ISSN 2250-3153

Analysis & Proposed Model of Maintenance & Replacement Policies in Fleet Management System Using Data Mining

Er.Siddharth Arora, Er. Parneet kaur

Department of Computer Science & Engineering
Ambala College of Engineering and Applied Research, Devasthali, Ambala Cantt-133001, Haryana, INDIA

Abstract- One of the major issues in Intelligent Transport System is Fleet Management. Patterns and categorization of record data is very essential for effective decision creation. Timely prediction of latest up-and-coming trends is also required in business. Sales and maintenance patterns from inventory data indicate market trends, maintenance behaviour respectively and can be used in prediction which provides help in effective decision support system, contriving and analyzing market trends. Main accusative in this research is to craft an effective fleet management approach that includes policies and procedures on acquisition, maintenance, replacement and disposal of vehicles, So that cost effectiveness and efficiency of a locality's fleet operation can be improved.

Index Terms- Fleet Management System, Fleet Performance, K-means clustering, Knowledge discovery Database (KDD)**.**

I. INTRODUCTION

The computerization of marketing operations, global connectivity and the automated software's support has completely altered the main basic concept of business and the way the various business operations are being carried out. Fleet management is not an exception to it. Fleet Management System has also witnessed a tremendous change in the way the various Fleet Management operations are carried out. The computerization of Maintenance may be seen as an action for retaining or restoring a piece of equipment, machine, or system to the specified operable condition to achieve its maximum useful life Fleet requirements sometimes involve modification of commercial vehicles.

1.1 Changing role of fleet managers

New organizational structures and expanded computing options have dramatically changed the nature of fleet management. Twenty years ago, maintaining equipments generally the only responsibility that the maintenance manager had and he did this within a budget allocated to him by upper management. Today, the role of the fleet manager has expanded from "fleet only" to total maintenance management. Fleet managers must not only complete tasks but must also take responsibility for outcomes. The role of a fleet manager has changed:

- From operations specialists to marketing and communications experts
- From hoarding resources to sharing resources.
- From a total focus on cost to total customer satisfaction.
- From a focus on downtime to one on reliable availability.
- From shop mechanic to computer technician.
- From total ownership of all equipment to the maximization of capital and technology.

Fleet management systems allow for planned and scheduled maintenance. Planned or scheduled maintenance is considerably less expensive than running repairs performed in response to in-service failures. Industry consultants estimate that planned maintenance can effectively reduce per-incident maintenance costs by 50%. Shops that take a proactive approach to this work by proper planning and scheduling can improve overall productivity by as much as 15% to 20%.

1.2 Data Mining:

Generally, data mining is the process of analyzing data from different perspectives and summarizing it into useful information - information that can be used to increase revenue, cuts costs, or both. Data mining is one of a number of analytical tools for analyzing data. It allows users to analyze data from many different dimensions or angles, categorize it, and summarize the relationships identified. Technically, data mining is the process of finding correlations or patterns among dozens of fields in large relational databases. Through the use of automated statistical analysis (or "data mining") techniques, businesses are discovering new trends and patterns of behavior that previously went unnoticed. Once they've uncovered this vital intelligence, it can be used in a predictive manner for a variety of applications.

Results of Data Mining Include:

- Forecasting what may happen in the future.
- Classifying groups by recognizing patterns.
- Clustering groups based on their attributes.
- Associating what events are likely to occur together.
- Sequencing what events are likely to lead to later events.

II. LITERATURE SURVEY

Today's fleet management systems have evolved into powerful, high-tech tools that impact both the day-to-day operation of a maintenance department and the overall performance of a transit agency. Fleet financial data once important only to the accounting department is now generating profit-and-loss information at the repair-shop level. Data that was once difficult to access is now at one's fingertips and can easily be manipulated into a variety of management formats. this paper

contributes to the humanitarian logistics literature and to the incentives alignment literature.

In fleet operations management the extant literature on humanitarian logistics follows a classical optimization approach. Most of the research examines relief systems for disaster preparedness disaster response or for timely dispatching problem. Typically, those papers apply operations research techniques to relief operations or to the vehicle route management taking a central planner approach. The objective can be equity or cost-efficiency oriented. Data Mining algorithm can be better understand in the work of Wu X., Yang Q., Motoda H[1].

Works regarding K-Mean implementation algorithm can be found in work of Thangavel et al [3] as he used the K-means clustering algorithm to analyze. K-means Cost-based objective functions are often represented either via monetary cost or via travel distance. Cost minimization can be found in the work of Beamon and Kotleba [7]. Works regarding the analyzing of large database through expert system can be well understand in the work of Nassar K. [6]. Analysis of management algorithms is studied from the work of Mazurkiewicz ,Tomasz and Walkowiak [14].

III. PROBLEM FORMULATION

Now a days most of the concept of Fleet Management has been moved to centralized database which has made fleet management system technically strong and more beneficiary for satisfaction of customer. In the present scenario, the huge amount of electronic data is being maintained by various fleet oriented agencies. The huge size of these database records makes it difficult or even impossible for the fleet manager to analyze these databases and to obtain useful facts/results as per the need of the fleet manager. Most of the fleet manager generally uses concept of Management Information System, through which fleet managers are generating various kinds of reports, which are then presented and analyzed for the decision making related to various traits of fleet with in the agency. However these reports available in the summarized form can be used by the governing authorities. While dealing with fleet management sector is quite cumbersome task. The fleet managers at present generate reports from the periodic paper reports and the statements as lay down by various constitute units. Such reports have a high extent of error, due to data being recorded and clarified by variety of parties at variety of levels.

The solution seems to be in incorporating the thought of data warehousing and data mining. Due to the enormous growth of the perspective of the data and its multivariate uses, the agencies and the individuals are feeling requirement for various centralized data management and retrieval system. The centralization of the data is necessary fundamentally for better processing and in turn facilitating the user access and analysis. So for analyzing these centralize data and to extract knowledge hidden from these databases we use the concept of Data Mining. The focus of our research is to craft an effective fleet management system that includes policies and procedures on acquisition, maintenance, replacement and disposal of vehicles at the optimum stage, so that cost effectiveness and efficiency of a locality's fleet operation can be improved which is different from the prior researched works.

3.1 Use of k-means Algorithm:

The k-means algorithm is an evolutionary algorithm that clusters observations into k groups, where k is provided as an input parameter. It then assigns each observation to clusters based upon the observation's proximity to the mean of the cluster. The cluster's mean is then recomputed and the process begins again. Here's how the algorithm works:

- The algorithm arbitrarily selects k points as the initial cluster centres ("means").
- Each point in the dataset is assigned to the closed cluster, based upon the Euclidean distance between each point and each cluster center.
- Each cluster center is recomputed as the average of the points in that cluster.

Steps 2 and 3 repeat until the clusters converge. Convergence may be defined differently depending upon the implementation, but it normally means that either no observations change clusters when steps 2 and 3 are repeated or that the changes do not make a material difference in the definition of the clusters.

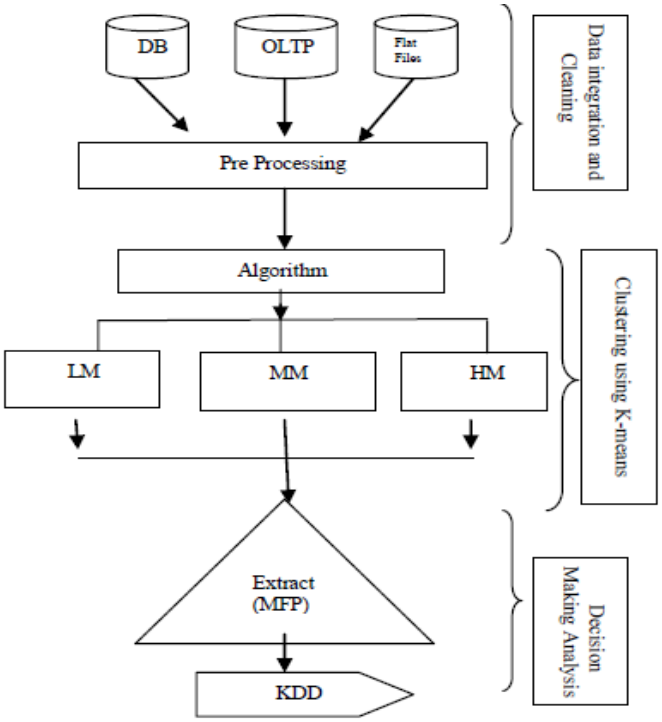
Mathematically, algorithm aims at minimizing and *objective function*, in this case a squared error function. The objective function-

$$J = \sum_{j=1}^{k} \sum_{i=1}^{k} \left\| x_i^{(j)} - c_j \right\|^2$$

Where $\left\| x^{(j)} - c_j \right\|^2$ is a chosen distance measure between a data point (*j*) *i x* and the cluster center *j c* , is an indicator of the distance of the *n* data points from their respective cluster centers.

IV. PROPOSED WORK

In this paper we proposed an a model for mining patterns of huge stock data to analyse the factors affecting the fleet`s maintenance and depreciation. In the first phase, we filter out the data from the database, OLTP and flat files in three different clusters by applying some preprocessing filters. On the basis of the preprocessing filter result we will design the algorithm to get the results in different clusters i.e. Low-Maintenance (LM), Medium -Maintenance (MM) and High–Maintenance (HM) using K-means algorithm. In the second phase we have proposed Most Frequent Pattern (MFP) algorithm to find frequencies of property values of the corresponding items to analyse the factors such as Maintenance system and Depreciation system so that on the basis of the results we can easily analyse and can get the cost effective decision making.



Proposed Model

Clustering Segment by- segment sales forecasting can produce very useful information. The forecasting can be categorized as per according to the use VIP category, common category, and rarely used category. However it is also very useful to understand the different vehicle's performance in Real market and also helps in comparison in terms of their maintenance and depreciation value. Effective inventory management enables an organization to meet or exceed User's expectations of Comfort while maximizing net profits and minimizing costs during the usage life time of the vehicle as used by the user. Only through data mining it is possible to extract useful pattern and association from the stock data.

V. CONCLUSION AND FUTURE WORK

In this paper, a clear analysis of the different vehicles performance in terms of their maintenance and depreciation is done and user can evaluate the useful results. Content state of different vehicles standard is being defined. Also, a functional proposed model of fleet management system is presented here. The exchange of system workflows is also being defined in this paper. Fleet management standard as defined provides categorisation of vehicles under different categories based upon their resulting cluster values and on the basis of that resulting value final result will be manipulated using decision making analysis.

The database usage data mining technique is described in this paper, which is a non-trivial process of extracting useful and previously unknown patterns from the use of Web. The future goal of this research is to develop a new model, by combining the most desirable traits of what currently exists and implementing some new ideas, which is optimal for developing fleet mileage management systems so that mileage related performance of various vehicles can be analysed for wider analysis.

REFERENCES

[1] Wu. X., Kumar V., Ghosh J., Ynag Q., Motoda H., " Top 10 algorithms in Data Mining" Survey Paper Springer-Verlag London limited 2007.

[2] Martinez Alfonso J. Pedraza, Hasija Sameer, I. Brandic, "An Operational Mechanism Design for FleetManagement Coordination in Humanitarian Operations", Future Generation Computer Systems (FGCS) Journal, 2009

[3] Thangavel, K., Jaganathan, P.P. and Easmi, P.O. Data Mining Aproach to Cervical Cancer Patients Analysis using clustering technique. Asian Journal of Information Technology (5) 4, 413-417.

[4] Barbarosoglu, Arda.2004. A Two Stage Stochastic Programming framework for transportation planning in disaster response. Journal of the Operational Research Society. 55 ,43-53.

[5] Fenghui. Wang, Ming. Yang, Ruqing. Yang, "Dynamic Fleet Management for Cybercars".

[6] Nassar khaled, : Application of Data-Mining to State Transportation Agencies` Project Databases.procceedings of the ITcon vol.12 (2006), NAssar, pg.139.

[7] Jian Yang, Patrick Jaillet, Hani Mahmassani. "Real-Time MultivehicleTruckload Pickup and Delivery Problems TRANSPORTATION SCIENCE" 2004 Vol. 38, No. 2.

[8] Beamon, B.M., S.A. kotebla.2006. Inventory modeling for complex emergencies in humanitarian relief operations. International Journal of Logistics: Research and Applications. 9(1)

[9] Cheng, T. H., Wei, C.P., Tesng., V.S.(2006) : Feature Selection for Medical Data Mining : Comparison of Expert judgement and Automatic Approaches. Proceeding of the 19th IEEE Symposium on Computer – Based Medical Systems (CBMS`06).

[10] Michel Parent, Arnaud de La Fortelle. Cybercars : Past Present and Future of the technology INRIA, France

[11] Ozamder , L.,E. Ekinci, B. Kucukyazici.2004 Emergency Logistics planning in natural disaster Annals of Operations Research. 129 217-245

[12] Chnag-Yi Chen, Tien-Yin Chou, Ching-Yun Mu, Bing-Jean Lee. Using Data Mining Techniques on Fleet Management System.

[13] Balcik, B., B. M. Beamon, K. Smilowitz 2008. Last mile Distribution in Humanitarian Relief. Journal of Intelligent Transport System 12(2) 51-63.

[14] Walkowiack, T. and Mazurkiewicz, J. Functionality Availability Analysis of Discrete Transport System Management. International journal of Critical Computer Based System, Vol.1, No 1-3, 2010

AUTHORS

First Author - Er.Siddharth Arora, M.Tech Scholar, Department of Computer Science & Engineering, Ambala College of Engineering and Applied Research, Devasthali, Ambala Cantt-133001, Haryana, INDIA
Email id - siddhartharora10@gmail.com

Second Author - Mrs Parneet kaur, Assistant Professor, Department of Computer Science & Engineering, Ambala College of Engineering and Applied Research, Devasthali, Ambala Cantt-133001, Haryana, INDIA
Email id - kaur.parneet@gmail.com