent at the constant rate. Langmuir Isotherm equation value was given in Table III. The equation may be expressed as (Vijayakumar *et al.*, 2012; Santhi and Manonmani, 2009):

$$C_e/q_e = \frac{1}{kQ_m} + \frac{C_e}{Q_m}$$

Q_m (mg/g). -- maximum adsorption capacity, slopes
k -- Langmuir constant

From the graph of C_e/q_e vs C_e , we can calculated where Q_m equal to slope ($1/Q_m$) and value of k is intercepts ($1/kQ_m$) of linear plots

Table III Adsorption Isotherm of Food Dyes on Dried *P. ostreatus* (Sample Dosage: 5g/L, Dye Concentration: 10mg/L, Speed of Stirring: 150rpm, room temperature)

Dyes	Q_m (mg/g)	k
Carmoisine	0.43	0.739
Tartrazine	0.33	0.1779
Brilliant Blue FCF	0.05	0.1313
Fast Green FCF	0.16	0.1355

D. Lagergren's Pseudo-First Order Kinetics Analysis

Kinetic studies of adsorption were carried out in different contact time to the surface of *P. ostreatus*. The amount of dye absorbed were increase with the passage of time. Referring Vijayakumar *et al.* (2012), the amount of adsorption qt (mg/g) was calculated by

$$qt = \frac{(C_0 - C_t)V}{w}$$

Figure 2 and 3 represent the bio-adsorption model for Pseudo first and second kinetics order respectively. The high values of correlation coefficients in our data (Table IV) proved the kinetics of bioadsorption are obeying pseudo-first-order rate kinetic model.

The kinetic data were acquired from the Lagergren's pseudo-first order rate equation (Kumar *et al.*, 2010; Santhi and Manonmani, 2009):

$$\log(q_e - qt) = \log q_e - \frac{k_1 t}{2.303}$$

k_1 -- first order rate constant, obtained from the slopes of the linear plots of $\log(q_e - qt)$ vs t

The linear form of pseudo-second-order kinetics described as (Kumar *et al.*, 2008; Hameed *et al.*, 2008):

$$\frac{t}{qt} = \frac{1}{k_2 q^2} + \frac{1}{q^2} t$$

k_2 -- second order constants rate in (g/mg h), obtained from the slope and intercept of plot t/qt vs t

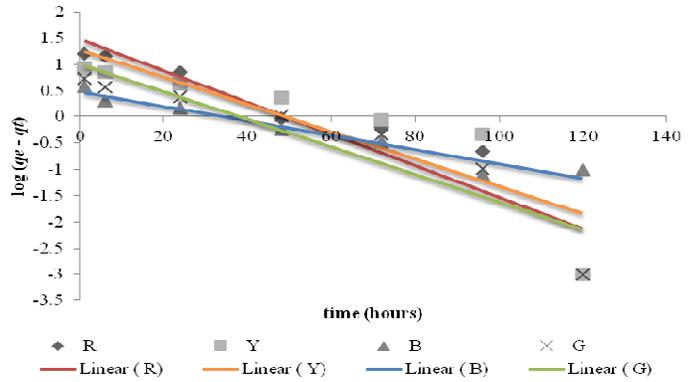


Fig. 2 Lagergren's Pseudo-First Order Graph Plot for Bio-adsorption of *P. ostreatus* (Sample Dosage: 5g/L, Dye Concentration: 10mg/L, Speed of Stirring: 150rpm, room temperature)

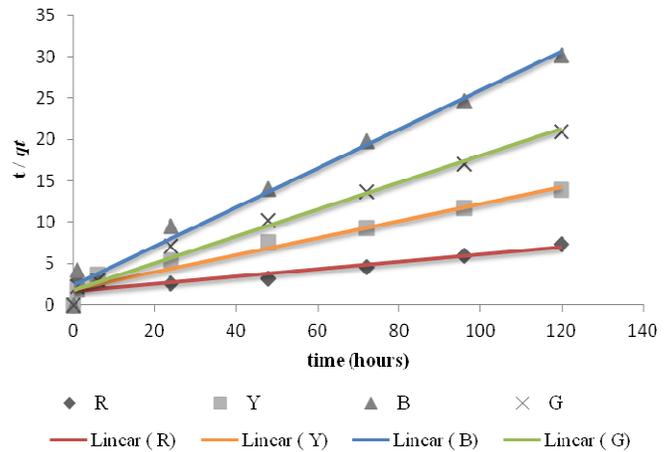


Fig. 3 Lagergren's Pseudo-Second Order Graph Plot for Bio-adsorption of *P. ostreatus* (Sample Dosage: 5g/L, Dye Concentration: 10mg/L, Speed of Stirring: 150rpm, room temperature)

Table IV Slope and R² Values Generated by Lagergren Plot

Dyes	Pseudo first order kinetic model		Pseudo second order kinetic model	
	k1	R ²	k2	R ²
Carmoisine	-0.0301	0.8721	0.0449	0.8838
Tartrazine	-0.0205	0.8529	0.1207	0.9591
Brilliant Blue FCF	-0.0137	0.9519	0.2351	0.9861
Fast Green FCF	-0.0212	0.8496	0.1616	0.9845

IV. DISCUSSION

Dead *P. ostreatus* with the amount of 20g/L showed an excellent dye decolourization characteristic with an increasing surface area for adsorption as a consequence of cell rupture upon death. Increase dyes exposure on fungal cell wall that covers with chitin or chitosan is the major site of biosorption, for example the pileus (Vetter, 2007). Apart, researchers have also reported that dead biomass was better choices that can effectively adsorbing organic pollutants and dyes compare to live biomass (Maurya *et al.*, 2006; Seyis and Subasioglu, 2008). The

disappearing of dyes (measure by visual appearance) was due to the chromophoric group transformation either by metabolism and adsorption of *P. ostreatus*. (Zhao, 2004) *P. ostreatus* biomass shown its highest capability and efficiency to adsorb and decolourize Carmoisine which contains monoazo group. Phenols structure in Carmoisine is ease to oxidize to phenoxyl radicals by laccase in the presence of O₂ cofactor (Couto, 2009). Similarly, monoazo group of Tartrazine, which owned a simple molecular structure and light molecular weights has successfully been decolourized by *P. ostreatus* biomass. High laccase activity has reported in the decolourization of Direct Dye Solar Golden Yellow R under optimized condition (Jilani *et al.*, 2011). The Naphthyl compounds can be decolourized to Naphthoquinone by *P. ostreatus* (Zhao, 2004). All the bonding and structure (azo, phenolic and naphthalene) can react by *P. ostreatus* and produce uncoloured compound after metabolism thus it appeared translucent (Yiping *et al.*, 2008). However, Brilliant Blue FCF with the high molecular weight and complex molecular structure are more resistant to be decolourized by *P. ostreatus*. Fast Green FCF also has similar instance with Brilliant Blue FCF, thus representing the Triphenylmethane dye group that contained complex molecular structure and large molecular weight is steric hindrance and resist food dyes to bind. The steric hindrance occurs due to the large molecular size and consequently caused it resistant to be transformed or degraded into simpler structure. Faraco *et al.* (2009) has reported in the presence of complex poly-azo and a stilbene structure in dye wastewater was unable to be degraded by the laccases of *P. ostreatus*. The chromophoric group did not transformed by *P. ostreatus*, thus the colour still can be visualized. All of these four dyes contain sulfonate groups can be decolourized by *P. ostreatus* (Lu *et al.*, 2008).

V. CONCLUSION

As the result, the low cost edible *P. osteratus* can act effectively toward monoazo group of food dyes for Camoisine and Tartrazine in aqueous solution. The isothermal data fitted to Langmuir equation and Q_m was accounted as 0.45mg/g. The bioadsorption processes followed the pseudo- second order rate kinetics. Thus, these results suggested that chemisorption was the underlying mechanism rather than physisorption for dye in order to adsorb on the intersurface of *P. ostreatus*.

APPENDIX



P. ostreatus mycelium culutred in PDA



P. ostreatus culutred in PDB added with dyes



Decolourization of Carmoisine on 3rd day (middle), 5th day (right) and control (left)



Decolourization of Tartrazine on 3rd day (middle), 5th day (right) and control (left)



Decolourization of Brilliant Blue FCF on 3rd day (middle), 5th day (right) and control (left)



Decolorization of Fast Green FCF on 3rd day (middle), 5th day (right) and control (left) (right) and control (left)

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“HANDS-FREE PC CONTROL” CONTROLLING OF MOUSE CURSOR USING EYE MOVEMENT

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Abstract- The paper presents hands free interface between computer and human. This technology is intended to replace the conventional computer screen pointing devices for the use of disabled or a new way to interact with mouse. the system we describe is real time, on-intrusive, fast and affordable technique for tracking facial features. The suggested algorithm solves the problem of occlusions and is robust to target variations and rotations. It is based on novel template matching technique. A SSR Filter integral image, SVM is used for adaptive search window positioning and sizing.

Index Terms- face Recognition, SRR, SVM, and template matching

I. INTRODUCTION

This technology is intended to be used by disabled people who face a lot of problems in communicating with fellow human beings. It will help them use their voluntary movements, like eyes and nose movements: to control computers and communicate through customized, educational software or expression building programs. People with severe disabilities can also benefit from computer access and take part in recreational activities, use internet or play games. This system uses a usb or inbuilt camera to capture and detect the user's face movement. The proposed algorithm tracks the motion accurately to control the cursor, thus providing an alternative to computer mouse or keyboard.

Primarily approaches to camera-based computer interfaces have been developed. However, they were computationally expensive, inaccurate or suffered from occlusion. For example, *the head movement tracking system* is the device that transmits a signal from top of computer monitor and tracks a reflector spot placed on user forehead. This technique is not completely practical as some disabled cannot move their head and it becomes inaccurate when someone rotates its head. *Electro-oculography (EOG)* is a technology where a electrode around user eye record the movement. The problems with this technique is that for using this the disabled person needs someone help to put it and also the system is quite expensive.

Another example is *CAMSHIFT* algorithm uses skin color to determine the location and orientation of head. This technique is fast and does not suffer from occlusion; this approach lacks precision since it works well for translation movement but not rotational movement.

II. FLOW OF USING THE APPLICATION

2.1 Face Detection

Face detection has always been a vast research field in the computer vision world. Considering that it is the back bone of any application that deals with the human face. The face detection method can be organized in two categories:

2.1.1 Feature-based method:

The first involves finding facial features (e.g. noses, eye brows, lips, eye pupils) and in order to verify their authenticity performs by geometrical analysis of their locations, areas and distances from each other. This analysis will eventually lead to localization of the face and the features that it contains. The feature based analysis is known for its pixel-accuracy, features localization and speed, on the other hand its lack of robustness.

2.1.2 Image-based method:

The second method is based on scanning the image of interest with a window that looks for faces at all scales and locations. This category of face detection implies pattern recognition, and achieves it with simple methods such as template matching or with more advanced techniques such as neural networks and support vector machines. Before over viewing the face detection algorithm we applied in this work here is an explanation of some of the idioms that are related to it.

2.2 SIX SEGMENTED RECTANGULAR FILTER [ssr]

At the beginning, a rectangle is scanned throughout the input image. This rectangle is segmented into six Segments as shown in Fig. (1).

S1	S2	S3
S4	S5	S6

Fig 1: segments of rectangle

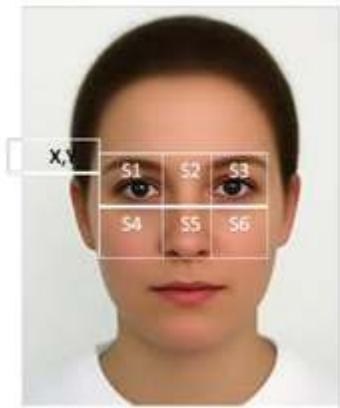


Fig 2: SSR Filter

We denote the total sum of pixel value of each segment (S1-S6). The proposed SSR filter is used to detect the Between-the-Eyes[BTE] based on two characteristics of face geometry. (1) The nose area (S_n) is brighter than the right and left eye area (eye right (S_{er}) and eye left (S_{el}), respectively) as shown in Fig.(2), where

$$S_n = S2 + S5$$

$$S_{er} = S1 + S4$$

$$S_{el} = S3 + S6$$

Then,

$$S_n > S_{er} \quad (1)$$

$$S_n > S_{el} \quad (2)$$

(2) The eye area (both eyes and eyebrows) (S_e) is relatively darker than the cheekbone area (including nose) (S_c) as shown in Fig. (2), where

$$S_e = S1 + S2 + S3$$

$$S_c = S4 + S5 + S6$$

Then,

$$S_e < S_c \quad (3)$$

When expression (1), (2), and (3) are all satisfied, the center of the rectangle can be a candidate for Between-the-Eyes

2.3 INTEGRAL IMAGE

In order to assist the use of Six-Segmented Rectangular filter an immediate image representation called “Integral Image” has been used. Here the integral image at location x, y contains the sum of pixels which are above and to the left of the pixel x, y [10] (Fig. 3).

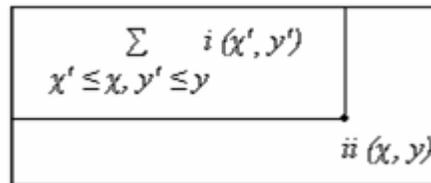


Fig 3: Integral Image; i: Pixel value; ii: Integral Image

So, the integral image is defined as:

$$ii(x, y) = \sum i(x', y') \quad (1)$$

$$x' \leq x, y' \leq y$$

With the above representation the calculation of the SSR filter becomes fast and easy. No matter how big he sector is, with 3 arithmetic operations we can calculate the pixels that belong to sectors (Fig. 4).

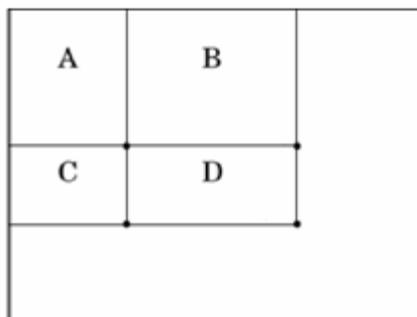


Fig. 4: Integral Image, The sum of pixel in Sector Dis computed as Sector =D - B - C + A

The Integral Image can be computed in one pass over the original image (video image) by:

$$s(x, y) = s(x, y-1) + i(x, y) \quad (2)$$

$$ii(x, y) = ii(x-1, y) + s(x, y) \quad (3)$$

Where $s(x, y)$ is the cumulative row sum, $s(x, -1) = 0$, and $ii(-1, y) = 0$. Using the integral image, any rectangular sum of pixels can be calculated in four arrays (Fig. 4).

2.4 SUPPORT VECTOR MACHINES [SVM]

SVM are a new type of maximum margin classifiers: In “learning theory” there is a theorem stating that in order to achieve minimal classification error the hyper plane which separates positive samples from negative ones should be with the maximal margin of the training sample and this is what the SVM is all about. The data samples that are closest to the hyper plane are called support vectors. The hyper plane is defined by balancing its distance between positive and negative support vectors in order to get the maximal margin of the training data set.

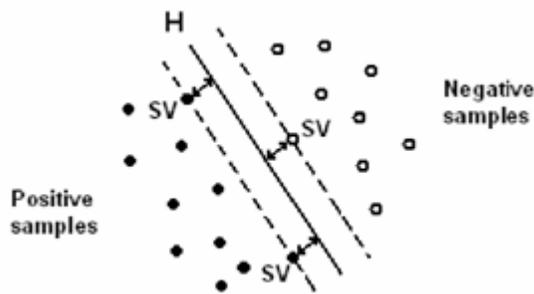


Fig 5: Hyper plane with the maximal margin.

Training pattern for SVM

SVM has been used to verify the BTE template. Each BTE is computed as: Extract 35 wide by 21 high templates, where the distance between the eyes is 23 pixels and they are located in the 8th row (Fig 5, 6, 7). The forehead and mouth regions are not used in the training templates to avoid the influence of different hair, moustaches and beard styles.

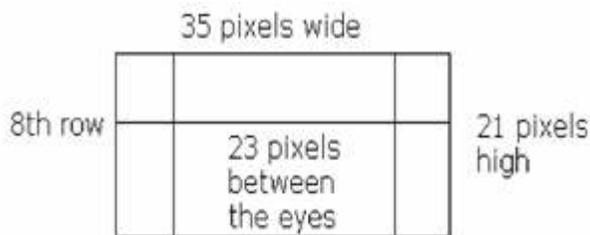


Fig 6: How to extract the training template

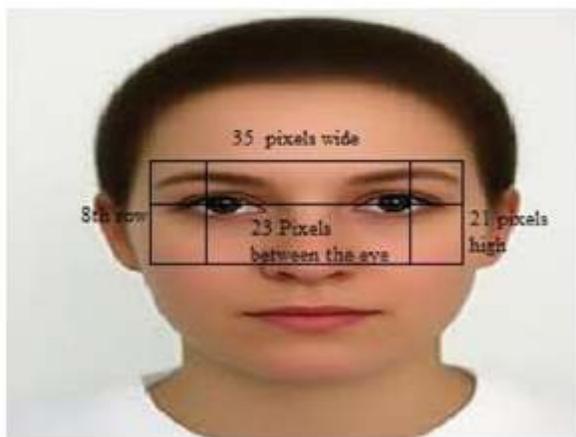


Fig. 7: Illustration of the training template

The training sample attributes are the templates pixels values, i.e., the attributes vector is 35*21 long. Two local minimum dark points are extracted from (S1+S3) and (S2+S6) areas of the SSR filter for left and right eye candidates. In order to extract BTE temple, at the beginning the scale rate (SR) were located by dividing the distance between left and right pupil's candidate with 23, where 23 is the distance between left and right eye in the training template and are aligned in 8th row. Then:

- Extract the template that has size of 35 x SR x 21, where the left and right pupil candidate are align on the 8 x SR row and the distance between them is 23 x SR pixels.

And then scale down the template with SR, so that the template which has size and alignment of the training templates is horizontally obtained, as shown in Fig. 8.



Fig. 8: Face pattern for SVM learning

In this section we have discussed the different algorithm's required for the face detection that is:

SVM, SSR, Integral image and now we will have a detailed survey of the different procedures involved: face tracking, motion detection, blink detection and eyes tracking.

III. FACE DETECTION ALGORITHM

OVERVIEW:

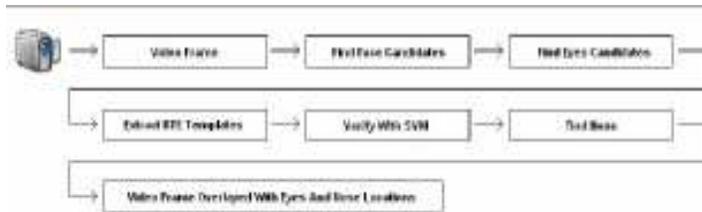


Fig. 9: Algorithm 1 for finding face candidates

3.1 Face Tracking

Now that we found the facial features that we need, using the SSR and SVM, Integral Image methods we will be tracking them in the video stream. The nose tip is tracked to use its movement and coordinates as them movement and coordinates of the mouse pointer. The eyes are tracked to detect their blinks, where the blink becomes the mouse click. The tracking process is based on predicting the place of the feature in the current frame based on its location in previous ones; template matching and some heuristics are applied to locate the feature's new coordinates.

3.2 Motion Detection

To detect motion in a certain region we subtract the pixels in that region from the same pixels of the previous frame, and at a given location (x,y); if the absolute value of the subtraction was larger than a certain threshold, we consider a motion at that pixel .

3.3 Blink detection

We apply blink detection in the eye's ROI before finding the eye's new exact location. The blink detection process is run only if the eye is not moving because when a person uses the mouse and wants to click, he moves the pointer to the desired location, stops, and then clicks; so basically the same for using the face: the user moves the pointer with the tip of the nose, stops, then blinks. To detect a blink we apply motion detection in the eye's ROI; if the number of motion pixels in the ROI is larger than a certain threshold we consider that a blink was detected because if the eye is still, and we are detecting a motion in the eye's ROI, that means that the eyelid is moving which means a blink. In order to avoid multiple blinks detection while they are a single blink the user can set the blink's length, so all blinks which are detected in the period of the first detected blink are omitted.

3.4 Eyes Tracking

If a left/right blink was detected, the tracking process of the left/right eye will be skipped and its location will be considered as the same one from the previous frame (because blink detection is applied only when the eye is still). Eyes are tracked in a bit different way from tracking the nose tip and the BTE, because these features have a steady state while the eyes are not (e.g. opening, closing, and blinking) To achieve better eyes tracking results we will be using the BTE (a steady feature that is well tracked) as our reference point; at each frame after locating the BTE and the eyes, we calculate the relative positions of the eyes to the BTE; in the next frame after locating the BTE we assume that the eyes have kept their relative locations to it, so we place the eyes' ROIs at the same relative positions to the new BTE. To find the eye's new template in the ROI we combined two methods: the first used template matching, the second searched in the ROI for the darkest 5*5 region (because the eye pupil is black), then we used the mean between the two found coordinates as the new eye's location.

IV. IMPLEMENTATION AND APPLICATIONS

4.1 Interface

The following setup is necessary for operating our "hands-free pc control". A user sits in front of the computer monitor with a generic USB camera widely available in the market, or a inbuilt camera.

Our system requires an initialization procedure. The camera position is adjusted so as to have the user's face in the center of the camera's view. Then, the feature to be tracked, in this case the eyes, eyebrows, nostril, is selected, thus acquiring the first template of the nostril (Figure 10). The required is then tracked, by the procedure described in above section, in all subsequent frames captured by the camera.



Fig 10: A screen shot of initialization window.

4.2 Applications

Hands-free PC control can be used to track faces both precisely and robustly. This aids the development of affordable vision based user interfaces that can be used in many different educational or recreational applications or even in controlling computer programs.

4.3 Software Specifications

We implemented our algorithm using JAVA in Jcreator a collection of JAVA functions and a few special classes that are used in image processing and are aimed at real time computer vision.

The advantage of using JAVA is its low computational cost in processing complex algorithms, platform independence and its inbuilt features Java Media Framework[JMF]2.1 which results in accurate real time processing applications.

V. CONCLUSION AND FUTURE DIRECTIONS

This paper focused on the analysis of the development of hands-free PC control - Controlling mouse cursor movements using human eyes, application in all aspects. Initially, the problem domain was identified and existing commercial products that fall in a similar area were compared and contrasted by evaluating their features and deficiencies. The usability of the system is very high, especially for its use with desktop applications. It exhibits accuracy and speed, which are sufficient for many real time applications and which allow handicapped users to enjoy many compute activities. In fact, it was possible to completely simulate a mouse without the use of the hands. However, after having tested the system, in future we tend to add additional functionality for speech recognition which we would help disabled enter password's/or type and document verbally.

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A Significant Root Leaf Wavelet Tree (SRLWT) Image Watermarking Technique Based on Tree Quantization

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Abstract- Digital watermarking techniques originally focused on copyright protection, but have been exploited in wide range of applications. There are several categories of watermarking schemes that are designed for different applications. Among them, robust watermarks are generally used for copyright protection and ownership identification because they are designed to withstand attacks such as common image processing operations. Recently to improve the compression of significance maps of wavelet coefficients, a new data structure called Wavelet Tree (WT) is introduced. The present paper extends the study on wavelet trees and developed new concept called Significant Root Leaf Wavelet Tree (SRLWT) to address the problem of 1) obtaining the best image quality for a given bit rate, and 2) to render the watermark more resistant to frequency based attacks, i.e., to achieve high robustness. This problem is important in many applications, particularly for progressive transmission, image browsing, multimedia applications and compatible transcoding in a digital hierarchy of multiple bit rates. It is also applicable to transmit over a noisy channel in the sense that the ordering of the bits in the order of importance leads naturally to prioritization for the purpose of layered protection schemes. Unlike other watermarking techniques which use a single casting energy, the proposed approach adopts adaptive casting energy in different resolutions. The experimental results indicate high robustness and image quality against various attacks when compared to several existing methods.

Index Terms- digital watermarking, wavelet Tree, robustness, significant root leaf wavelet tree.

I. INTRODUCTION

The growth in digital multimedia technology has shown a tremendous impact in the internet and wireless applications.

Today commercial and governmental organizations like commercial enterprises, museums, cultural organizations, image archiving, libraries, and retrieving agencies etc., almost converted their data into digital form. Due to this digitization and advanced networking with Giga or Tera bits of capacity has made a steep increase in the use of the widespread internet. This has allowed the people of various sectors to distribute or share their content in digital form through internet very easily, with high speed and at a cheaper rate of transmission. The shared contents can be video, digital repositories, audio, libraries or web publishing etc. This dependence on the internet transmission in digital form and huge digital repositories in web has brought some crucial and significant problems like in copying a digital content rapidly, perfectly and without limitations on the number of copies. This has made many researchers to think on the problem of copyright protection, which depends on image authorization, authentication and security. To address the above prime need issues a great deal of research efforts has been focused on digital watermarking in recent years. The digital watermarking plays a very important and primary role in protecting authentication, image authorization and security issues in several other areas like fingerprinting, authentication broadcast monitoring, e-commerce, e-governance [2, 4-8] and covert communication. That's why the research on digital watermarking methods has received considerable attention in recent years.

A new data structure called Wavelet Tree (WT) is introduced to improve the compression of significance maps of wavelet coefficients. Few researchers used the concept of wavelet tree data structure, and developed efficient compression algorithms like Embedded Zero Tree Wavelet (EZW) coding [1]. The wavelet tree and zero tree wavelets are simple and they achieved remarkably effective compression levels [3]. The present paper proposes new concepts of wavelet tree called Significant Root Leaf Wavelet Tree (SRLWT) using Haar wavelets to achieve the

robustness of watermarking scheme. The proposed approach is hierarchical. And in the proposed approach, embedded watermark is hard to detect, and the extracted watermark is visually recognizable. The proposed SRLWT matches the upcoming image/video compression algorithms.

The paper is organized as follows. WT are described in Section 2. Section 3 describes the proposed method for embedding and extraction of watermark. The section four describes the experimental results. The conclusion is discussed in the final section.

II. WAVELET TREES

A. Wavelet transform of images

The wavelet transform is identical to a hierarchical sub band system. The basic idea of the DWT for a two-dimensional image is described as follows. An image is first decomposed into four parts of high, middle, and low frequencies (i.e., LL_1 , HL_1 , LH_1 , HH_1 subbands) by critically sub-sampling horizontal and vertical channels using sub band filters. The sub bands labeled HL_1 , LH_1 , and HH_1 represent the finest scale wavelet coefficients. To obtain the next coarser scaled wavelet coefficients, the sub band LL_1 is further decomposed and critically sub sampled. This process is repeated several times, which is determined by the application at hand. An image being decomposed into 13 subbands for four levels. Each level has various bands information such as low-low, low-high, high-low, and high-high frequency bands. Furthermore, from these DWT coefficients, the original image can be reconstructed. This reconstruction process is called the inverse DWT(IDWT).

B. Wavelet tree

To improve the compression of significance maps of wavelet coefficients, a new data structures called SRLWT is proposed in the present paper. A parent child relationship can be defined between wavelet coefficients at different scales corresponding to the same location. Except the highest frequency sub bands (i.e., HL_1 , LH_1 , and HH_1), every coefficient at a given scale can be related to a set of coefficients at the next finer scale of similar orientation. The coefficient at the coarse scale is called the parent, and all coefficients corresponding to the same spatial location at the next finer scale of similar orientation are called children. For a given parent, the set of all coefficients at all finer scales of similar orientation corresponding to the same location are called descendants. Similarly, for a given child, the set of coefficients at all coarser scales of similar orientation corresponding to the same location are called ancestors. The coefficients selection approach of the proposed SRLWT is derived from EZW.

III. PROPOSED SRLWT METHOD

Definition for proposed SRLWT: If any wavelet coefficient $x_n(i,j) \in D$ at the coarsest scale is a parent of $x_{n-1}(p,q)$, where D is a sub band labeled HL_n , LH_n , HH_n , and the corresponding coefficients at finest scale or leaf nodes of $x_n(i,j) \in D$ satisfy $|x_n(i,j)| > T_1$, $|x_{n-1}(p,q)| > T_2$ for a given threshold T_1, T_2 , then $x_n(i,j)$ and all its children are called Significant Root Leaf Wavelet Tree (SRLWT).

The host image of size n by n is transformed into wavelet coefficients using the L level DWT. With L level decomposition,

one can have $L \times 3 + 1$ frequency bands. The proposed methods are experimented with four levels i.e. $L = 4$, the lowest frequency sub band is located in the top left (i.e., the LL_4 sub band), the highest frequency sub band is at the bottom right (i.e., the HH_1 sub band). The relationship between these frequency bands from the blocks of variable size can be seen as a parent child relationship. With the exception of the lowest frequency sub band LL_4 , the parent child relationship can be connected between these sub nodes to form a wavelet tree. If the root consists of more than one node, then an image will have many wavelet trees as explained below.

A wavelet tree descending from a coefficient in sub band HH_4 of SRLWT, with the exception of the lowest frequency sub band, all parents have four children. For the lowest frequency sub band, the parent child relationship is defined such that each parent node has three children in the SRLWT. In the proposed SRLWT approaches the scanning of the coefficients is performed in such a way that no child node is scanned before its parent. For an N scale transform, the scan begins at the lowest frequency sub band, denoted as LL_N , and scans sub bands HL_N , LH_N and HH_N , at which point it moves on to the scale $N-1$, etc. Each coefficient within a given coarser sub band is scanned before any coefficient in the next finer sub band in the proposed SRLWT method.

In the proposed approach of SRLWT a higher level sub band (e.g., the HL_4 sub band) is more significant than a lower level sub band (e.g., the HL_2 sub band). The proposed SRLWT is not considering the LL_4 sub band as a root to embed a watermark, since LL_4 is a low frequency band, which contains important information about an image.

A. Watermark insertion process of SRLWT

The present paper adopted various preprocessing steps for selecting significant sub bands of SRLWT. Preprocessing steps enhances the quality, better illumination, contrast and sharpening of image. By this confidentiality, quality, data integrity and robustness of the image are improved. In the proposed approach, the preprocessing step **mean** is applied as threshold. The preprocessing equation on mean is given in the Equation 1.

$$Mean = \text{int} \left(\frac{\sum_{i=0}^{z-1} \sum_{j=0}^{z-1} P(i,j)}{z} \right) \quad (1)$$

where $P(i,j)$ represents the gray level value at the location (i, j) of the window, z is number of pixels in the block. The watermark bit is embedded according to the ordered coefficients. In this method the watermark bit is inserted in the 6th LSB or 7th LSB if the coefficient of the pixel value is even or odd respectively. After embedding the watermark bits in the 85 coefficients as explained above, the next sub band is chosen and the same process is repeated until the entire watermark bits are embedded.

B. Watermark Extraction process of SRLWT

For extraction of the watermark the proposed method initially transform the watermarked image into four levels of DWT. Then, wavelets trees are created as explained above and rearranged them into 3072 trees. From these trees, based on the preprocessing method significant SRLWT are identified and watermark bits are extracted.

IV. EXPERIMENTAL RESULTS AND DISCUSSIONS

The performance of the proposed algorithm is evaluated with respect to watermark imperceptibility, and robustness. The proposed SRLWT is experimented with 30 standard images and few sample images Lena, Monalisa, House and Cheetah of size 512×512 are shown in Figure 1. The figure shows the original and watermarked images. The Haar wavelet transform is used in the proposed method. The watermark considered for the experiments is text watermark “Srinivasa Ramanujan Research Forum (SRRF), Godavari Institute of Engineering and Technology (GIET), Rajahmundry-533296, AP, India” is shown in Figure 1. The watermark text contains 129 characters and the size of the watermark is 129 bits. In the proposed method, the pre-processing step **mean** is applied as threshold. However any pre-processing method can be applied. The watermark bits are inserted in the selected locations by using the above method.

Original Cheetah image	Watermark Text	Watermarked Cheetah Image PSNR=38.27 dB NCC = 0.917
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Figure1: Original & Watermarked Images with PSNR & NCC values

A. SRLWT with attacks

The proposed SRLWT methods on Haar wavelets are also tested with various attacks such as JPEG compression with different ratios (90%, 80% ,70% and 60%), Gaussian noise with different ratios (10%,15%,20% and 25%), cropping with different ratios (5%, 10% ,15% and 20%),and Median filter with different size (2×2, 3×3, 4×4,5×5), to test the robustness. Table 1 shows the PSNR and NCC values with various attacks on the considered images. From the Table 1, it is clearly evident that the proposed method is having a very good PSNR for all the images even after attacks. The experimental results demonstrate that the correlation coefficient’s value is above 0.7. The NCC values of Table 1 clearly indicate the quality of the watermark image is not degraded for all the attacks. The table also indicates the robustness is not degraded for the proposed methods with attacks.

	“Srinivasa Ramanujan Research Forum (SRRF), Godavari Institute of Engineering and Technology (GIET), Rajahmundry-533296, AP, India”	
Original Lena image	Watermark Text	Watermarked Lena Image PSNR=39.54dB NCC = 0.993
	“Srinivasa Ramanujan Research Forum (SRRF), Godavari Institute of Engineering and Technology (GIET), Rajahmundry-533296, AP, India”	
Original Monalisa image	Watermark Text	Watermarked Monalisa Image PSNR=39.52 dB NCC = 0.967
	“Srinivasa Ramanujan Research Forum (SRRF), Godavari Institute of Engineering and Technology (GIET), Rajahmundry-533296, AP, India”	
Original House image	Watermark Text	Watermarked House Image PSNR=38.63 dB NCC = 0.963
	“Srinivasa Ramanujan Research Forum (SRRF), Godavari Institute of Engineering and Technology (GIET), Rajahmundry-533296, AP, India”	

Table I - PSNR and NCC results of various attacks on the test images for proposed method

Attacks		Lena		Monalisa		House		Che etah	
		PSNR	NCC	PSNR	NCC	PSNR	NCC	PSNR	NCC
Adding	10%	38.11	0.943	38.61	0.923	38.34	0.932	38.61	0.906
	15%	38.49	0.947	38.20	0.938	37.94	0.924	37.78	0.898
	20%	38.33	0.942	38.18	0.903	37.81	0.917	38.79	0.875
	25%	38.21	0.949	38.08	0.902	38.07	0.878	38.17	0.799
Compression	90%	38.86	0.958	38.66	0.924	38.83	0.909	37.94	0.904
	80%	38.73	0.957	38.59	0.928	37.76	0.974	37.64	0.892
	70%	38.32	0.946	37.65	0.914	37.36	0.823	37.64	0.878
	60%	37.69	0.908	37.12	0.867	37.12	0.819	36.97	0.814
Filtering	3-3	38.79	0.943	38.15	0.924	38.11	0.979	37.20	0.897
	3-3	37.94	0.932	38.07	0.918	37.74	0.833	37.88	0.877
	4-4	36.83	0.947	38.16	0.888	37.88	0.812	37.61	0.803
	4-4	35.64	0.940	37.66	0.884	37.82	0.861	37.11	0.889
Cropping	5%	38.89	0.959	38.82	0.931	37.96	0.881	37.78	0.882
	10%	38.28	0.944	38.20	0.922	37.82	0.836	37.32	0.828
	15%	38.82	0.946	38.19	0.910	38.96	0.819	37.11	0.808
	20%	37.69	0.902	38.08	0.899	38.07	0.914	38.81	0.862

B. Comparisons with other wavelet tree based methods

Table 2 compares the PSNR values after inserting the watermark without attacks by the proposed SRLWT method with various other existing methods on sample images(Lena, Mandrill, peppers and Barbara) [9, 10]. Table 2 clearly indicates the SRLWT outperform the other existing methods.

Table II - Comparison of the proposed SRLWT approaches with other methods

Test images	LIU Hui and HU Yu-ping method	Hui-Yu-Huang: 9/7 Wavelet Filter (DWT) Standard method	Hui-Yu-Huang: 9/7 Wavelet Filter (DWT) modified method	Prayoth Kumsawat et.al method	Proposed SRLWT method
	PSNR(dB)				
Lena	35.2	29.68	33.08	38.37	39.54
Mandrill	38.2	29.14	35.14	37.7	39.67
Peppers	36.11	33.81	34.98	38.01	39.02
Barbara	35.27	34.7	36.72	38.16	39.58

V. CONCLUSION

The present paper demonstrated a novel scheme called SRLWT which is an extension of zero wavelet trees. In the proposed scheme each watermark bit is embedded in various frequency bands and the information of the watermark bit is

spread throughout large spatial regions. While the proposed watermarking schemes achieve high perceptual quality of the watermarked image for human eyes, it possesses high performance of robustness to various malicious manipulations including median filtering, low pass filtering, image rescaling, image cropping, JPEG, and JPEG2000 compression. Even the proposed scheme is implemented to provide that the value of NCC of the extracted watermark is as high as 0.9 while the watermarked image is attacked by the JPEG compression with a quality factor as low as 40%. In addition to copyright protection, the proposed watermarking schemes can also be applied to data hiding or image authentication. The proposed approach is hierarchical and has multi-resolution characteristics. In the proposed approach, the embedded watermark is hard to detect by human visual perceptivity. The approaches match the upcoming image/video compression standards.

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Location Based Authentication: A New Approach towards Providing Security

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Abstract- Identifying communicating entities i.e. “users” is today’s need. The process of identifying these entities accurately is known as authentication. The conventional authentication mechanisms are based on three factors: knowledge, possession and biometrics. The geographical position of a user is an important attribute that can be used to authenticate a user. In this paper, we are trying to explain how location can be used as one of the credentials to give access to data only to legitimate user. This technique is relatively new approach towards information security.

Index Terms- communicating entities; credentials; legitimate users information security; location- based authentication

I. INTRODUCTION

Authentication is the process of identifying correct entities and giving access to legitimate users. Location-based authentication is a new approach towards providing higher security.

With the growth of wireless technologies in sectors like the military, aviation, etc, there is a need to determine the authenticity of a genuine user. The location-based authentication is a quite new direction in the information security. The direction gains in importance nowadays due to mobile devices coming to wireless network environment.

Authentication is one of the three main processes of AAA systems (Authentication Authorization Accounting) [2]. Generic AAA system is in Figure 1.

AAA system consists of three main factors:

- Authenticator
- Authority and
- Accounting

As shown in Figure 1, if a user wants to get access to restricted area, he has to give request to authenticator (1). However authority (2) will decide whether or not to grant access to that user. If the user is legitimate then controller (3) will establish connection between user and restricted area. Information related to user’s actions is recorded by Accounting (4).

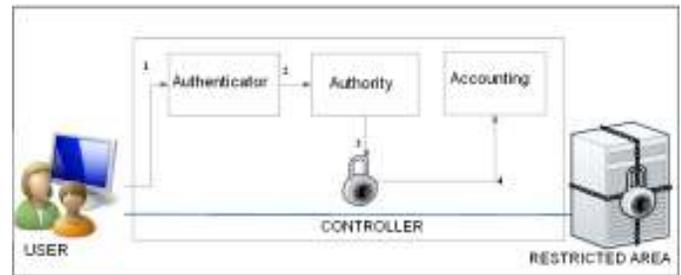


Figure 1: AAA System

The existing authentication models are most prevalent authentication models and have been used for decades. In order to authenticate a particular user, there is wide range of aspects. These aspects possess any of the following factors:

- Something you know: a password
- Something you have: a digital certificate
- Something you are: a biometric

Location Based Authentication is a technique that will take into account the geographical location of the user; which is latitude, longitude of the person who is trying to authenticate his identity. Location information is captured at that instance when he is trying to access his mail account. In this paper, we are introducing a relatively new technique which will provide a higher level of security to an application.

The user gets access to his mail account only after evaluation of following credentials:

- User id and Password
- IP address
- Biometric Data
- Location

Thus after this we can decide whether the user is legitimate or not. In this way we can provide a higher level of security to an application.

Consider the example of any social networking site or an E-Mail application; the important information about users such as username, password, personal details, etc. is stored in the database. This database is mostly placed on the server(s) which are located at a particular location(s). So, the information stored on the servers might get accessed by the providers for some reasons like security. Access to this should be granted only when the person is at the geographic position where the particular server is located. Or else the access must be denied. In other words the information should not be taken away outside that premise. In such cases, existing security controls are

insufficient to provide the level of security that this kind of growing computing system want.

The solution to this problem would be Location Based Authentication that will take into account not only the user id and password but also geographical location and biometric template; thus leading to higher level security. After successful authentication, the data that is to be sent and received would be encrypted. To achieve this Advanced Encryption Standard algorithm will be used.

II. RELATED WORK

Authentication is accepting proof of identity given by a credible person who has evidence on the said identity or on the originator and the object under assessment as his artifact respectively. Traditional authentication technique generally requires an id and password to verify the identity of user. By nature, user is looking for a password that is easy to remember and secured from any attack. However, remembering many complicated passwords, especially when user has different accounts, is not an easy task. Earlier two factor authentication technique is common in use. In the two factor authentication individual can be identified by his user name and password. If username and password is matched then process of authentication is done and user can access the data. But in this technique anyone can hack password and access information. In many cases, users' passwords are stored in plain-text form on the server machine. Anyone who can gain access to the server's database has access to enough information to impersonate any authenticable user. In cases in which users' passwords are stored in encrypted form on the server machine, plain-text passwords are still sent across a possibly-insecure network from the client to the server. Anyone with access to the intervening network may be able to "snoop" pairs out of conversations and replay them to forge authentication to the system. Each separate system must carry its own copy of each user's authentication information. As a result, users must maintain passwords on each system to which they authenticate, and so are likely to choose less-than-secure passwords for convenience. Knowledge based authentication uses secret information. When user provides some information to authenticate himself as a legitimate user, the system processes this information and suggests whether the user is legitimate or not

For more security new factor is added. Humans have specific physical attributes that are unique to specific individuals. Humans are conditioned to recognize these characteristics and use them for authentication. A user enrolls in a biometric system by providing a sample of the physical characteristic measured by the system. In biometry techniques like facial recognition, finger print analysis, retina, voice recognition is done. Biometrics consists of methods for uniquely recognizing humans based upon one or more intrinsic physical or behavioral traits. A biometric system can operate in the following two modes. In verification mode the system performs a one-to-one comparison of a captured biometric with a specific template stored in a biometric database in order to verify the individual is the person they claim to be. Three steps involved in person verification. . In the first step, reference models for all the users are generated and stored in the model database. In the second step, some samples are matched

with reference models to generate the genuine and impostor scores and calculate the threshold. Third step is the testing step. In Identification mode the system performs a one-to-many comparison against a biometric database in attempt to establish the identity of an unknown individual. To prevent identity theft, biometric data is usually encrypted when it's gathered. How biometric verification works on the back end: To convert the biometric input, a software application is used to identify specific points of data as match points. The match points in the database are processed using an algorithm that translates that information into a numeric value. The database value is compared with the biometric input the end user has entered into the scanner and authentication is either approved or denied.

The STAT II technique uses active infrastructure to provide space-time information. It uses the proprietary communication technology IQRF to determine the possible location. This technique needs a new entity of the system for position determination. A new entity in the system is an anchor point.

The anchor point is a transceiver with short signal range and with the exactly known position. The transceiver of anchor point is based on proprietary communication technology IQRF. IQMESH is a network protocol implemented on IQRF devices enabling them to communicate to each other. IQRF is a complete modular platform for wireless peer-to-peer or network connectivity.

Authentication terminal sends space-time information to server AAA in order to authenticate.

Encryption is the conversion of data into a form, called a cipher text that cannot be easily understood by unauthorized people. Decryption is the process of converting encrypted data back into its original form, so it can be understood. In order to easily recover the contents of an encrypted signal, the correct decryption key is required.

However, we can increase the reliability and security of the authentication mechanism by combining multiple authentication factors into a single model.

III. PROPOSED SYSTEM

The principal behind the system is to provide access to only those who have been identified correctly. To authenticate users, following credentials will be used:

15. Location

Location of a specific user is highly sensitive information. This can be used for efficient authentication. This can be used as one of the key attribute to authenticate a person. In this model we will be using GPS device, specifically GPS receiver for tracking the geographic position of a particular user. The task of GPS device is to track the latitude and longitude co-ordinates of a user who is trying to get authenticated. Once the location sent by the user is process by local server, he will be able to access his mail account. One user can have multiple locations depicted.

16. Biometric

A physical feature or behavior is another distinct aspect, which is exclusive to an individual being authenticated. A finely designed biometric system accepts readings from an individual and precisely carries out the authentication. A fingerprint scanner, Digital Persona is used to manage and enroll

fingerprints on notebooks/laptops running on 32-bit operating systems.

17. Encryption

The process of converting plain text to cipher text is known as encryption. In this system the data that a legitimate user will send or receive will be in encrypted form. To achieve this we will be using AES (Advanced Encryption Standard) algorithm which is advanced version of DES (Data Encryption Standard). The main advantages of AES are that its resistance against all known attacks; speed and code compactness on a wide range of platforms; design simplicity.

18. Key Generation

Key generation is the process of generating keys of cryptography. A key is used to encrypt and decrypt whatever data is being encrypted /decrypted. Symmetric-key algorithms are a class of algorithms for cryptography that use trivially related, often identical, cryptographic keys for both encryption of plain text and decryption of cipher text.

System Description:

Figure (2) shows the overall working of the system. The proposed location-based authentication can be easily applied on a Mail system. Initially, the user will connect with local server wirelessly. The Local Server then will send a Connection Request to Mail Server. An acknowledgement will be sent by Mail Server to Local Server on successful connection establishment. After this process, if the user is not registered, he will begin the (1) Register. Here, the user will provide details like username, password; will scan his fingerprint impression and select a location from the list provided as per his preference. Furthermore, he would also submit information like address, email id, contact no, etc. The Local Server will send acknowledgement signal (2) Successful, once the user has registered successfully.

Now, the next step is (3) Login. Whenever the user wants to login to his account, he will first, open the application, enter his username and password and will submit it to Local Server. These details are then given to the Mail Server. These credentials will be validated by the Mail Server and if are correct, user will be asked to scan his thumb. This all is done in step (5) Username and password Authentication. The next step is to (6) Scan Thumb. This fingerprint impression is validated locally by the Local Server and then the location of the user is traced out. This location is sent to Local Server via (7) Send Location where it is checked if the location is valid. To accomplish this task, the system will make use of GPS enabled device that is connected to user machine via which user's location will be traced out. This device provides user's space-time information i.e. latitude & longitude to Local Server. The Local Server stores all information about user such as username, password, fingerprint template, his preferred location's latitude and longitude and range of that location.

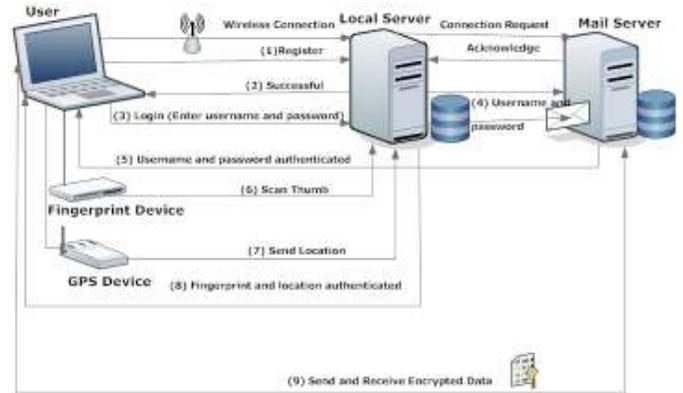


Figure 2 : System Description

The Fingerprint and location authentication is done at stage (8). After successful login, the Local server will establish connection between the User and the Mail Server, after which the user can compose mails, send mails and check inbox. All these details (such as username, password, e-mail details) of user are stored on the Server in encrypted format. Also the sending and receiving signals are encrypted by using AES algorithm.

The coverage area is specified for users. If a user goes out of that area after successful login, the access to his account will be prohibited.

The major advantage of the system is that the level of confidentiality is very high which leads to higher level of security. However, GPS Device's capacity to catch the signals appropriately is a sensitive issue.

IV. ALGORITHMS

As mentioned earlier, this scheme revolves around the idea about using location as one of the attributes to provide more security. To accomplish this task, following algorithms are being used:

1. Registration

This will focus on registering user to the system. Steps for this are as follows:

1. Enter user's personnel information
2. Enter USER ID and PASSWORD
3. Scan fingerprint
4. Select possible locations from database
5. Validate and store data

2. Log in: Go to login page

This is to provide login facility to the user. Steps are:

1. Enter USER ID and PASSWORD and validate it.
2. If success then go to step 3, else go to step 5.
3. Scan Fingerprint if match then proceed, else go to step 5.
4. Implicitly check location if valid go to step 6, else go to step 5.
5. Ask to enter again if attempts less than 3 else, go to step 7.
6. Grant access to user's account and show inbox.
7. Stop.

3. Fingerprint algorithm

When the user provides valid username and password, the next step is to ask him to scan his fingerprint and validate it. So in

order to add new Fingerprint Impression(if user is in registration phase) or to check if it is valid, following is the algorithm:

1. Create an object enroller of DPFPEnrollment by using method called createEnrollment() from getEnrollmentFactory().
2. Process the sample and create a feature set for the enrollment purpose using extractFeature (sample, DPFPDataPurpose.DATA_PURPOSE_ENROLLMENT).
3. Check quality of the sample and add to enroller if it's good.
4. Add feature set to template.
5. Check if template has been created. If yes, report success and stop capturing. If not, report failure and restart capturing.

To verify the fingerprint while logging in:

1. Create an object verifier of DPFPVerification by using createVerification() method of getVerificationFactory().
2. Collect the sample from the user.
3. Process sample and create a feature set for verification. Again use extractFeature (sample, DPFPDataPurpose.DATA_PURPOSE_VERIFICATION) for this.
4. Compare the feature set with stored template.
5. If match found, proceed to next step; location validation.
6. If no match found and no of attempts are less than 3, ask to scan fingerprint again.
7. Else deny access to the email account.

4. GPS algorithm

After successful validation of fingerprint, the location is to be tracked out with the help of GPS device, for that following are the steps:

1. Initialize GPS Device
2. Listen to a port by using GPSTDriver() function at specific port and with finite baudRate.
3. Setup GPS.
4. Retrieve available Port list and baud rate list by using two main functions getPortList() and getBaudRateList().
5. Start auto detection of GPS Driver by following steps:
 - a. Create an object OBJ of GPSTDriver.
 - b. Make use of GPSTDriver.detect() to detect GPSTDriver.
 - c. Open the GPSTDriver.
 - d. Add GPS listener to the object OBJ by using addGPSListener().
6. As soon as the GPS Driver is successfully initialized, the location of the user is to be traced out. To accomplish this task, a method called gpsEvent() is defined which has object of GPSInfo as a parameter.
 - a. Extract Latitude and Longitude of the location specified by the user.
 - b. Check the distance of the same.
 - c. If the distance of the location specified by the user is within valid range, proceed further.

- d. If invalid, deny the access to his account.
7. When the user is accessing his account, keep on tracing out his location continuously. For this isAlive () is used. This will check if user is within the coverage area. If user goes out of this stipulated area, cut down the access to his account.

V. CONCLUSION AND FUTURE WORK

Location based authentication is an additional factor in providing strong authentication as a location characteristic can never be stolen or spoofed. It has provided a supplementary dimension in network security. It gives the owner the complete control of the information that only he has access to.

The avenues for future work on this application are:

- Monitoring behavior of the user
- Implementation on a PDA
- Besides latitude and longitude fields, an altitude field can also be added.

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Proximate Composition, available Carbohydrates, Dietary Fibres and Anti-Nutritional factors in Bael (*Aegle Marmelos L.*) Leaf, Pulp and Seed Powder

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Abstract- Bael (*Aegle marmelos L.*) leaf, pulp and seed powder were analyzed chemically for proximate composition, available carbohydrates, mineral content, dietary fiber and anti-nutritional factors. The values have been calculated for 100 g of bael (*Aegle marmelos L.*) leaf, pulp and seed powder. It was found that bael leaf, pulp and seed are good source of protein, fat, minerals, crude fibre and energy. They are rich source of available carbohydrates and dietary fibre. They also contain anti-nutrient content which help in controlling blood sugar. Thus, it was concluded that this hypoglycemic medicinal plants provide various nutrients which are not provided by allopathic medicine and these plants have no side effects. So, the diabetic patients should be encouraged to include this medicinal plant in their daily diet to control blood sugar level.

Index Terms- Crude fat, crude protein, Saponin, Tannin and Phytic acid

I. INTRODUCTION

A*egle marmelos* family rutaceae is highly reputed medicinal tree commonly known as the bael. It is medium sized tree growing throughout the forest of India of altitude 1200 meter. It is found all over India, from sub-Himalayan forest, Bengal, central and south India. The different parts of this plant contain number of coumarins, alkaloids, sterols and essential oils. Various parts of this plant such as leaves, fruit and seed possess hypoglycaemic, hypolipidemic and blood pressure lowering property (Lmbole et al 2010). The peel of the fruit which is a very hard shell and green to brown in color depends on ripening stage. The appearance of yellow or orange edible pulp is like a boiled pumpkin, possesses a slightly sweet taste and a characteristic floral, terpene-like aroma, very fragrant and pleasantly flavored. Seeds are surrounded by slimy transparent mucilage (Suvimol and Pranee 2008).

Bael (*Aegle marmelos*) is an important medicinal plant of India. Biochemical compounds of bael leaves, fruits and seeds have been used in several diseases like diabetes, cardiovascular and anti-inflammatory (Maity et al 2009). The most important ingredients present in plants are alkaloids, terpenoids, sterioids, phenols glycosides and tannins (Venkatesan et al 2009). The bael leaf contain seven monoterpene hydrocarbons (90.7%), three oxygenated monoterpenes (2.9%), four sesquiterpene hydrocarbons (3.1%) and one phenolic compound (0.2%).

Limonene (82.4%) was the main constituent of bael (Kaur et al 2006). *Aegle marmelos* leaf extract (200 mg/dl for 35 days) significantly affect the activity of lipid peroxidase, lipoprotein and antioxidant enzymes in isoproterenol treated rats (Rajadurai and Prince 2005).

Leaf extract of *Aegle marmelos* (Bilva) was effective in restoring blood glucose, body weight to normal values and significantly reversed the altered (histological and ultra structural) parameters in tissues of streptozotocin induced diabetic rats seen by light and electron microscopy to near normal and improved the functional state of pancreatic beta cells. The hypoglycemic effects of this plant drug appear to be mediated through regeneration of damaged pancreas (Dahanukar et al 2000). Bael leaf enhances ability to utilize the external glucose load in the body by stimulation of glucose uptake similar to insulin. Bael extract significantly lowers blood urea, reduction in lipid peroxidation and cholesterol and increased levels of super dioxide dismutase, catalase, glutathione peroxidase and glutathione level in serum as well as in liver in experimental diabetic animals (Sharma et al 2007).

These days great attention is being given to management of diabetes with medicinal plants along with dietary restriction. Modern medicine is rooted in ethno botanical traditions using indigenous flora to treat symptoms of human diseases or to improve specific aspects of the body conditions. Today a great number of modern drugs are still derived from natural sources and 25 per cent of all prescriptions contain one or more active ingredients from plants (Thorfeldt 2005). WHO has estimated that 80 per cent of the population of developing countries still relies on traditional medicines mostly plant drugs for their primary health care needs and ensure patient safety by upgrading the skills and knowledge of traditional medicine providers (WHO 2008).

The prevalence of diabetes has dramatically increased in the latter half of the the 20th century, largely due to ready availability of large quantities of calorie rich foods and the technology driven reduction in routine daily exercise (Birnbaum 2005). Obesity and physical inactivity independently contribute to the development of type-2 diabetes. However, magnitude of risk contributed by obesity is much greater than that imparted by lack of physical activity (Rana et al 2007).

Bael leaves taken every morning reduce blood pressure due to presence of potassium which maintain dialation of blood vessels (Parichha 2004). Aegeline 2 present in leaves of *Aegle marmelos*

have antihyperglycemic activity as evidenced by lowering the blood glucose levels, decreased the plasma triglyceride, total cholesterol and free fatty acids accompanied with increase in HDL-C and HDL-C/TC ratio (Narender et al 2007). Clinically bael leaves also show antidiabetic activity (Yaheya and Ismail 2009). Bael patra is used in management of hyperglycemia where the sugar level in blood and urine reduced significantly by the end of 8th week (Shankhla et al 2009).

II. METHODOLOGY

The raw material, bael leaves and fruit were procured from Regional Research Station, Patiala. Fresh leaves were thoroughly washed to remove unwanted material and dirt. The leaves were spread under shade for drying and then dried in oven at 40°C for 4-6 hours. Dried leaves were powdered. Fresh bael fruit were thoroughly washed in clean water to remove unwanted material and dirt. The washed mature bael fruit were broken and pulp along with the seeds and fibre were scooped out. Then they were mixed properly and pulp was separated from the fibre by pulper. Bael fruit powder were prepared by drying the pulp after adding 2 g/kg sodium carbonate in the form of thin layer, this layer were cut into pieces and further dried to below 4 per cent moisture in a cabinet drier at 60 ± 5°C. The pieces were grinded into powder. Bael seeds were washed in clean water to remove dust. The seed kernel were dried in an oven at 60 – 65°C till complete drying and then ground into fine powder by 60 mesh sieve size in a cyclotic mill and were stored in air tight plastic container for

further use. Bael leaf, fruit and seed powder will be analyzed chemically for proximate composition (AOAC 1990), available carbohydrates (Yemen and Willis 1954, Somogyi 1945 and Clegg 1956), mineral content (Page et al 1982 and AOAC 2000), dietary fiber (Van Soest and Wines 1967) and anti-nutritional factors (Singh and Jambunathan 1981, Fenwick and Oakenfull 1983 and Sadasivam and Manickam 1992).

Statistical analysis: The data on proximate composition, available carbohydrates, mineral content, dietary fiber and anti-nutritional factors were analyzed statistically. The average and mean standard error was ascertained using a computer programme package (Cheema and Singh 1990).

III. RESULTS AND DISCUSSION

Bael (*Aegle marmelos* L.) leaf, pulp and seed powder had 66.5±0.46, 61.6±0.07 and 49.1±0.12 g of moisture respectively, 5.9±0.12, 4.7±0.13 and 1.9±0.14 g of crude protein respectively, 1.8±0.10, 0.5±0.06 and 13.1±0.07 g of crude fat, 14.8±0.13, 6.5±0.12 and 5.3±0.07 g of crude fiber, 9.2±0.03, 2.7±0.11 and 3.0±0.12 g of ash, 1.8±0.09, 24.1±0.08 and 27.6±0.14 g of carbohydrate and provided 47.0±0.53, 119.8±0.55 and 235.9±0.09 Kcal of energy respectively. Narendhirakannan et al (2005) reported that *Aegle marmelos* leaf powder have 10.3 g ash. According to Gupta et al (2006) bael pulp contain 61.5% moisture, 0.3% fat, 1.8% protein, 2.9% fibre with 137 Kcal calorific value (Table 1).

Table 1: Proximate composition of bael (*Aegle marmelos* L.) leaf, pulp and seed powder

	Bael Leaf (g/100g)	Bael Pulp (g/100g)	Bael Seed (g/100g)
Moisture	66.5±0.46	61.6±0.07	49.1±0.12
Crude Protein	5.9±0.12	4.7±0.13	1.9±0.14
Crude Fat	1.8±0.10	0.5±0.06	13.1±0.07
Crude Fiber	14.8±0.13	6.5±0.12	5.3±0.07
Ash	9.2±0.03	2.7±0.11	3.0±0.12
NFE	1.8±0.09	24.1±0.08	27.6±0.14
Energy (Kcal)	47.0±0.53	119.8±0.55	235.9±0.09

Bael (*Aegle marmelos* L.) leaf, pulp and seed powder had 4.3±0.12, 7.6±0.18 and 6.6±0.09 g of total sugars, 2.9±0.06, 6.2±0.09 and 0.4±0.06 g of reducing sugars, 1.4±0.09, 1.4±0.11 and 6.2±0.12 g of non-reducing sugars and 1.3±0.12, 3.6±0.14 and 3.1±0.13 g of starch respectively (Table 2).

Table 2: Available carbohydrates of bael (*Aegle marmelos* L.) leaf, pulp and seed powder

	Bael Leaf (g/100g)	Bael Pulp (g/100g)	Bael Seed (g/100g)
Total soluble sugars	4.3±0.12	7.6±0.18	6.6±0.09
Reducing sugars	2.9±0.06	6.2±0.09	0.4±0.06
Non reducing sugars	1.4±0.09	1.4±0.11	6.2±0.12
Starch	1.3±0.12	3.6±0.14	3.1±0.13

The concentrations of zinc in bael (*Aegle marmelos* L.) leaf, pulp and seed powder was 6.5±0.06, 3.0±0.09 and 6.0±0.10 mg ; chromium 19.5±0.20, 16.6±0.06 and 7.8±0.07 mg and iron 22.5±0.21, 8.0±0.24 and 16.6±0.26 mg respectively. Narendhirakannan et al (2005) reported that *Aegle marmelos* leaf powder contained 0.14 µg zinc, 2.67 µg iron and 1.73 µg of chromium (Table 3).

Table 3: Mineral content of bael (*Aegle marmelos* L.) leaf, pulp and seed powder

	Bael Leaf (mg/100g)	Bael Pulp (mg/100g)	Bael Seed (mg/100g)
Zinc	6.5±0.06	3.0±0.09	6.0±0.10
Chromium	19.5±0.20	16.6±0.06	7.8±0.07
Iron	22.5±0.09	8.0±0.12	16.6±0.11

Bael (*Aegle marmelos* L.) leaf, pulp and seed powder had 30.0±0.47, 12.0±0.28 and 12.0±0.09 g of neutral detergent fiber, 26.0±0.12, 12.0±0.28 and 4.0±0.14 g of acid detergent fiber, 4.0±0.09, 0.0 and 8.0±0.07 g of hemicellulose, 2.0±0.06, 2.0±0.03 and 6.0±0.09 g of cellulose, 24.0±0.09, 8.0±0.12 and 6.0±0.12 g of lignin and 3.4±0.29, 8.8±0.26 and 5.8±0.27 g of pectin respectively. Suvimol and Pranee (2008) reported that thai bael fruit pulps had total, soluble, and insoluble dietary fiber contents of 19.84, 11.22, and 8.62 g/100 g, respectively (Table 4).

Table 4: Dietary fiber constituents of bael (*Aegle marmelos* L.) leaf, pulp and seed powder

	Bael Leaf (g/100g)	Bael Pulp (g/100g)	Bael Seed (g/100g)
Neutral detergent fiber	30.0±0.47	12.0±0.28	12.0±0.09
Acid detergent fiber	26.0±0.12	12.0±0.28	4.0±0.14
Hemicellulose	4.0±0.09	0.00	8.0±0.07
Cellulose	2.0±0.06	2.0±0.03	6.0±0.09
Lignin	24.0±0.09	8.0±0.12	6.0±0.12
Pectin	3.4±0.29	8.8±0.26	5.8±0.27

Bael (*Aegle marmelos* L.) leaf, pulp and seed powder had 2.3±0.11, 9.0±0.17 and 1.6±0.20 g of tannin, 3.7±0.12, 1.2±0.32 and 0.6±0.12 g of saponin and 0.6±0.14, 0.4±0.19 and 1.9±0.21 g of phytic acid respectively. According to Agroforestry Database (2009) reported that bael pulp contain 9% tannin (Table 5).

Table 5: Anti-nutritional factors of bael (*Aegle marmelos* L.) leaf, pulp and seed powder

	Bael Leaf (g/100g)	Bael Pulp (g/100g)	Bael Seed (g/100g)
Tannins	2.3±0.11	9.0±0.17	1.6±0.20
Saponin	3.7±0.12	1.2±0.32	0.6±0.12
Phytic acid	0.6±0.14	0.4±0.19	1.9±0.20

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Mobile Node Replication Attack Detection in Wireless Sensor Network

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Abstract- In wireless sensor network, an attacker can capture sensor nodes and can compromise sensor nodes. Then would create duplicate nodes and built up various attacks using duplicate nodes, inserts into the network. This is happened because of unattended nature of wireless sensor network. These attacks helps attacker to control few more nodes to have control over the network. There are many node replication attack detection methods which have been used to secure from attacks in the sensor network where nodes are static. These methods are dependent on fixed location of sensors and hence do not works for sensor network where nodes are mobile. In wireless sensor network where sensor node are moving i.e. mobile, for node replication attack detection proposed system is used where attacks are detected quickly. In this method basic idea is used that mobile node never have more speed than system speed. The proposed system can detect node replication attack in effective and robust manner.

Index Terms- mobile sensor network, security, sequential analysis, mobile node attack replication

I. INTRODUCTION

The *wireless sensor network* is a collection of nodes organized into a cooperative network. Each node consists of processing capability may contain multiple types of memory, have a RF transceiver, have a power source, and accommodate various sensors and actuators. In wireless sensor network if sensor nodes are at fixed location, it called as *static wireless sensor network* and sensor nodes are *static nodes*. If sensor nodes are moving, it is called as *mobile sensor network* and sensor nodes are *mobile nodes*. Mobile nodes are small robots which are having capacity of sensing, wireless communication, and movement. Robomote is a robot that functions as a single mobile node in a mobile sensor network. It is hardware and software design. Mobile nodes are useful for application such that sensor deployment, adaptive sampling, network repair and event detection [1]. The security of mobile nodes is serious. The attacker is able to obtain and extract information of mobile node, and attacker uses this information to introduce false data, disturb network operations, and have control over network communication. In this situation attacker takes secret information from compromised node and creates greater number of attacker –controlled replica nodes which share the node’s secret information and identity. The attacker spreads these replicas over entire network. With the help of single affected node, the attacker creates many replica nodes.

The requirement for mobile node is that node has software and key information to communicate in the network. The attacker – controlled nodes have secret information that allow them to appear like authorized element or member of the network. Procedures for secure sensor network communication would allow replica nodes to create shared keys with other nodes and the base station, enabling the nodes to encrypt, decrypt, and authenticate their communications as they were the collected from captured node. The attacker can use this insider position in many ways. For example attacker can monitor network traffic as per his requirement. Also he could jam genuine signals from authorized nodes or inserts fake data to corrupt the sensors’ monitoring operation. A more destructive attacker could use common network protocols, including cluster information, localization and data aggregation, which cause continuous disruption to network operation. Through these methods attacker who is having large number of replica nodes can easily beat the main purpose of the deployed network. Hardware solution is tamper resistant which easy to implement but it is time consuming method.

For static sensor network, many different node replication attack detection schemes are used. The primary method used by these schemes is to have node creates report of location claims which identifies its position and attempt to detect conflicting reports that signal one node in multiple locations. This approach requires fixed node location. Thus main challenge is to design a scheme which detects mobile node replication attack in effective and robust manner for mobile sensor network [3][4]. In the proposed system basic concept which used is that an original mobile node is moving at speed less than the system maximum speed. If mobile node’s speed is greater than maximum speed, it is possible that at least two nodes with same identity are present in the network. The sequential analysis using probability ratio test on every mobile node using null hypothesis that mobile node has not been duplicated and an alternate hypothesis that it has duplicated nodes is performed. With the help of probability and hypothesis replicated node is detected. The proposed system detects mobile node replication attack with zero false positives and negatives. This is because the probability ratio test with sequential analysis is proven to be the best mechanism in terms of number of observations to reach a decision among all sequential and non – sequential decision processes.

II. PRELIMINARIES

In this section, problem statement, assumptions for proposed system, basic requirements of the proposed scheme are described.

1) Problem Statement:

Here, problem of detecting mobile node replication attack is tackled. If mobile node is x then its replica node is x' . Mobile node x' having secret information and identity same as mobile node x . An attacker creates replica node x' as follows: He first captures the node and extracts all secret information from it. Then he prepares new node x' , sets identity same node x and loads secret information of node x into node x' . There may be multiple captured and duplicated nodes.

Main goal is to detect node x and x' (or its multiple replicas) as separate entities with same identity and keys.

2) Network Assumptions:

Consider a two-dimensional *mobile sensor network* where sensor nodes freely travel in the entire network. Also assume that every mobile sensor node's movement is physically limited by the system's maximum speed. Also assume that all direct communication links between sensor nodes are bidirectional. It is assume that every mobile node is having capability of finding its location and also validating the locations of its neighboring nodes. It is also assume that the mobile nodes in the network communicate with a base station. The base station is static as long as the nodes have a way to communicate reliably to the base station on a regular basis.

3) Adversary Model :

It is assumed that an attacker may have full control over set of sensor nodes and enabling him to build up various kinds of attacks. For example, he can introduce false data into network and disturb control protocol. Moreover he can launch denial of service attacks by squeezing the signals from authorized nodes. Also assumed that attacker try to use as many duplicated nodes of original nodes in the network as will be effective for his attack. Also it is assumed that an original and replica node (or nodes) follows the Random Waypoint Mobility (RWM) model when they are moving in the network. Note that attacker could move his duplicated nodes in different patterns to discourage the scheme.

4) Robomote: Enabling Mobility

This is hardware design of the mobile sensor node. The robomote is designed to be compatible with the popular mote/tinys platform. The robomote (Fig. 1 and Fig. 2) consists of an Atmel 8535 microcontroller. This is an 8-bit AVR RISC MCU with 8k bytes of In-system programmable flash along with 512 bytes of EEPROM and 512 bytes of Internal SRAM. The microcontroller also incorporates various desirable features like programmable sleep modes and reprogramming capability. It has two motors, compass for heading and IR sensors. Each of these is described in further detail below. The robomote is complete with the addition of a mote. The mote is used as the master. All basic functionality of the robomote is exported to the mote via modular interfaces [1].

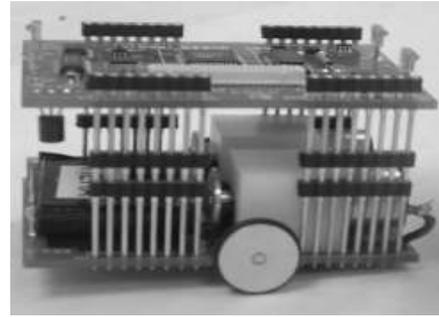


Fig 1: Robomote without the mote

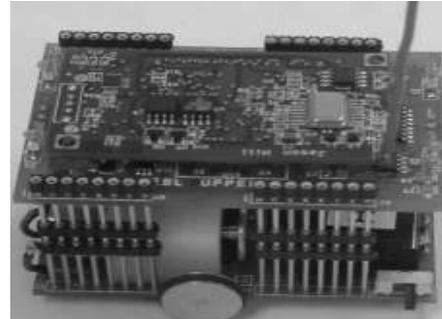


Fig 2: Robomote with the mote

The mobile sensor node in network simulator will be as follows:

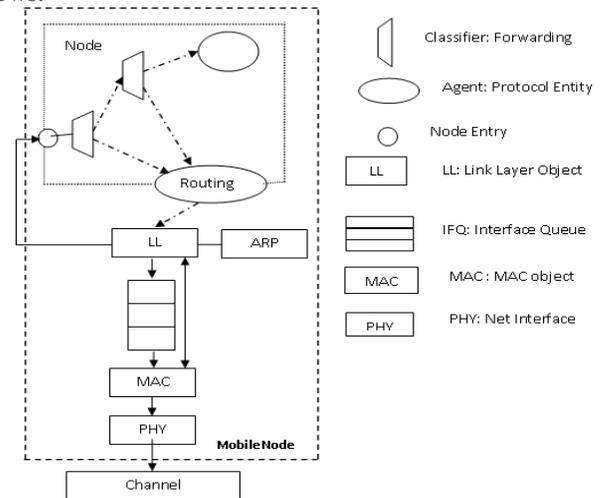


Fig 3: Mobile node in Simulator

5) Mobility Model:

Several mobility models have been used to evaluate performance of methods which are used for detection of node replication attacks in wireless sensor network. Usually the Random Waypoint Mobility (RWM) is used. The Random waypoint model is a random-based mobility model. The mobility model is designed to describe the movement pattern of mobile nodes, and how their location. Mobility models are used for simulation purposes when new network protocols are evaluated. In the Random Waypoint Mobility model, each node moves to location which chosen randomly with speed. The speed is randomly selected with the help of a predefined minimum and maximum speed. Once reached to location, node stays at location for predefined pause time. Once pause time is completed, it then

randomly chooses another and moved to that location. The process of random movement is continuous for simulation period. When the Random Waypoint Mobility model is used in simulation, it takes some time for the probability distribution of the movement of nodes to converge to a steady state distribution after the start of simulation. Furthermore, the convergence time is changed in accordance with the parameters of the mobility model and the performance of the network varies with the convergence time. Thus, it is hard to find a steady-state distribution in the RWM model.

To resolve this problem, the Random Trip Mobility (RTM) model is proposed as a generic framework for finding the steady-state distribution of any mobility model based on random movement. It is believed that the performance of the scheme will be more accurately evaluated under a mobility model with a steady-state distribution; accordingly, Random Waypoint Mobility model with steady-state distribution obtained from Random Trip Mobility model will be used. In proposed system Random Waypoint Mobility model is used with steady – state distribution provided by the Random Trip Mobility (RTM) model [5][6].

6) Localization Techniques:

There are many different methods for estimating location of a mobile node as well as validating the location of mobile node. Some of them are described as follows:

The *Verifiable Multilateration (VM)* technique enables a secure computation and verification of the positions of mobile devices in the presence of attackers. Here, by *secure position computation* we mean that base stations compute the correct position of a node in the presence of attacker, or that a node can compute its own position in the presence of an attacker; by *secure position verification* we mean that the base stations can verify the position reported by the node. *Multilateration* is a technique for determining the position of a (mobile) device from a set of reference points whose positions are known, based on the ranges measured between the reference points and the device. The position of the device in two (three) dimensions can be computed if the device measured its distance to three (four) reference points. As we already detailed in Section II, distance estimation techniques are vulnerable to attacks from internal and external attacks, which can maliciously modify the measured distances. Multilateration is equally vulnerable to the same set of attacks because it relies on distance estimations [2].

7) Identity Based Public Key Scheme:

Identity based public key encryption in which the public key can be an arbitrary string. In such a scheme there are four algorithms [7]:

- (1) setup generates global system parameters and a master-key,
- (2) extract uses the master-key to generate the private key corresponding to an arbitrary public key string $ID \in \{0, 1\}^*$
- (3) encrypt encrypts messages using the public key ID,
- (4) decrypt decrypts messages using the corresponding private key.

The public key operations can be effectively implemented for static sensor nodes. And also identity based public key operations are effective in mobile sensor devices which are powerful than static in terms of power. But power consumption for public key signature and verification is less than energy consumption of

movement. Thus public key scheme is practical for mobile sensor networks.

III. DETECTION OF MOBILE NODE REPLICATION ATTACK

1.1. Procedure for Detection:

In mobile sensor network as nodes are moving continuously in the network techniques for detecting duplicate nodes in static sensor network are not applicable. Mobility provides hint for solving problem of node replication attack detection that a mobile sensor node never move faster than the system maximum speed. Therefore, if we examine that the mobile node speed is over the maximum speed, and then at least two nodes with the same identity are present in the network. The proposed scheme is using this observation. It is based on the probability ratio test using sequential analysis, which is a statistical decision process. Probability ratio test using sequential analysis is the best mechanism. This test considers the random walk, null hypothesis and alternate hypothesis. The null hypothesis is associated with the lower limit and the alternate one is associated with the upper limit. A random walk starts from a point between two limits and moves toward the lower or upper limit in accordance with each observation. If the walk reaches or exceeds the lower or upper limit, it terminates and the null or alternate hypothesis is selected, respectively.

Probability ratio test using sequential analysis for mobile node replication attack detection problem as follows. Each time a mobile sensor node moves to a new location, each of its neighbors asks for a signed claim containing its location and time information and decides probabilistically whether to forward the received claim to the base station. The base station computes the speed from every two consecutive claims of a mobile node and performs the probability test by taking speed as an observed sample. Each time maximum speed is exceeded by the mobile node; it will expedite the random walk to hit or cross the upper limit and thus lead to the base station accepting the alternate hypothesis that the mobile node has been replicated. On the other hand, each time the maximum speed of the mobile node is not reached, it will expedite the random walk to hit or cross the lower limit and thus lead to the base station accepting the null hypothesis that mobile node has not been replicated. Once the base station decides that a mobile node has been replicated, it initiates revocation on the replica nodes. The proposed system is having two phases as:

1.1.1. Location claim generation:

A mobile sensor node x moves to a new location each time. First it finds location L_x and determines neighboring node $N(x)$. By sending neighboring node y 's current time t to node x , requests for an authenticated claim for location from node x and where node y belongs to $N(x)$. Node x checks the validity of time t when it is received by node x .

Let,

t' = claim receipt time at node x .

Δ = transmission delay of claim.

Si_x = signature generated by node x 's private key.

If

$|t' - t| > \Delta$ then, node x ignores the request.

Otherwise node x generates claim for location as

$$LC_x = \{x \parallel L_x \parallel t \parallel S_i\}$$

This claim sends to neighboring node y .

On the failure of verification of claim request or node x denies the claim request, node x should be removed from $N(y)$. Also if node x declares a location L_x such that distance between L_y and L_x is larger than signal range of y , then it will be removed from $N(y)$. Each neighbor node 'y' of node x forwards x 's claim to the base station with probability p .

1.1.2. Detection and Revocation:

Once location claim is received at base station, base station verifies the legitimacy of location claim with the public key of node x and rejects if not authentic. Genuine claims from node x are LC_x^1, LC_x^2, \dots . The base station extracts location information L_x^i and time information T_i from LC_x^i .

Consider,

$$d_i = \text{distance from } LC_x^{i-1} \text{ at time } t_{i-1} \text{ to } LC_x^i \text{ at time } t_i$$

$$v_i = \text{speed at time } t_i$$

Where $i = 1, 2, 3, \dots$.

$$v_i = (d_i / |t_i - t_{i-1}|)$$

Let S_i be the random variable that is defined as

$$S_i = \begin{cases} 0, & v_i \leq V_{\max} \\ 1, & v_i > V_{\max} \end{cases}$$

Where V_{\max} = maximum system configured speed.

The success probability p is defined as

$$\Pr(S_i = 1) = 1 - \Pr(S_i = 0) = p$$

By comparing p with a preset threshold p' , to decide whether node x is has been duplicated or not, and which can be prepared as a hypothesis testing problem with null hypothesis and alternate hypothesis. Here need to develop a suitable sampling approach in order to prevent hypothesis testing from leading to a wrong decision. Maximum possibilities of wrong decisions should be specified to tolerate for good sampling strategy. To execute this hypothesis testing problem is prepared again as one with null hypothesis and alternate hypothesis of $p < p_0$ and $p > p_1$ such that $p_0 < p_1$ respectively. In this reformulated problem, the acceptance of null hypothesis is regarded as false negative error when $p \geq p_0$ and the acceptance of the alternate hypothesis is regarded as false positive error when $p \leq p_0$. The process of making decision from these two types of errors can be prevented by defining a user – configured false positive a' and false negative b' such that false positive and false negative should not go beyond a' and b' respectively. The probability ratio test using sequential analysis is performed to make a choice about node x from n experiential samples, where a measured speed of x is treated as a sample.

Here define,

H_0 = null hypothesis = hypothesis that node x has not been replicated.

H_1 = alternate hypothesis = hypothesis that node x has been replicated.

L_n = log probability ratio on n samples.

$$L_n = \ln \left\{ \frac{P(S_1, S_2, \dots, S_n | H_1)}{P(S_1, S_2, \dots, S_n | H_0)} \right\}$$

If S_i is independent and identically distributed then L_n as follows,

$$L_n = \sum_{i=1}^n \left(\ln \frac{P(S_i | H_1)}{P(S_i | H_0)} \right)$$

Consider, Ω_n = number of times that $S_i = 1$ in the n samples

Then, $L_n = \{ \Omega_n \ln(p_1 / p_0) + (n - \Omega_n) \ln([1-p_1] / [1-p_0]) \}$

Where, $p_0 = P(S_i = 1 | H_0)$, $p_1 = P(S_i = 1 | H_1)$

On the basis of log probability ratio L_n , the probability ratio test using sequential analysis for H_0 against H_1 is as follows,

- $L_n \leq \ln \{ b' / (1 - a') \}$: choose H_0 and end the test
- $L_n \geq \ln \{ (1 - b') / a' \}$: choose H_1 and end the test
- $\ln \{ b' / (1 - a') \} < L_n < \ln \{ (1 - b') / a' \}$: continue the test with other observation.

If node x is evaluated as trusted node, the base station starts the probability ratio examination using sequential analysis with recently arrived claims from x . If, x is determined to be replicated, the base station terminates the probability ratio examination on x and invalidates all nodes with identity x from the network.

1.2. Performance Analysis

For this scheme performance is analyzed in terms of the communication, computation and storage overheads.

a) Communication overheads:

The average number of claims that are sent or forwarded by nodes in the network represents communication overheads.

Theoretically, each time a mobile node x receives c claim requests on an average at a location; it sends an average of $c \times p$ claims to the base station, where p is the probability that the claim is forwarded to the base station. Now consider the worst-case situation in which every mobile node receives c claim requests at a location and sends $c \times p$ claims to the base station at the same time. Since the average hop distance between two randomly chosen nodes is given by $O(\sqrt{N})$, where N = total number of sensor nodes. Thus communication overhead in the worst case will be $(c \times p \times N \times \sqrt{N})$. Each node's requests contain the same location information L . Actually $O(1)$ claim per location L is sufficient for base station to perform replica detection. $c \times p$ can be reduced to $O(1)$ by setting p to $k(1/c) = O(1/c)$, for some constant k . Thus the communication overhead in worst case can be now $O(N \times \sqrt{N})$.

b) Computation and Storage Overheads:

Computation overheads are defines as average number of public key signing and verification operations per node. The computation overhead in worst case can be $O(N)$. Every time a mobile node receives c claim requests on an average at a location, it needs to perform c signature generation operations. Similarly, each time a mobile node sends c claim requests on an average at a location, it needs to verify up to b signatures. In the worst case, every mobile node sends $c \times p$ claims to the base station at the same time and the base station thus needs to verify up to $c \times p \times N$ signatures. The computation overhead in worst case can be $O(N)$ as c and p are constants.

The average number of claims that needs to be stored by the node is called as storage overheads. The storage overhead can be one per claim. This is because the base station stores location claims to perform the probability ratio test using sequential analysis and the sensor nodes do not require to store its own or other nodes' claims. Thus, only need to compute the number of claims that are stored by the base station. Thus N claims are required to be stored at base station.

IV. CONCLUSION

The proposed system is centralized approach in which base station is centralized entity. The basic idea used in proposed scheme is that a mobile node never has velocity greater than the maximum velocity of system built up. Using this idea, probability ratio test with sequential analysis is performed to detect mobile node replication attack. The proposed scheme discovers node replication attack with less number of location claims. This centralized approach is efficient than deployment knowledge because deployment knowledge is not suitable for mobile sensor network, since location changes time to time in mobile wireless sensor network. The performance of the scheme is good as compared to the other approaches. The proposed scheme detects the attack faster. The proposed system can detect node replication attack in effective and robust manner.

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On Rolf Nevanlinna Prize Winners Collaboration Graph- II

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Abstract- The problem of determining the collaboration graph of co-authors of Paul Erdos is a challenging task. Here we take up this problem for the case of Rolf Nevanlinna Prize Winners. Even though the number of these prizewinners as on date is 7, the collaboration graphs has 20 vertices and 41 edges and possess several interesting properties. In this paper we have obtained this graph and determined standard graph parameters for both this graph and its complement besides probing its structural properties. Several new results were obtained.

Index Terms- Collaboration Graph, Erdos, Rolf Nevanlinna Prize Winner Domination, Global Domination, Total Domination, Connected Domination, Strong Domination, Spectrum 2000 Subject Classification: 05C07, 05C12, 05C15, 05C35, 05C38, 05C40, 05C45, 05C90

I. INTRODUCTION

In the past decade, graph theory has gone through a remarkable shift and a profound transformation. The change is in large part due to humongous amount of information that are confronted with. A main way to sort through massive data sets is to build and examine the network formed by interrelations. For example, Google's successful web search algorithms are based on the www graph, which contain all WebPages as vertices and hyper links as edges. These are sorts of information networks, such as biological networks built from biological databases and social networks formed by email, phone calls, instant messaging and various other types of physical networks. Of particular interest to mathematicians is the collaboration graph, which is based on the data from Mathematical Reviews. In the collaboration graph, every mathematician is a vertex, and two mathematicians who wrote a joint paper are connected by an edge.

The graph considered in his paper is finite, simple and undirected. For any undefined terms see [1] and [2]. For any graph G , we denote by $V(G)$ and $E(G)$ the vertex set and the edge set of G respectively. The collaboration graph G has as vertices all researchers (dead or alive) from all academic disciplines with an edge joining vertices u and v if u and v have jointly published a paper or book. The distance between two vertices u and v denoted $d(u,v)$, is the number of edges in the shortest path between u and v in case if such a path exists and ∞ otherwise. Clearly $d(u,u) = 0$. We now consider the collaboration subgraph centered at Paul Erdos (1913-1996). For a researcher v ,

the number $d(\text{Erdos},v)$ is called the Erdos number of v . That is, Paul Erdos himself has Erdos number 0, and his coauthors have Erdos number 1. People not having Erdos number 0 or 1 but who have published with some one with Erdos number 1 have Erdos number 2, and so on. Those who are not linked in this way to Paul Erdos have Erdos number ∞ . The collection of all individuals with a finite Erdos number constitutes the Erdos component of G . 511 people have Erdos number 1, and over 5000 have Erdos number 2. In the history of scholarly publishing in Mathematics, no one has ever matched Paul Erdos number of collaborators or papers (about 1500, almost 70% of which were joint works). Many important people in academic areas other than mathematics proper-as diverse as physics, chemistry, crystallography, economics, finance, biology, medicine, biophysics, genetics, metrology, astronomy, geology, aeronautical engineering, electrical engineering, computer Science, linguistics, psychology and philosophy do indeed have finite Erdos numbers. Also see [4] for more details.

Problem: For the sake of brevity we denote the Rolf Nevanlinna Prize Winners Collaboration Graph by G^* . In this paper we have indicated the method of obtaining this graph. Further we have computed for this graph several interesting parameters like domination number, total domination number, global domination number, total global domination number, k -domination number, connected domination number, strong domination number and spectrum.

1.1 About Rolf Nevanlinna Prize (RNP)



Front side view



Rear side view

The RNP is awarded once in every four years at the International Congress of Mathematicians for outstanding contribution in mathematical aspects of information science that includes: 1) computer science areas like complexity theory, logic of programming languages, analysis of algorithms, cryptography,

computer vision, pattern recognition, information processing and modeling of intelligence; computing and numerical analysis; 3) computational aspects of optimization and control theory. The RNP committee is chosen by the executive committee of the International Mathematical Union. The name of the Chair of the committee is made public, but the names of other members of the committee remain anonymous until the award of the prize at the Congress. A candidate's 40th birthday must not occur before January 1st of the year of the congress at which the Prize is awarded. If a former student (Ph.D. thesis only) of a committee member is seriously considered, such a member shall not continue to serve on the committee for its final decision.

1.2 History of the Rolf Nevanlinna Prize (RNP)

The RNP in mathematical aspects of information science was established by the Executive Committee of the International Mathematical Union (IMU) in April 1981. It was decided that the prize should consist of a gold medal and a cash prize similar to the ones associated with the Fields Medal and that one prize should be given at each International Congress of Mathematicians. One year later, in April 1982, the IMU accepted the offer by the University of Helsinki to finance the prize. The prize was named the RNP in honor of Rolf Nevanlinna (1895-1980), who had been Rector of the University of Helsinki and President of the IMU and who in the 1950s had taken the initiative to the computer organization at Finnish universities. On its obverse side, the medal represents Nevanlinna and bears the text "RNP". In addition, there is in very small characters "RH 83", RH refers to the Finnish sculptor Raimo Heino (1932-95) who designed the medal, and 83 to the year 1983 when the first medal was minted. On the reverse side, the two figures are related to the University of Helsinki. On the University's seal in the lower right, the text "Universitas Helsingiensis" is readable. The seal is from the 17th century, except for the Cross of Liberty, which was added to it in 1940. In the upper left part, the word "Helsinki" is in coded form. The name of the prizewinner is engraved on the rim of the medal.

2. Construction of G^*

G^* is constructed as follows: G^* has twenty vertices and forty one edges. $V(G^*) = \{u_1, u_2, \dots, u_{20}\}$ here $u_1 =$ Paul Erdos, $u_2 =$ Maria Margarat Klawe, $u_3 =$ Siemion Fajtlowicz, $u_4 =$ Robert Robinson, $u_5 =$ George Gunthar Lorentz, $u_6 =$ Endre Szemerédi, $u_7 =$ Laszlo Lovasz, $u_8 =$ Nathan Linial, $u_9 =$ Alon Noga, $u_{10} =$ Boris Aronov, $u_{11} =$ Andrej Ehrenfeucht, $u_{12} =$ Mark Jerrum, $u_{13} =$ Alok Aggarwal, $u_{14} =$ Robert Endre Tarjan, $u_{15} =$ Leslie Valiant, $u_{16} =$ A.A. Razborov, $u_{17} =$ Avi Wigderson, $u_{18} =$ Peter W. Shor, $u_{19} =$ Madhu Sudan, $u_{20} =$ Jon Kleinberg. Note that the chronological orders of prize winners are defined in order by u_j , $j = 14$ to 20 , $E(G^*) = \{e_1, e_2, \dots, e_{41}\}$ where $e_1 = (u_1, u_2)$, $e_2 = (u_1, u_3)$, $e_3 = (u_1, u_4)$, $e_4 = (u_1, u_5)$, $e_5 = (u_1, u_6)$, $e_6 = (u_1, u_7)$, $e_7 = (u_1, u_8)$, $e_8 = (u_1, u_9)$, $e_9 = (u_1, u_{10})$, $e_{10} = (u_2, u_8)$, $e_{11} = (u_2, u_{13})$, $e_{12} = (u_2, u_{14})$, $e_{13} = (u_2, u_{17})$, $e_{14} = (u_2, u_{18})$, $e_{15} = (u_3, u_{11})$, $e_{16} = (u_4, u_{12})$, $e_{17} = (u_5, u_{16})$, $e_{18} = (u_6, u_9)$, $e_{19} = (u_6, u_{16})$, $e_{20} = (u_6, u_{17})$, $e_{21} = (u_7, u_8)$, $e_{22} = (u_7, u_9)$,

$e_{23} = (u_7, u_{17})$, $e_{24} = (u_7, u_{18})$, $e_{25} = (u_8, u_9)$, $e_{26} = (u_8, u_{13})$, $e_{27} = (u_8, u_{17})$, $e_{28} = (u_8, u_{18})$, $e_{29} = (u_9, u_{10})$, $e_{30} = (u_9, u_{17})$, $e_{31} = (u_9, u_{19})$, $e_{32} = (u_{10}, u_{13})$, $e_{33} = (u_{11}, u_{15})$, $e_{34} = (u_{12}, u_{15})$, $e_{35} = (u_{13}, u_{17})$, $e_{36} = (u_{13}, u_{18})$, $e_{37} = (u_{13}, u_{19})$, $e_{38} = (u_{13}, u_{20})$, $e_{39} = (u_{16}, u_{17})$, $e_{40} = (u_{17}, u_{19})$, $e_{41} = (u_{19}, u_{20})$. None of the seven RNPW'S have Erdos number 1. Out of the 511 direct co-authors of Paul Erdos, with Erdos Number 1, only Nine members are connected by a path of length 1 or 2 with the RNPW'S. Out of the seven RNPW'S only five members namely $u_{14}, u_{16}, u_{17}, u_{18}, u_{19}$ have Erdos number 2, the remaining members namely u_{15}, u_{20} have Erdos number 3. G^* is shown in Figure 1.

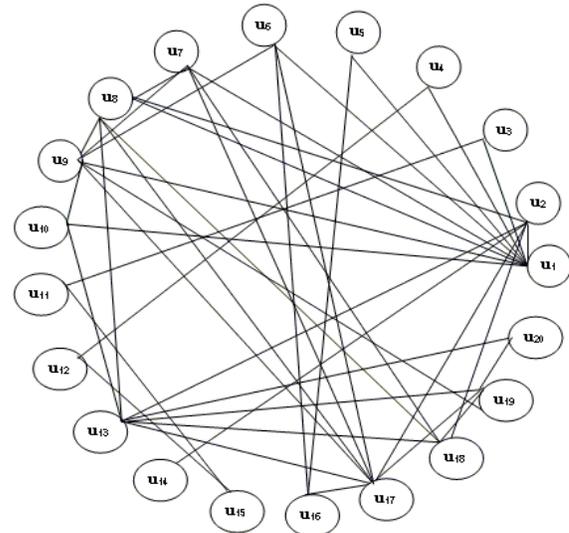
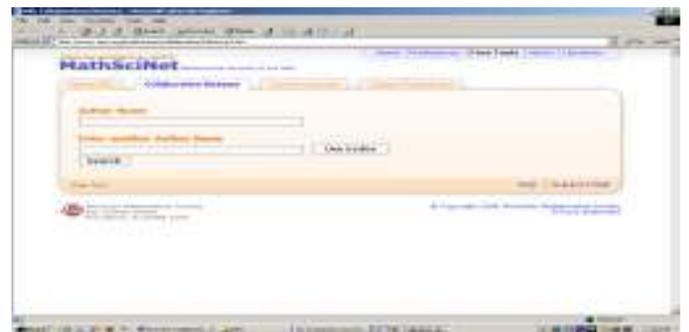


Figure 1: G^*

The method of obtaining the G^* is described as follows:
Step1: Click on the link: <http://www.ams.org/mathscinet/collaborationDistance.html>

The result of step 1 is the following screen:



Step 2: Enter the Author name and Enter another author name or click on the use Erdos icon. For example, if the author name is: Jon.M. Kleinberg and another author name are: Paul Erdos then we obtain the following screen:

$\Pr[v, S] = \{w \in V(G) : N(w) \cap S = \{v\}\}$. Note that 1) if $w \in V(G) - S$ and w is adjacent to only $v \in S$, then $w \in \Pr[v, S]$, 2) if $w \in S$ and $w \neq v$, then $w \notin \Pr[v, S]$, 3) If $w = v$ is not adjacent to any vertex of S , then $w \in \Pr[v, S]$. Haynes, Hedetniemi and Slater[3] have showed that a dominating set in a graph G is a minimal dominal set if and only if for every vertex $v \in S, \Pr[v, S] \neq \emptyset$. Now consider the set $S_1 = \{u_1, u_{13}, u_{14}, u_{15}, u_{16}\}$, a subset of $V(G^*)$. As (u_i, u_1) for $i = 2, 3, \dots, 10$; (u_i, u_{15}) , for $i = 11, 12$; (u_i, u_{13}) , for $i = 17, 18, 19, 20$ are all edges of G^* , we see that S_1 is a dominating set of G^* . We claim that S_1 is a minimal dominating set. As $N(u_9) \cap S_1 = \{u_1\}$ we see that $u_9 \in \Pr[u_1, S_1]$ and hence $\Pr[u_1, S_1] \neq \emptyset$. Further, u_j is not adjacent to any vertex of S_1 for $j = u_1, u_{13}, u_{14}, u_{15}, u_{16}$. Therefore $\Pr[u_j, S_1] \neq \emptyset$ for $j = u_1, u_{13}, u_{14}, u_{15}, u_{16}$ and S_1 is a minimal dominating set. Next we claim that G^* has no minimum dominating set. That is, we show that $S_2 = \{u_1, u_2, u_{13}, u_{15}, u_{17}\}$ is another minimal dominating set. S_2 is a dominating set, since, (u_i, u_1) for $i = 2, 3, \dots, 10$; (u_i, u_{15}) for $i = 11, 12$; (u_{14}, u_2) ; (u_{16}, u_{17}) ; (u_i, u_{13}) for $i = 18, 19, 20$ are all edges of G^* . Moreover, $u_5 \in \Pr[u_1, S_2]$; $u_{14} \in \Pr[u_2, S_2]$; $u_{20} \in \Pr[u_{13}, S_2]$; $u_{12} \in \Pr[u_{15}, S_2]$; $u_6 \in \Pr[u_{17}, S_2]$ and hence $\Pr[u_i, S_2] \neq \emptyset$ for all $i \in S_2$. Therefore, S_2 is a minimal dominating set. Hence $\gamma(G^*) = |\square|$ (or $= |S_2|$) = 5.

Note1 It is interesting to note that even though $\deg(u_{14}) < \deg(u_2)$, u_{14} can also become an element of a dominating set in general and a minimal dominating set in particular.

Theorem 2 $\gamma_T(G^*) = 6$

Proof By Theorem 1, we have seen that a dominating set of G^* should have at least five elements. Now we claim that any total dominating set of G^* must have at least six elements. To see this, let us first start with an arbitrary set $S \subseteq V(G^*)$ with indispensable elements as dictated by the structure of G^* . By Theorem 1, the compulsory elements of G^* are $\{u_1, u_{13}, u_{14}, u_{15}\}$ (or) $\{u_1, u_2, u_{13}, u_{15}\}$. Suppose $S = \{u_1, u_2, u_{13}, u_{15}\}$ then the all possible dominating sets are $S_1 = \{u_1, u_2, u_5, u_{13}, u_{15}\}$, $S_2 = \{u_1, u_2, u_6, u_{13}, u_{15}\}$, $S_3 = \{u_1, u_2, u_{13}, u_{15}, u_{16}\}$ and $S_4 = \{u_1, u_2, u_{13}, u_{15}, u_{17}\}$.

This is because $\{u_1, u_2, u_j, u_{13}, u_{15}\}$ is not a dominating set as $(u_j, u_{16}) \notin E(G^*)$ for the following different possible combinations: $j = (u_1, u_2, u_3, u_{13}, u_{15})$ (or) $(u_1, u_2, u_4, u_{13}, u_{15})$ (or) $(u_1, u_2, u_7, u_{13}, u_{15})$ (or) $(u_1, u_2, u_8, u_{13}, u_{15})$ (or) $(u_1, u_2, u_9, u_{13}, u_{15})$ (or) $(u_1, u_2, u_{10}, u_{13}, u_{15})$ (or) $(u_1, u_2, u_{11}, u_{13}, u_{15})$ (or) $(u_1, u_2, u_{12}, u_{13}, u_{15})$ (or) $(u_1, u_2, u_{18}, u_{13}, u_{15})$ (or) $(u_1, u_2, u_{19}, u_{13}, u_{15})$ (or) $(u_1, u_2, u_{20}, u_{13}, u_{15})$. Again if $S = \{u_1, u_{13}, u_{14}, u_{15}\}$ then the all possible dominating sets are $S_5 = \{u_1, u_{13}, u_{14}, u_{15}, u_5\}$, $S_6 = \{u_1, u_{13}, u_{14}, u_{15}, u_6\}$, $S_7 = \{u_1, u_{13}, u_{14}, u_{15}, u_{16}\}$ and $S_8 = \{u_1, u_{13}, u_{14}, u_{15}, u_{17}\}$ for the same reason given above. In view of this, the total number of distinct dominating sets possible for G^* is eight. It is easy to see that none of these eight dominating sets can be a total dominating set. This is because, the u_{15} is not adjacent with any of the elements of any of these eight dominating sets. Hence we infer that a total dominating set of G^* must have at least six elements.

Now by the definition of a total dominating set, we infer that every element in the total dominating set S must be adjacent with at least one element of the S . The presence of u_{15} as an indispensable element in the construction of a total dominating set reveals that the fact that the sixth element must be either u_{11} or u_{12} . Hence the all possible total dominating sets of G^* are $T_1 = \{u_1, u_2, u_{13}, u_{15}, u_5, u_{11}\}$, $T_2 = \{u_1, u_2, u_{13}, u_{15}, u_5, u_{12}\}$, $T_3 = \{u_1, u_2, u_{13}, u_{15}, u_6, u_{11}\}$, $T_4 = \{u_1, u_2, u_{13}, u_{15}, u_6, u_{12}\}$, $T_5 = \{u_1, u_2, u_{13}, u_{15}, u_{16}, u_{11}\}$, $T_6 = \{u_1, u_2, u_{13}, u_{15}, u_{16}, u_{12}\}$, $T_7 = \{u_1, u_2, u_{13}, u_{15}, u_{17}, u_{11}\}$ and $T_8 = \{u_1, u_2, u_{13}, u_{15}, u_{17}, u_{12}\}$. let G be a graph and S a subset of $V(G)$. For $v \in S$, the total private neighbourhood of v with respect to S in G , denoted $T \Pr[v, S]$ is defined as: $T \Pr[v, S] = \{w \in V(G) : N[w] \cap S = \{v\}\}$. Note that, 1) if $w \in V(G) - \{v\}$ and w is adjacent to only $v \in S$, then $w \in T \Pr[v, S]$. 2) if $w = v \in S$, then $w \notin T \Pr[v, S]$. we claim that a total dominating set S in G is a minimal total dominating set if and only if for every vertex $v \in S, T \Pr[v, S] \neq \emptyset$. Let S be a minimal total dominating set in G and $v \in S$ be any arbitrary vertex. So there exists a $w \in V(G)$ such that w is not adjacent to any vertex $S - v$. If $w = v$, then w is not adjacent to any vertex of S and in which case, S will turn out to be a non total dominating set, a contradiction. Now let $w \neq v \in V(G)$. As S

is a total dominating set and w is adjacent to only v in S , we see that $w \in TPr[v, S]$. that is, $TPr[v, S] \neq \emptyset$ for any $v \in S$. Conversely, suppose that S is a total dominating set in G for any vertex $v \in S$, $TPr[v, S] \neq \emptyset$. Let $S_1 = S - \{v\}$ and $w \in TPr[v, S]$. Then $w \neq v$ is adjacent to only v in S . Also w is not adjacent to any vertex of S_1 . That is, S_1 is not a total dominating set in G . This is true, of course, for any vertex v of S . Hence S is a minimal total dominating set in G . Clearly $S = \{u_1, u_2, u_{11}, u_{13}, u_{15}, u_{17}\}$ is a minimum total dominating set. This is because (u_i, u_1) for $i = 3, \dots, 10$; $(u_{12}, u_{15}), (u_{14}, u_2), (u_{16}, u_{17}), (u_i, u_{13})$ for $i = 18, 19, 20$; $(u_1, u_2), (u_2, u_{17}), (u_{11}, u_{15}), (u_{13}, u_{17})$ are all edges of G^* or the subgraph induced by set S has no isolates. Further note that u_4 is adjacent to only $u_1 \in S$; u_{13} is adjacent to $u_2 \in S$; u_{15} is adjacent to only $u_{11} \in S$; u_{19} is adjacent to only $u_{13} \in S$; u_{12} is adjacent to only $u_{15} \in S$; u_{16} is adjacent to only $u_{17} \in S$. This shows that $TPr[u_i, S] \neq \emptyset$ for all $u_i \in S$. For the same reason we infer that $S_1 = \{u_1, u_2, u_5, u_{11}, u_{13}, u_{15}\}$ is a minimal total dominating set in G^* . Therefore we infer that G^* has no minimum total dominating set. Hence we conclude that $\gamma_T(G^*) = |S| = 6$.

Note 2 In Theorem 1, we have seen two dominating sets. In the course of the proof of Theorem 2, we have decisively found all the dominating sets of G^* .

Note 3 We have found in the course of the proof of Theorem 2 all the minimal total dominating sets of G^* . They are $T_1 = \{u_1, u_2, u_{13}, u_{15}, u_5, u_{11}\}, T_2 = \{u_1, u_2, u_{13}, u_{15}, u_5, u_{12}\}, T_3 = \{u_1, u_2, u_{13}, u_{15}, u_6, u_{11}\}, T_4 = \{u_1, u_2, u_{13}, u_{15}, u_6, u_{12}\}, T_5 = \{u_1, u_2, u_{13}, u_{15}, u_{16}, u_{11}\}, T_6 = \{u_1, u_2, u_{13}, u_{15}, u_{16}, u_{12}\}, T_7 = \{u_1, u_2, u_{13}, u_{15}, u_{17}, u_{11}\}$ and $T_8 = \{u_1, u_2, u_{13}, u_{15}, u_{17}, u_{12}\}$.

Let us present here an algorithm to find a dominating set of any graph G

Algorithm

1. Pick a vertex $u \in V(G)$ and color it A.
2. Color all uncolored neighbours of all vertices with color A with the color B.
3. Color all uncolored neighbours of all vertices with color B with the color A.
4. If there are uncolored vertices, go to step 2.

5. Let $S_A = \{u \in V(G) : color(u) = A\}$ and $S_B = \{u \in V(G) : color(u) = B\}$. If $|S_A| > |S_B|$ then $S = S_B$; else $S = S_A$. S_A is the set of vertices with color A, S_B is the set of vertices with color B. The resulting dominating set is not necessarily minimal but $|S| \leq n/2$, where $n = V(G)$. We use the above algorithm and construct a dominating set of G^* . Pick u_1 and let $col(u_1) = A$ where $c : V(G^*) \rightarrow \{A, B\}$ is a color function. So initially $S_A = \{u_1\}$. Assign all the neighbours of u_1 with color B. As $N(u_1) = \{u_i : 2 \leq i \leq 10\}$, we get $S_B = \{u_2, u_3, u_4, u_5, u_6, u_7, u_8, u_9, u_{10}\}$. Now color all the uncolored neighbours of all the elements of S_B with the color A. Then the initial S_A gets revised to $S_A = \{u_1, u_{11}, u_{12}, u_{13}, u_{14}, u_{16}, u_{17}, u_{18}, u_{19}\}$. Now color all the uncolored neighbours of all the elements of S_A with the color B. This gives revised S_B with $S_B = \{u_2, u_3, u_4, u_5, u_6, u_7, u_8, u_9, u_{10}, u_{15}, u_{20}\}$. As $|S_B| > |S_A|$, we get $S = S_B$ and it is a dominating set. Also note that $|S_A| = 9 < 10 (= 20/2)$.

We observe that the above algorithm is not an efficient one to produce a minimal dominating set. However, for networks of enormous size, this algorithm proves useful in producing an initial dominating set, which can be pruned later into a minimal one by employing other heuristic or greedy approaches.

4. Global Domination and Total Global Domination

A dominating set S of G is a global dominating set if S is also a dominating set of G^C . The global domination number $\gamma_g(G)$ of G is the minimum cardinality of a global dominating set. A global dominating set S of G is a total global dominating set, if S is also a total dominating set of G^C . The total global domination number $\gamma_{tg}(G)$ is the minimum cardinality of a total global dominating set. Note that $\gamma(G)$ and $\gamma_g(G)$ are defined for any graph G , while $\gamma_t(G)$ is defined only for those G with $\delta(G) \geq 1$ and $\gamma_{tg}(G)$ is defined only for those G with $\delta(G) \geq 1$ and $\delta(G^C) \geq 1$.

Theorem 3 $\gamma_g(G^*) = 5$

Proof In the course of the proof of Theorem 2, we have found all the dominating sets of G^* . They are

$$S_1 = \{u_1, u_2, u_5, u_{13}, u_{15}\}, S_2 = \{u_1, u_2, u_6, u_{13}, u_{15}\}, S_3 = \{u_1, u_2, u_{13}, u_{15}, u_{16}\}, S_4 = \{u_1, u_2, u_{13}, u_{15}, u_{17}\},$$

$$S_5 = \{u_1, u_{13}, u_{14}, u_{15}, u_5\}, S_6 = \{u_1, u_{13}, u_{14}, u_{15}, u_6\},$$

$$S_7 = \{u_1, u_{13}, u_{14}, u_{15}, u_{16}\}, S_8 = \{u_1, u_{13}, u_{14}, u_{15}, u_{17}\}.$$

As $(u_{13}, u_j) \in E(G^*)^C$ for $j = 3, 4, 6, 7, 9, 11$; $(u_{14}, u_j) \in E(G^*)^C$ for $j = 8, 10, 13, 16, 17, 18, 19, 20$; we find that S_1 is a global dominating set. Moreover, we find S_j is a global dominating set for $j=1$ to 8. In view of this, we infer that there is no minimum global dominating set. Hence $\gamma_g(G^*) = 5$.

Theorem 4 $\gamma_{ig}(G^*) = 6$

Proof In the course of the proof of Theorem 2, we have found all the total dominating sets of G^* . They are $T_1 = \{u_1, u_2, u_{13}, u_{15}, u_5, u_{11}\}, T_2 = \{u_1, u_2, u_{13}, u_{15}, u_5, u_{12}\}, T_3 = \{u_1, u_2, u_{13}, u_{15}, u_6, u_{11}\}, T_4 = \{u_1, u_2, u_{13}, u_{15}, u_6, u_{12}\}, T_5 = \{u_1, u_2, u_{13}, u_{15}, u_{16}, u_{11}\}, T_6 = \{u_1, u_2, u_{13}, u_{15}, u_{16}, u_{12}\}, T_7 = \{u_1, u_2, u_{13}, u_{15}, u_{17}, u_{11}\}$ and $T_8 = \{u_1, u_2, u_{13}, u_{15}, u_{17}, u_{12}\}$. Consider the total dominating set $T_7 = \{u_1, u_2, u_{11}, u_{13}, u_{15}, u_{17}\}$ of G^* . We claim that T_7 is also a total global dominating set of G^* . As (u_1, u_i) for $i = 11, 13, 14, 17, 18$; (u_2, u_i) for $i = 3, 4, 5, 6, 7, 9, 10, 12, 15, 16, 19, 20$; (u_8, u_{11}) ; are all edges of $(G^*)^C$, the claim follows. By Theorem 2, $\gamma_t(G^*) = 6$ with T_7 as the minimum total dominating set. Moreover, we find T_j is a global total dominating set for $j=1$ to 8. In view of this, we infer that there is no minimum total global dominating set and $\gamma_{ig}(G^*) = 6$. □

Theorem 5 The global dominating set and total global dominating set of G^* are distinct with different cardinality.

Proof In [1], we proved that $diam(\overline{G^*}) = 3$. Kulli and Janakiram [5] have showed that if G and G^C both have no isolated vertices and $diam(G) \geq 5$ then a set $S \subseteq V(G)$ with $\delta(\langle S \rangle) \geq 1$ is a global dominating set if and only if S is a total global dominating set. Here both G^* and $(G^*)^C$ have no isolated vertices and $diam(G^*) = 3$. This implies that G^* has global dominating set distinct from its total global dominating set. This result was further confirmed by Theorem 3 and Theorem 4.

Theorem 6 It is not necessary that diameter of a graph should be at least 5 to have the same total dominating set and total global dominating set.

Proof Kulli and Janakiram [5] have showed that for a graph G with $diam(G) \geq 5$, a set $S \subseteq V(G)$ is a total dominating set iff S is a total global dominating set. But we have proved in Theorem.4, that $\gamma_{ig}(G^*) = 6$ and $\gamma_t(G^*) = 6$ with the same set $S = \{u_1, u_2, u_{11}, u_{13}, u_{15}, u_{17}\}$ serving as a total global dominating set and a total dominating set. Also in [1], we have proved that $diam(G^*) = 3$. Hence the result follows. □

Observation 1 Kulli and Janakiram [5] have proved: A total dominating set S of G is a total global dominating set iff for each $v \in V$ there exists a vertex $u \in S$ such that v is not adjacent to u . The graph G^* satisfies this result. This can be seen by noticing that for $u_i, i = 3, 4, 5, 6, 7, 11, 12, 15, 16$ there exists a vertex $u_2 \in S = \{u_1, u_2, u_{11}, u_{13}, u_{15}, u_{17}\}$ and for $u_i, i = 1, 2, 8, 9, 10, 13, 14, 17, 18, 19, 20$ there exists a vertex $u_{11} \in S$ such that u_i are not adjacent to u_2, u_{11} for respective i 's. Also we have established by Theorem 2 and 4 above that S is the same for both total domination and total global domination.

Observation 2 Kulli and Janakiram [5] have proved : If G is a graph such that neither itself nor its complement has an isolated vertex, then $\gamma_{ig}(G) = |V(G)|$ iff G is isomorphic to one of $P_4, mK_2, (mK_2)^C, m \geq 2$. As G^* is different from these graphs we conclude that $\gamma_{ig}(G^*) \neq |V(G^*)| = 20$. Moreover we have proved in Theorem 4 that $\gamma_{ig}(G^*) = 6$.

5. Connected Domination

Sampath Kumar and Walikar [6] defined a connected dominating set S to be a dominating set S whose induced subgraph is connected. Since a dominating set of a graph G must contain at least one vertex from each component of G , it follows that only connected graphs have connected dominating set. A connected dominating set S is said to be a minimal connected dominating set of G if and only if for any $v \in S, S - v$ is not a connected dominating set.

Theorem 7 $\gamma_c(G^*) = 7$

Proof Let S be a connected dominating set in G and $v \in S$. Then note that 1) if $w \in V(G) - S$ and w is adjacent to only $v \in S$, then $w \in Pr[v, S]$ 2) if $w \in S$ and S contains at least two vertices, then $w \notin Pr[v, S]$, 3) if $S = \{v\}$, then $v \in Pr[v, S]$.

First we claim that a connected dominating set S in G is a minimal connected dominating set if and only if at least one

of the following conditions are satisfied by every vertex $v \in S$. (i) $\Pr[v, S] \neq \emptyset$, (ii) v is a cut vertex of S . Let S be a minimal connected dominating set in G and $v \in S$. Then, $S - v$ is not a connected dominating set. So, either the subgraph induced by $S - v$ is not connected or $S - v$ is not a dominating set.

Case-1 The subgraph induced by $S - v$ is connected. In this case, v is a cut-vertex of S .

Case-2 $S - v$ is not a dominating set in G . In this case, there exists a vertex $w \in V(G) - \{S - v\}$ such that w is not adjacent to any vertex of $S - v$. That is., w is adjacent to only one vertex of S . If $w = v$, then w is not adjacent to every vertex of S and therefore the subgraph induced by S is not connected, a contradiction. So, $w \neq v$ and w is adjacent to only $v \in S$. This means $w \in \Pr[v, S]$. That is., $\Pr[v, S] \neq \emptyset$. Conversely, suppose that S is a connected dominating set in G and at least one of the following conditions are satisfied by every vertex $v \in S$, viz., (i) $\Pr[v, S] \neq \emptyset$, (ii) v is a cut vertex of S . Now two cases arise.

Case-1 v is not a cut vertex of S . Then the sub graph induced by $S - v$ is connected. That is, S contains at least two vertices. Let $w \in \Pr[v, S]$. Then $w \notin S$ and w is adjacent to only v in S . Let $S_1 = S - v$. Then S_1 is not a dominating set in G . Thus, if a vertex $v \in S$ is not a cut-vertex of S , then $S - v$ is not a connected dominating set.

Case-2 v is not a cut vertex of S and the sub graph induced by $S - v$ is not connected. In this case, $S - v$ is not a connected dominating set. To sum up, in all the above cases, we have that for any $v \in V(G)$, $S - v$ is not a connected dominating set. Hence S is a minimal connected dominating set in G .

By Theorem 1 and Theorem 2 it follows that the dominating sets of G^* are

$$S_1 = \{u_1, u_2, u_5, u_{13}, u_{15}\}, S_2 = \{u_1, u_2, u_6, u_{13}, u_{15}\},$$

$$S_3 = \{u_1, u_2, u_{13}, u_{15}, u_{16}\}, S_4 = \{u_1, u_2, u_{13}, u_{15}, u_{17}\}$$

$$S_5 = \{u_1, u_{13}, u_{14}, u_{15}, u_5\}, S_6 = \{u_1, u_{13}, u_{14}, u_{15}, u_6\},$$

$$S_7 = \{u_1, u_{13}, u_{14}, u_{15}, u_{16}\} \text{ and } S_8 = \{u_1, u_{13}, u_{14}, u_{15},$$

$$u_{17}\}.$$

First we establish a connected dominating set must contain at least 7 elements. Now as $(u_{15}, u_i) \in E(G^*)$ only for $i=11, 12$, the sixth element of S_j , $j=1$ to 8 can be either u_{11}, u_{12} . Suppose that u_{11} is the sixth element of S_j , $j=1$ to 8, We see that u_{11} and u_{15} constitutes a separate component, K_2 , in G^* and hence S_j does not induce a connected sub graph of G^* for $j=1$ to 8. For a similar reason, u_{12} also cannot be a sixth element of S_j for $j=1$ to 8. This analysis therefore reveals that a

connected dominating set of G^* must contain at least 7 elements. As a possible connected dominating set should contain 7 elements, we enumerate the number of choices for the sixth and seventh positions. Out of 15 elements, two elements can be

chosen in $\binom{15}{2}$ ways. But u_{11} or u_{12} must be an element of a

connected dominating set by virtue of the fact that u_{15} is adjacent only with u_{11} or u_{12} . In view of this the possible choices for a dominating set to be a connected dominating set are: $T_j = S_j \cup \{u_{11}\}$ or $Q_j = S_j \cup \{u_{12}\}$ for $j=1$ to 8. Next we determine the possible choices for the seventh position of both T_j and Q_j : As u_{11} and u_{15} together contributes a component K_2 , u_l cannot be the seventh element of T_j , for $l=4, 6$ to 10, 12, 14, 16 to 20. That is, we have only one choice for the seventh position, namely, the element u_3 . This implies the existence of a connected dominating set, $T_j' = T_j \cup \{u_3\}$ for $j=1, 2, 4$. For the rest of the T_j' for $j=3, 5, 6, 7, 8$, we observe that either (u_{11}, u_{15}) constitutes a separate component or we find an isolated vertex. Specifically, for T_3' either u_{16} is isolated or (u_{11}, u_{15}) a separate component; for T_m' either (u_{11}, u_{15}) is a separate component or u_{14} is an isolated vertex for $m=5$ to 8. Similarly, as u_{12} and u_{15} together constitutes a component K_2 , u_l cannot be the seventh element of Q_j , for $l=3, 6$ to 10, 12, 14, 16 to 20. That is, we have u_{14} as the only choice for the seventh position. This yields a another set of connected dominating sets, $Q_j' = Q_j \cup \{u_{14}\}$ for $j=1, 2, 4$. For the rest of the Q_j' for $j=3, 5, 6, 7, 8$, we observe that either (u_{12}, u_{15}) constitutes a separate component; for Q_m' either (u_{12}, u_{15}) is a separate component or u_{14} is an isolated vertex for $m=5$ to 8. Therefore the connected components are exactly six and they are: $T_1' = \{u_1, u_2, u_5, u_{13}, u_{15}, u_{11}, u_3\}$, $T_2' = \{u_1, u_2, u_6, u_{13}, u_{15}, u_{11}, u_3\}$, $T_4' = \{u_1, u_2, u_{13}, u_{15}, u_{17}, u_{11}, u_3\}$, $Q_1' = \{u_1, u_2, u_5, u_{13}, u_{15}, u_{12}, u_4\}$, $Q_2' = \{u_1, u_2, u_6, u_{13}, u_{15}, u_{12}, u_4\}$, $Q_4' = \{u_1, u_2, u_5, u_{13}, u_{15}, u_{17}, u_{12}, u_4\}$. Finally we determine by using the above criteria for a minimal connected dominating set, which of the T_j' and Q_j' are minimal connected dominating sets for $j=1, 2, 4$. Consider T_j' for $j=1, 2$. Here u_1, u_2, u_3, u_{11} are cut vertices and

as $u_{16} \in Pr[u_5, T_1]$, $u_{16} \in Pr[u_6, T_2]$, $u_{20} \in Pr[u_{13}, T_j]$ and $u_{12} \in Pr[u_{15}, T_j]$ we infer that T_j is a minimal connected dominating set for $j=1,2$. For T_4 , u_2, u_3 and u_{11} are cut vertices and $u_4 \in Pr[u_1, T_4]$, $u_{20} \in Pr[u_{13}, T_4]$, $u_{12} \in Pr[u_{15}, T_4]$, $u_{16} \in Pr[u_{17}, T_4]$ and hence T_4 is also a minimal connected dominating set. For Q_4 , u_2, u_4, u_{12}, u_{13} are cut vertices and as $u_5 \in Pr[u_1, Q_4]$, $u_{11} \in Pr[u_{15}, Q_4]$, $u_{16} \in Pr[u_{17}, Q_4]$ and hence Q_4 is also a minimal connected dominating sets hence it turns out that all connected dominating sets are minimal connected dominating sets. Clearly there is no minimum connected dominating set. Hence $\gamma_c(G^*) = 7$. \square

6. k-Domination

The concept of k -Domination is stronger than the concept of Domination. There are dominating sets which are not k -dominating for $k \geq 2$. Let G be a graph and k be a positive integer. A subset S of $V(G)$ is said to be a k -dominating set in the graph G if every vertex $v \in V(G) - S$ is adjacent to at least k vertices of S . A k -dominating set S in G is said to be minimal k -dominating set if for any $v \in S$, $S - v$ is not a k -dominating set. A k -dominating set in G with minimum cardinality is called a minimum k -dominating set in G . The minimum cardinality of a k -dominating set, denoted $\gamma_k(G)$ is called the k -dominating number. If S is a k -dominating set in G , $\gamma_k(G) \leq |S|$. If $k = 1$, then $\gamma_1(G) = \gamma(G)$. If S is a k -dominating set in G then it is also j -dominating set for $j < k$, and $\gamma_j(G) = \gamma_k(G)$.

Theorem 8 $\gamma_2(G^*) = 10$

Proof Let G be any graph and S a subset of $V(G)$. Let $v \in S$ and $k \geq 1$. The Private k -neighbourhood of v with respect to S , denoted $PR_k[v, S]$ is defined as: $PR_k[v, S] = \{w \in V(G) - S : w \text{ is adjacent to exactly } k \text{ vertices of } S \text{ including } v\} \cup \{v : v \text{ is adjacent to at most } k - 1 \text{ vertices of } S\}$. First we claim that a k -dominating set S in a graph G is a minimal k -dominating set if and only if $PR_k[v, S] \neq \emptyset, \forall v \in S$. Let S be a minimal k -dominating set in G . Let $v \in S$ be any arbitrary vertex. Then $S - v$ is not a k -dominating set in G . So there exists a vertex $w \in V(G) - (S - v)$ which is adjacent

to at most $(k - 1)$ vertices of $S - v$. If $w = v$ and is adjacent to at most $(k - 1)$ vertices of S . Then $v \in PR_k[v, S]$ and $PR_k[v, S] \neq \emptyset$. If $w \neq v \in V(G) - (S - v)$ then as S is k -dominating and w is adjacent to at most $(k - 1)$ vertices of $S - v$, w must be adjacent to v . This means, w is adjacent to exactly k vertices of S and so $w \in PR_k[v, S]$ and $PR_k[v, S] \neq \emptyset$. Conversely, suppose that $PR_k[v, S] \neq \emptyset$ for every $v \in S$. Let $v \in S$ be any arbitrary vertex and $w \in PR_k[v, S]$. If $w = v$ and w is adjacent to at most $(k - 1)$ vertices of S . Then w is adjacent to at most $(k - 1)$ vertices of $S - v$. That is., $S - v$ is not a k -dominating set in G . If $w \neq v$ then w is adjacent to exactly k vertices of S including v . That is., w is adjacent to exactly $(k - 1)$ vertices of $S - v$ and $S - v$ is not k -dominating set in G . This means S is a minimal k -dominating set in G .

Now let us construct a minimal 2-connected dominating set S . First we allow all vertices of degree one as the element of S for obvious reasons. Therefore $S_1 = \{u_{14}\}$. Next let us include all vertices of degree two in S . Then S_1 gets refined to $S_2 = \{u_{14}, u_3, u_4, u_5, u_{11}, u_{12}, u_{15}, u_{20}\}$. Clearly S_2 is not a 2-connected dominating set as u_6 is not adjacent to any element of S_2 . Now as u_{11} is adjacent to u_3, u_{15} and u_{12} is adjacent to u_4, u_{15} , we can conveniently drop u_{11} and u_{12} from S_2 to include other vital elements to produce a 2-connected dominating set. So S_2 gets refined to $S_3 = \{u_{14}, u_3, u_4, u_5, u_{15}, u_{20}\}$. We find that the inclusion of u_2 is mandatory, else, $Pr_2(u_{14}, S)$ will become empty by the definition of a minimal 2-connected dominating set. So S_3 gets modified into $S_4 = \{u_{14}, u_3, u_4, u_5, u_{15}, u_{20}, u_2\}$. Now as u_6 to u_{10} and u_{21} are adjacent to u_1 , the inclusion of u_1 will ensure at least one vertex of adjacency to these vertices in the proposed minimal 2-connected dominating set. So S_4 gets refined to $S_5 = \{u_1, u_2, u_3, u_4, u_5, u_{14}, u_{15}, u_{20}\}$. Similarly as u_{17} is adjacent to u_6 to u_9, u_{13}, u_{16} and u_{19} . For the same reason as above, we allow u_{17} into our proposed set. Hence S_5 gets modified into $S_6 = \{u_1, u_2, u_3, u_4, u_5, u_{14}, u_{15}, u_{17}, u_{20}\}$. But S_6 is still not a 2-connected dominating set. This is because, u_{10} is adjacent to only one vertex in S_6 . Again as u_{13} is adjacent to u_{10}, u_{18} and u_{20} , we allow u_{13} into the proposed set. So S_6 gets modified into $S = \{u_1, u_2, u_3, u_4, u_5, u_{13},$

$u_{14}, u_{15}, u_{17}, u_{20}$ }. Now as u_6 to u_9 are adjacent to u_1 and u_{17}, u_{10} is adjacent to u_1 and u_{13} , u_{11} is adjacent to u_3 and u_{15} , u_{12} is adjacent to u_4 and u_{15}, u_{16} is adjacent to u_5 and u_{17}, u_{18} is adjacent to u_2 and u_{13}, u_{19} is adjacent to u_{13} and u_{17} we see that S is a 2-connected dominating set.

Moreover we find that $u_{10} \in Pr_2[u_1, S]$, $u_{18} \in Pr_2[u_2, S]$, $u_{11} \in Pr_2[u_3, S]$, $u_{12} \in Pr_2[u_4, S]$, $u_{16} \in Pr_2[u_5, S]$, $u_{10} \in Pr_2[u_{13}, S]$, $u_{11} \in Pr_2[u_{15}, S]$, $u_7 \in Pr_2[u_{17}, S]$ we see that $Pr_2[u_j, S] \neq \emptyset$ for all $j=1$ to $5, 13$ to $15, 17, 20$. Hence we deduce that S is a minimal 2-connected dominating set.

Interestingly we find another minimal 2-connected dominating set S' by just adding u_{16} to S and dropping u_5 from S. That is $S' = \{u_1, u_2, u_3, u_4, u_{13}, u_{14}, u_{15}, u_{16}, u_{17}, u_{20}\}$ is a minimal 2-connected dominating set as $u_5 \in Pr_2[u_{16}, S']$. In view of this we conclude that there exists no minimum or a unique 2-connected dominating set with twelve elements. Hence $\gamma_2(G^*) = 10$.

Note 4: It is easy to see from the structure of G^* that there exists no k -dominating set for $k \geq 3$ as there are a number of vertices (7 to be exact) with maximum degree equal to 2.

Note 5: In [9] we have found the vertex independence number β_o of $G^*. \beta_o = 9$ and $I = \{u_2, u_3, u_4, u_5, u_6, u_7, u_{10}, u_{15}, u_{19}\}$ is an independent set. It is interesting to observe that an independent set need not be a 2-dominating set. That is., I is not 2-dominating as u_{14} is adjacent to only u_2 and out of the two adjacent elements u_{13}, u_{19} of u_{20} in G^* only $u_{19} \in I$.

7. Strong domination

For a graph $G = (V, E)$, a set $S \subseteq V$ is a strong dominating set if every vertex $v \in V - S$ has a neighbour u in S such that the degree of u is not smaller than the degree of v . The minimum cardinality of a strong dominating set of G is the strong domination number, $\gamma_{strong}(G)$.

Theorem 9 $\gamma_{strong}(G^*) = 5$

Proof We know from Theorem 1,2 that a dominating set of G^* must have at least five elements and the possible dominating sets are

$$S_1 = \{u_1, u_2, u_5, u_{13}, u_{15}\},$$

$$S_2 = \{u_1, u_2, u_6, u_{13}, u_{15}\}, \quad S_3 = \{u_1, u_2, u_{13}, u_{15}, u_{16}\},$$

$$S_4 = \{u_1, u_2, u_{13}, u_{15}, u_{17}\}, \quad S_5 = \{u_1, u_{13}, u_{14}, u_{15}, u_5\},$$

$$S_6 = \{u_1, u_{13}, u_{14}, u_{15}, u_6\}, \quad S_7 = \{u_1, u_{13}, u_{14}, u_{15}, u_{16}\},$$

$S_8 = \{u_1, u_{13}, u_{14}, u_{15}, u_{17}\}$. Let us now determine how many of these are strong dominating sets. It turns out that S_4 and S_8 are strong dominating sets. This is because, for $S_4: u_j$ is adjacent to u_1 for $j = 3$ to 10 with $\deg(u_1) > \deg(u_j)$; u_j is adjacent to u_{15} for $j=11, 12$; with $\deg(u_{15}) > \deg(u_j)$; u_4 is adjacent to u_2 with $\deg(u_2) > \deg(u_{14})$; u_{16} is adjacent to u_{17} with $\deg(u_{17}) > \deg(u_{16})$; u_j is adjacent to u_{13} for $j=18$ to 20 with $\deg(u_{13}) > \deg(u_j)$; u_j is adjacent to u_{15} for $j=11, 12$ with $\deg(u_{15}) \geq \deg(u_j)$; u_{16} is adjacent to u_{17} with $\deg(u_{17}) > \deg(u_{16})$; u_j is adjacent to u_{13} for $j=18$ to 20 with $\deg(u_{13}) \geq \deg(u_j)$. For S_8 , the same reason exactly as in S_4 holds good expect for one minor difference: instead of u_j is adjacent to u_1 for $j=3$ to 10 with $\deg(u_1) > \deg(u_j)$ read u_j is adjacent to u_1 for $j=2$ to 10 with $\deg(u_1) > \deg(u_j)$. Now S_j is not a strong dominating set for $j=1, 2, 3, 5, 6, 7$ because, the degree of u_{17} an element of S_j has degree more than all the elements of S_j . Further as there exists more than one strong dominating set, we conclude that G^* has no minimum strong dominating set. Hence $\gamma_{strong}(G^*) = 5$.

Note 6 Harinarayanan et.al[3] have proved the following: Let G be a graph of order n and size m . Let the strong domination number of G be t . Then every t -subset of $V(G)$ is strong dominating iff G is either K_n or K_n^c or $\left(\left(\frac{n}{2}\right)K_2\right)^c$. As our

G^* is different from K_{20} or K_{20}^c or $(10K_2)^c$, it is easy to see from the above that, not every 5-element subset of $V(G^*)$ is strong dominating. For instance, $\{u_1, u_2, u_5, u_{13}, u_{15}\}, \{u_1, u_2, u_6, u_{13}, u_{15}\}, \{u_1, u_2, u_5, u_{13}, u_{15}\}$ are some 5-element subsets of G^* that are not strong dominating sets (even though they are dominating).

8. Spectrum of G^*

The eigenvalues of a matrix A are the numbers λ such that $Ax = \lambda x$ has a nonzero solution vector; each such solution is an eigen vector associated with λ . The eigenvalues of a graph are the eigenvalues of its adjacency matrix A. There are the roots $\lambda_1, \dots, \lambda_n$ of the characteristic polynomial $\phi(G : \lambda) = \det(\lambda I - A) = \prod_{i=1}^n (\lambda - \lambda_i)$. The spectrum is the

list of distinct eigenvalues with their

multiplicities m_1, \dots, m_r ; write $\text{Spec}(G) = \left(\begin{matrix} \lambda_1, \dots, \lambda_r \\ m_1, \dots, m_r \end{matrix} \right)$.

It would be interesting to compute the spectrum of G^* . We made use of the computer software Sage notebook and found that the characteristic polynomial of G^* is:

$$\phi(G^* : x) = x^{20} - 41x^{18} - 46x^{17} + 511x^{16} + 792x^{15} - 2875x^{14} - 5278x^{13} + 8158x^{12} + 17584x^{11} - 11467x^{10} - 31520x^9 + 6132x^8 + 30372x^7 + 1743x^6 - 14644x^5 - 2734x^4 + 2916x^3 + 588x^2 - 176x - 16$$

Now solving $\phi(G^* : x) = 0$ we get the eigenvalues $\lambda_i, i = 1, \dots, 20$ as follows:

- 1)1 2)-1 3)-3.30889 4)-2.59562
- 5)-2.16512
- 6)-1.721867)-1.654668) -1.30711 9)-0.98670
- 10)-0.69808
- 11)-0.49168 12)-0.07864 13)0.25157

Observe that only two out of 20 are integers and the others are numbers with non-terminating decimal digits (given here as corrected to 5 decimal digits). Out of these 20 eigenvalues, 7 are positive and 7 are negative. As all the eigenvalues are distinct, the minimal polynomial of the adjacency matrix A of G^* is

$$\psi(A) = \prod_{i=1}^{20} (\lambda - \lambda_i), \text{ where } \{\lambda_1, \dots, \lambda_{20}\} \text{ are the distinct eigenvalues of } A.$$

Note that the adjacency matrix A of G^* given below is symmetric and hence they have real eigenvalues by spectral theorem and 20 orthonormal eigenvectors as given below.

- Corresponding to 1: (0, 0, 1, -1, 0, 0, 0, 0, 0, 0, 1, -1, 0, 0, 0, 0, 0, 0, 0, 0);
- Corresponding to -1 : (0, 0, 1, -1, 0, 0, 0, 0, 0, 0, -1, 1, 0, 0, 0, 0, 0, 0, 0, 0);
- Corresponding to -3.30889 : (1, -0.59718, -0.34024, -0.34024, -0.33251, -0.55915, -0.53435, -0.36986, 0.18998, -0.42533, 0.12580, 0.12581, 0.21739, 0.18048, -0.07604, 0.10025, 0.55994, 0.38805, -0.29987, 0.02495);
- Corresponding to -2.59562 : (1, -15.74683, -0.48835, -0.48835, 7.18851, 6.98239, -17.98015, 22.08629, -36.32039, 32.17126, 0.26758, 0.26758, -48.18393, 6.06670, -0.20618, -19.65862, 36.85539, 23.04830, 13.15869, 13.49398);
- Corresponding to -2.16512 : (1, -0.14376, -0.73553, -0.73553, -0.76080, 0.30007, 0.56919, 0.58883, -1.35634, 0.10875, 0.59251, 0.59251, 0.12088, 0.06640, -0.54733, 0.64721, -0.94056, -0.52428, 1.31035, -0.66104);
- Corresponding to -1.72186: (1, -74.79231, 15.91217, 15.91217, 24.47158, 39.80277, 10.51548, 21.23822, -36.39862, -18.38331, -28.39846, -28.39846, 67.05203, 43.43704, 32.98588, -43.13652, 10.00051, -13.94624, -1.500499, -38.07029);
- Corresponding to -1.65466: (1, -0.38617, 1.70155, 1.70155, -3.20688, -2.28203, -1.23140, 1.68897, 0.10626, 0.25348, -3.81550, -3.81550, -1.52569,

- 0.23338, 4.61181, 4.30631, -1.63658, 0.87890, 2.03174, -0.30583);
- Corresponding to -1.30711: (1, 1.32671, -0.17266, -0.17266, -0.13435, 0.03594, 1.62533, -2.71663, -1.39857, 0.29976, -0.77432, -0.77432, 0.00675, -1.01500, 1.18478, -0.82439, 1.17598, -0.18528, 0.40771, -0.31708);
- Corresponding to -0.98670: (1, -2.72873, -0.51334, -0.51334, -8.67837, -8.12056, 12.82638, 10.35370, -9.88692, 6.27449, -0.49348, -0.49348, 2.69585, 2.76551, 14.00206, 5.6298, 9.35150, 4.22864, 1.92138, 1.91507, 17)1.61947822);
- Corresponding to -0.69808: (1, 1.10210, -0.86239, -0.86239, 0.46764, 0.73902, -1.55588, 1.48011, 0.09124, -1.29752, -0.39798, -0.39798, -0.18547, -1.57876, 1.14022, -1.32645, -0.28069, -1.20453, -0.14873, 0.47875);
- Corresponding to -0.49168: (1, -0.93030, -1.29648, -1.29648, -2.04419, 6.0183, 1.44346, -1.78841, 0.01246, -0.61002, -0.36255, -0.36255, -0.71252, 1.89211, 1.47473, 0.00508, -3.97661, 4.04284, -2.09284, 5.70568);
- Corresponding to -0.07865: (1, -1.14661, -8.46777, -8.46776, 15.65384, -11.124608, 8.97250, -0.22027, 6.45984, -1.73780, -0.33402, -0.33402, -7.32316, 14.57885, 8.49404, -2.23115, -4.35375, -3.59149, 6.95587, 4.67001);
- Corresponding to 0.25157 : (1, 0.24555, 2.62147, 2.62147, -0.63595, -0.27389, 1.25620, 0.04835, -0.52694, -5.10469, -0.34051, -0.34051, -1.75724, 0.97605, -2.70714, -1.15999, 0.61802, -0.82342, 2.32344, 2.25067);
- Corresponding to 0.51006: (1, -13.43408, 1.24500, 1.24499, 19.42510, -9.19602, 10.29204, 4.92133, -8.91280, -5.07549, -0.36498, -0.36498, 5.32402, -26.33846, -1.43116, 8.90788, -5.68556, 13.92654, -0.80232, 8.86512);
- Corresponding to 1.07442: (1, 0.78285, 0.42644, 0.42644, 1.30307, -0.11604, -1.34670, -0.58757, -0.76750, 0.95344, -0.54182, -0.54182, 0.79190, 0.72863, -1.00859, 0.40004, -0.75721, -0.33463, 0.02948, 0.76448);
- Corresponding to 1.32138: (1, -1.47321, 0.15327, 0.15327, -1.19917, -0.88567, 0.70072, 0.06045, 1.74457, 2.06714, -0.79747, -0.79747, -0.01311, -1.11490, -1.20703, -2.58455, -1.33033, -0.54878, 0.69293, 0.51448);
- Corresponding to 1.69002:

(1,2.45644, -3.52210, -3.52210, 1.07705,0.64529, 3.91898, 3.22667,-0.39357, -2.19663,-6.95242,-6.95242, -4.31879, 1.4535,-8.22762, 0.82023, -0.33612,3.12618, -6.92331, -6.65205);

Corresponding to 2.00038:

(1, 1.39966, 0.99906,0.99906, -0.32998, -1.55880, 0.50743,0.99358, -1.02610, 0.01645, 0.99850,0.99850, 0.05900, 0.69970, 0.99831,-1.66008, -1.43200, 1.47956, -1.57924,-0.75998);

Corresponding to 2.47911: (1, -0.48386,0.53159, 0.53159, 0.58748, 0.70959,0.17957, -0.24155, 0.46828, 0.19644,0.31786, 0.31786, -0.98128, 0.19518,0.25643, 0.45642, -0.16555, -0.61599,-0.51758, -0.60460);

Corresponding to 5.68144:

(1,0.88363, 0.18202, 0.18202, 0.23751, 0.61837, 0.87713,1.14651, 1.03482, 0.51941, 0.03416, 0.03416, 0.91619,0.15553, 0.01202, 0.34938, 1.12908, 0.67297, 0.58875,0.26489)

Let $w_i, i = 1$ to 20 denote these eigenvectors. Using this, we can write $x^T Ax = x^T S \wedge S^T x$, where \wedge is the diagonal matrix of eigenvalues $\lambda_1 \geq \dots \geq \lambda_{20}$ and S

has columns $\omega_1, \dots, \omega_{20}$. If S has 7 positive and 7 negative eigenvalues, $x^T Ax$ becomes,

$$x^T Ax = \sum_{i=1}^7 (y^i \cdot x)^2 - \sum_{i=14}^{20} (z^i \cdot x)^2, \text{ where } y^i \text{ or } z^i \text{ is } |\lambda_i|^{\left(\frac{1}{2}\right)} \omega_i.$$

Proposition10 The diameter of G^* is less than the number of distinct eigenvalues of G^* .

Proof In [1], we have already computed the diameter of G^* as $diam(G^*) = 3$. As the number of distinct eigenvalues of G^* are 20, the result follows. \square

As Spectral Theorem guarantees real eigenvalues, arrange the eigenvalues of G^* in the descending order as $\lambda_1 \geq \lambda_2 \geq \dots \geq \lambda_{20}$.

Proposition11 If G' is an induced subgraph of G^* then $\lambda_{\min}(G^*) = \lambda_{20} \leq \lambda_{\min}(G') \leq \lambda_{\max}(G') \leq \lambda_{\max}(G^*) = \lambda_1$.

Observation 3 Wilf[8] have proved that for any graph $G, \chi(G) = 1 + \lambda_{\max}(G)$. In [1] we have computed the chromatic number of G^* as 4. As $\lambda_{\max}(G^*) = 5.681$, the inequality is very well intact.

Observation 4 We notice that for G^* the number of bicliques needed to decompose G^* is at least 7, which is equal to the maximum of the number of positive and number of negative eigenvalues of the adjacency matrix $A(G^*)$. For instance,

$$41 = |E(G^*)| > |E(G_1)| + |E(G_2)| + |E(G_3)| + |E(G_4)| + |E(G_5)| + |E(G_6)| + |E(G_7)| + |E(G_8)|$$

where $G_i \cong K_{1,2}$ if $i = 1$ to 4; $G_i \cong K_{1,3}$ if $i = 5, 6$;

$G_7 \cong K_{1,4}$; $G_8 \cong K_{1,7}$ where G_i 's $i = 1, 2, \dots, 8$ are shown

below. The vertex set of these G_i 's are given below. In all the graphs, the first vertex denotes the central vertex and the others are pendent vertices, connected to the central vertex and thereby forming stars

$$K_{1,3}, K_{1,3}, K_{1,3}, K_{1,3}, K_{1,4}, K_{1,4}, K_{1,5}, K_{1,8} \text{ respectively in order. } V(G_1) = \{u_8, u_1, u_{18}\}; V(G_2) = \{u_{15}, u_{11}, u_{12}\}; V(G_3) = \{u_{16}, u_5, u_6\}; V(G_4) = \{u_2, u_{13}, u_{14}\}; V(G_5) = \{u_{13}, u_8, u_{10}, u_{20}\}; V(G_6) = \{u_{18}, u_2, u_{17}, u_{19}\}; V(G_7) = \{u_{17}, u_2, u_6, u_7, u_{16}\}; V(G_8) = \{u_1, u_2, u_3, u_4, u_5, u_6, u_7, u_{10}\}$$

Observation 5 Notice that $\Delta(G^*) = 9$ and G^* has only one vertex namely u_1 with $\deg(u_1) = 9$. Hence there is no 9-regular subcomponent in G^* . This means the eigenvalue of G^* with largest absolute value namely $\lambda = 5.681$ is less than $\Delta(G^*) = 9$, a fact which is in support of the truth that: The necessary and sufficient condition for the eigenvalue of a graph G with largest absolute value is $\Delta(G)$ is that it should have some $\Delta(G)$ -regular subcomponent.

Appendix

Rolf Nevanlinna Prize Winners

Name	Photo	Year	Country of Origin	Erdos Number	Affiliation
ROBERT ENDRE TARJAN		1982	USA	2	Dept of Computer Science, Princeton University, 35, Olden Street, Room 324, Princeton, NJ 08544-2087
LESLIE G. VALIANT		1986	UK	3	Dept of Computer Science and Applied Mathematics, Harvard University; School of Engg. & Applied Science, 351, Maxwell Dworkin, 33, Oxford street, Cambridge, MA 02138
A.A. RAZBOROV		1990	Russia	2	Dept of Computer Science, Eotvos University, H-1088, Budapest Hungary, Dept of Computer Science, Princeton University, NJ 08544, USA
AVI WIGDERSON		1994	Israel	2	School of Mathematics, Institute for Advanced Study, Princeton
PETER W. SHOR		1998	USA	2	AT&T Labs Florham Park, New Jersey, USA
MADHU SUDAN		2002	INDIA	2	Massachusetts Institute of Technology, USA.
JON M. KLEINBERG		2006	USA	3	Dept of Computer Science, Cornell University, Ithaca, NY 14853

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Simulation of Single Phase Transformer with Different Supplies

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Abstract-Transformer is a static device which transfers electrical energy from one circuit to another without change in frequency. Most of the cases we see that the inputs given are sinusoidal wave only. In this paper the simulation of single phase transformer with different supplies such as continuous and discontinuous are carried out. This study is also shown graphically. MATLAB/SIMULINK environment was used for simulation.

Index Terms: Transformer, continuous supply, discontinuous Supply

I. INTRODUCTION

Transformer is a electromagnetic energy conversion device that transfers energy from one electrical circuit to another electrical circuit through the medium of magnetic field and without a change in the frequency. The electric circuit which receives energy from the supply mains is called primary winding and the other circuit which delivers electric energy to the load is called the secondary winding. [1]

In a transformer, the electric energy transfer from one circuit to another circuit takes place without the use of moving parts- it has, therefore, the possible efficiency out of all the electrical machines and requires almost negligible amount of maintenance and supervision [2].

II. MODELING OF TRANSFORMER

The ideal transformer shows the transformation of voltage and current between primary and secondary winding. The transformer magnetization curve is assumed to be linear [3]. Ideal transformer circuit diagram is shown in fig (1).

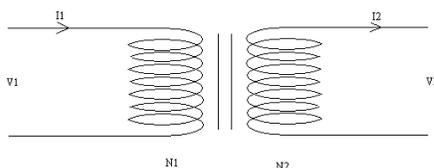


Figure 1: Ideal transformer circuit diagram

The voltage developed by transformer action is given by

$$E = 4.44 \times f \times N \times B_{max} \times A \quad \text{-----(1)}$$

For a transformer to be an ideal one, the various assumptions are as follows [4]:

1. Winding resistances are negligible.
2. All the flux set up by the primary links the secondary windings, i.e. all the flux confined to the magnetic core.
3. The core losses (hysteresis and eddy current losses) are negligible.
4. The core has constant permeability, i.e. the magnetization curve for the core is linear.

Equivalent Circuit of Transformer

The equivalent circuit is simply a circuit representation of the equation describing the performance of the device. If any electrical device is to be analyzed and investigated further for suitable modification, its appropriate equivalent circuit is necessary. [5]

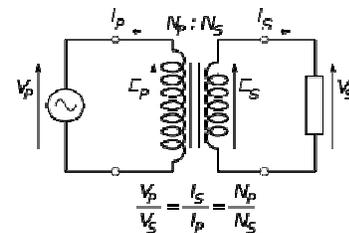


Figure 2: Equivalent circuit diagram of Transformer

$$R_c = \frac{V_1}{I_c} \quad \text{-----(2)}$$

$$X_m = \frac{V_1}{I_m} \quad \text{-----(3)}$$

$$P_c = I_c \times 2 \times R_c = \frac{(V_1)^2 \times 2}{R_c} \quad \text{-----(4)}$$

III. METHODOLOGY

The structure of the circuit equivalent of a transformer is developed. The performance parameters of interest can be

obtained by solving that circuit for any load conditions. The equivalent circuit parameters are available to the designer of the transformers from the various expressions that a designer uses for designing the transformers. But for a user these are not available most of the times. In order to get the equivalent circuit parameters various test are conducted on transformer [6]. The various parameters of a transformer can be easily determined by two tests:

I. Open-circuit test

II. Short circuit test

In this paper different type of supplies are given to the transformer namely:

A. Continuous supply: -

Continuous supply can be defined as the supply where the current and the inductive energy storage never reaches zero. The various types of continuous supply are like:-Saw tooth, square, sinusoidal, triangular wave etc. [7]

1. Sinusoidal Waveform: The sine wave or sinusoid wave is a mathematical function that describes a smooth repetitive oscillation. It occurs often in pure mathematics, well as physics, signal processing, electrical engineering and many other fields.[9]

$$f(x) = \frac{I_m}{\pi} + \sum_{n=1}^{\infty} \left(\frac{2I_m}{n(1-n^2)} \cos \frac{n\pi x}{L} \right) \quad \text{----- (5)}$$

The above equation is valid for only $n=2, 4, 6, \dots$ and at $n=1, 3, 5, \dots$ $a_n=0$.

2. Square Waveform: A square wave is a kind of non-sinusoidal waveform, most typically encountered in electronics and signal processing. An ideal square wave alternates regularly and instantaneously between two levels.[9]

$$f(x) = \sum_{n=1}^{\infty} \left(\frac{4V}{n\pi} \sin \frac{n\pi x}{L} \right) \quad \text{----- (6)}$$

The above equation is valid for only $n=1, 3, 5, \dots$ and at $n=2, 4, 6, \dots$ $a_n=0$.

B. Discontinuous supply:

Discontinuous supply can be defined as the supply when the current and inductive energy storage may reach or cross zero. The various types of discontinuous supply are like: half sinusoidal wave, square pulse etc. [10]

1. Square Pulse: A pulse wave or pulse train is a kind of non-sinusoidal waveform that is similar to a square wave, but does not have the symmetrical shape associated with a perfect square wave.[8]

III. CASE STUDY AND RESULTS

CASE I:

When the Single Phase Transformer was simulated with Continuous Supply with 230volts sinusoidal voltage waveform applied as input to the transformer then the output voltage waveform is same as input voltage waveform having a voltage magnitude of 229 volts. Similarly when 230volts square voltage waveform is applied as input to the transformer then the output voltage waveform is same as input voltage waveform having a voltage magnitude of 230volts as shown in Figure 3. These results are noticed to be as same as open circuit results.

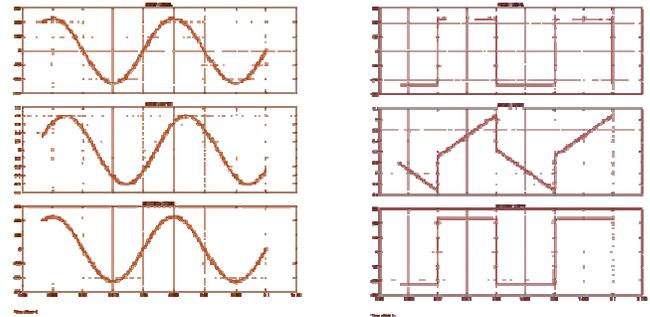


Figure3: Wave Forms for (a) input voltage (b) input current (c) output voltage with Sinusoidal and Square

Open Circuit Test

Table I: Simulation Results for Open Circuit with Continuous Sinusoidal and Square wave

S. no	Input Waveform	Primary Current (A)	Primary Voltage(V)	Secondary Voltage(V)
1.	Sine wave	0.40	230	229
2.	Square wave	0.08	230	230

Sinusoidal wave:

During open circuit test when sinusoidal voltage waveform is applied to the transformer then the output voltage waveform is same as input voltage waveform having a voltage magnitude of 229volts as shown in Figure 4.

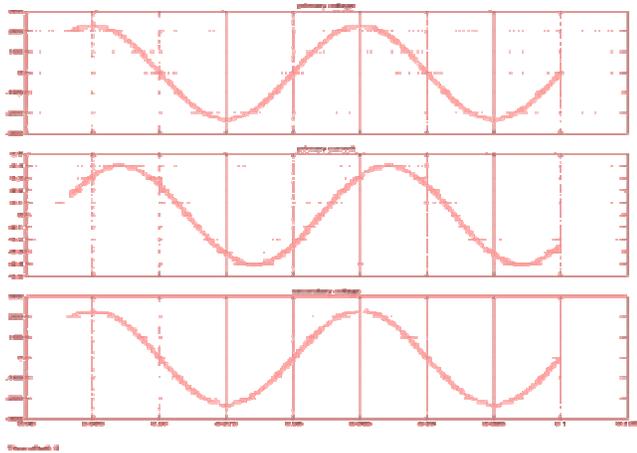


Figure.4: Wave Forms for (a) input voltage (b) input current (c) output voltage with Sinusoidal

Square wave:

As shown in Figure.5, during open circuit test when square voltage waveform is applied to the transformer then the output voltage waveform is slightly different from input voltage waveform having a voltage magnitude of 230volts.

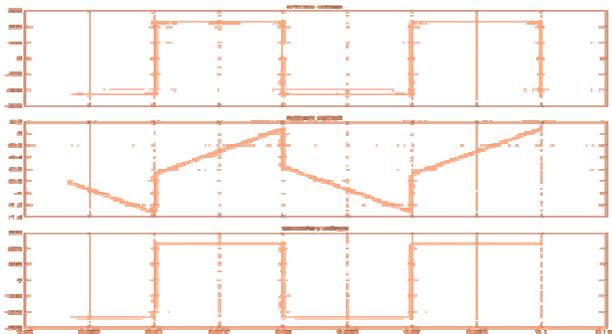


Figure.5: Wave Forms for (a) input voltage (b) input current (c) output voltage with Square

Short Circuit Test

Table II: Simulation Results for Short circuit with Continuous sinusoidal and square wave

S. no.	Input waveform	Primary Current(A)	Primary Voltage(V)	Secondary Current(A)
1.	Sine wave	13	14	213.20
2.	Square wave	13	9	312.82

Sinusoidal wave:

During short circuit test when sinusoidal voltage waveform is applied to the transformer then the output current waveform is same as input current waveform having a current magnitude of 213.20amp as shown in fig 6.

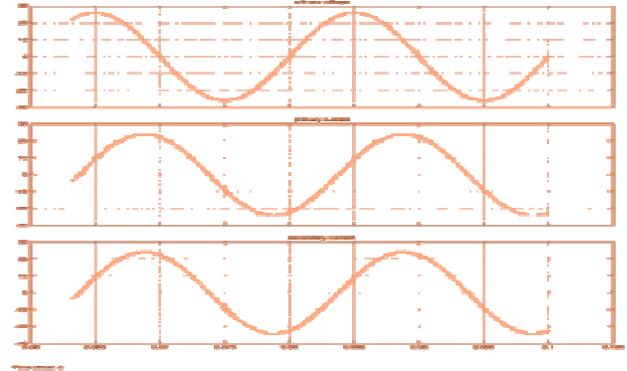


Figure 6: Wave Forms for (a) input voltage (b) input current (c) output voltage With Sinusoidal and Square

Square wave:

During short circuit test when square voltage waveform is applied to the transformer then the output current waveform is slightly different from input current waveform as shown in figure.7 having a voltage magnitude of 312.82.

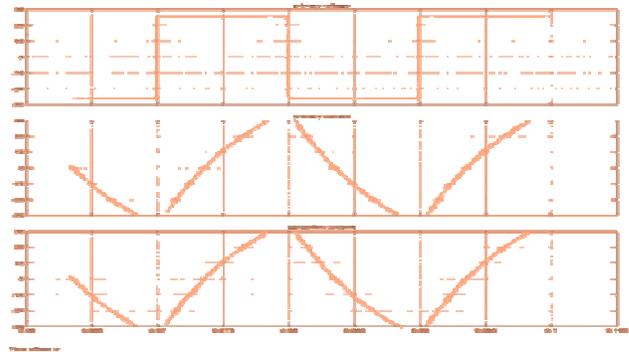


Figure.7: Wave Forms for (a) input voltage (b) input current (c) output voltage with Square

CASE II:

Simulation of single phase transformer with Discontinuous supply

Open Circuit Test

Table III: Simulation Results for Open circuit with Discontinuous sinusoidal and square wave

S. no.	Input waveform	Primary Current(A)	Primary Voltage(V)	Secondary Voltage(V)
1.	Sine Wave	0.78	229.8	229.6
2.	Square Wave	1.08	229.3	228.97

Sinusoidal wave:

From figure 8 open circuit test with sinusoidal voltage waveform of transformer is shown. The output voltage waveform is same as input voltage waveform having a voltage magnitude of 229.6volts.

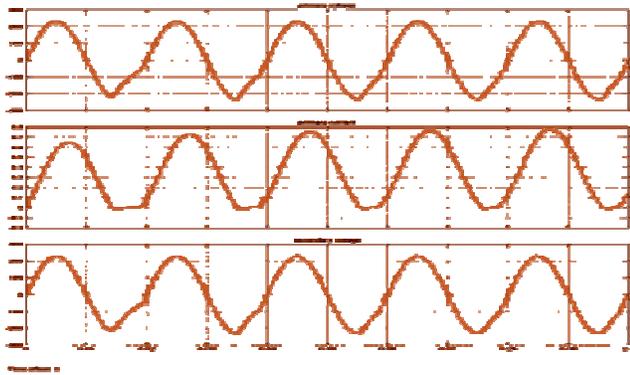


Figure 8: Wave Forms for (a) input voltage (b) input current (c) output voltage With Sinusoidal

Square wave:

During open circuit test when square voltage waveform is applied to the transformer then the output voltage waveform is same as input voltage waveform having a voltage magnitude of 228.97volts as shown in figure 9.

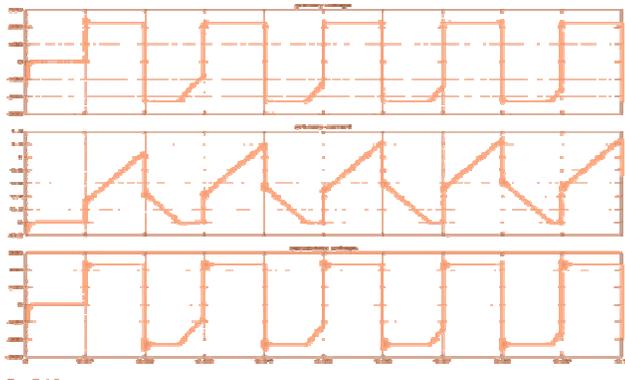


Figure 9: Wave Forms for (a) input voltage (b) input current (c) output voltage with Square

Short Circuit Test

Table IV: Simulation Results for Open circuit with Discontinuous sinusoidal and square wave

S. no.	Input waveform	Primary Current(A)	Primary Voltage(V)	Secondary Current(A)
1.	Sine Wave	13	12	278.98
2.	Square Wave	13	8.5	408.4

Sinusoidal wave:

During short circuit test when sinusoidal voltage waveform is applied to the transformer then the output current waveform is same as input current waveform having a current magnitude of 278.98amp as shown in figure 10.

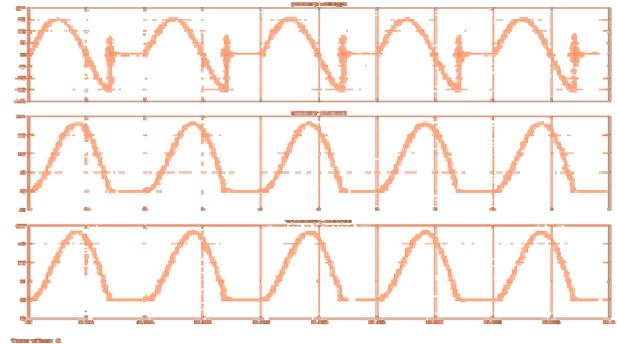


Figure 10: Wave Forms for (a) input voltage (b) input current (c) output voltage with Sinusoidal

Square wave:

During short circuit test when square voltage waveform is applied to the transformer then the output current waveform is slightly different from input current waveform having a voltage magnitude of 408.4 as shown in figure 11.

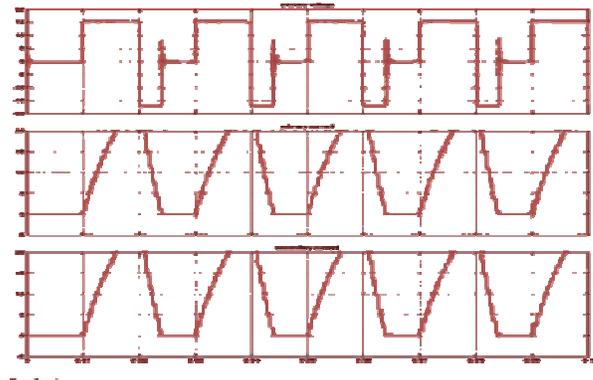


Figure 11: Wave Forms for (a) input voltage (b) input current (c) output voltage with Square

IV. CONCLUSION

From simulation results it can be noted that when a transformer is operated with different types of supply then the output and input waveform are not same. It was also observed that the output voltage and current waveform is not in the same phase. Tests were performed by using continuous supplies as well as discontinuous supplies and graphs are plotted for different voltages and currents. It was also observed that voltage leads the current not exactly at 90degree but at some angle less than 90 degree.

APPENDIX-A

Specifications of transformer

$R_1=0.2\Omega$, $X_1=0.5\Omega$, $I_1=13A$, $V_1=230V$, $R_2=0.2\Omega$, $X_2=0.5\Omega$, $I_2=13A$, $V_2=230V$, $R_0=718.7\Omega$, $X_0=958.3\Omega$, $I_0=0.4A$, $I_c=0.32A$, $I_m=0.24A$, $L_1=1.593*10^{-3}H$, $L_2=1.593*10^{-3}H$, $L_0=3.00H$, Power factor= 0.8

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