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Improving Customer Relationship Management Using Data Mining

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Abstract— Customer Relationship Management (CRM) possesses Business Intelligence by incorporating information acquisition, decision support functions and information storage to provide customized customer service. CRM enables to analyze and classify data in order to satisfy the customer needs. CRM has become one of the most important points for many industries such as Telecommunication, Insurance, Banking and Retail**.** True to the saying "Customer is the King", has now been made possible. CRM takes customer as the focal point and optimizes the business process. With the rampant competition in the business world, the Customer Relationship Management (CRM) has become one of the matters of concern to the enterprise. But in reality we have learned that CRM classification models are outdated, because of noisy and imbalanced dataset. In an effort to help enterprises understand their customer requirements, the ways in which the customer can trust the enterprise and the ways in which the enterprise can retain valued customers, we propose data mining techniques. Data mining is playing an important role in the decision support activity of every walk of life.Based on the analysis of the business environment on the basis of customer relationship management, and based on clustering analysis customer segment in the application of data mining, this paper wants to promote the importance of data mining within the customer relation management. Also, a new feature selection method is proposed to resolve such CRM dataset with the help of an efficient data mining technique to improve data quality. Finally it enhances the performance of classification.

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Index Terms— Data Flow Diagram,Unified Modelling Language , Spiral Model, Data Mining, Customer relationship management system, Clustering analysis, Association rule, Feature selection, Imbalanced classification

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1.Introduction

Customer retaining is a very important issue in all industries. In today's world there is a lot of competition and dissatisfied customers makes the organization vulnerable. Because they damage organization's reputation and competition, also they try to convince other customers to avoid transaction with the organization. It is clear that CRM is one of the most important issue in the business world. Primary researchers of Customer Relationship Management believed interests and benefits of CRM can be searched based on each industry's structure separately. But the results of the recent studies and investigations in several industries show that the interest of CRM in different industries does not change very much. The main advantages of CRM can be stated as below:

- Improve capabilities in targeting profitable customers.
- Virtual integration of communication with customers.
- Personalized marketing message. Make products and services Proportional (Especially storage)
- Improve efficiency and effectiveness in customer services.
- Improve pricing capabilities.
- Improve sale forces efficiency and effectiveness.

2. LITERATURE SURVEY

Limei Zhang [1] describes about concept of Data Mining, the concept of Command and the concept of analysis method. Based on the analysis of the hotel environment on the basis of the customer relationship management, and based on clustering analysis customer segment in the application of data mining, this paper promotes the importance of data mining within the customer relationship management. The various methods adopted are 1) The artificial neural network 2) On-line analytical processing 3) Decision Tree4) Data Visualization

Kum Wu, Feng-Ying Liu [2] explains how to apply the rules and patterns of data mining to assist enterprise decision-making. Customer relationship management (CRM) has become the core of growth of the company. Data mining, is a powerful data analysis tool that extracts critical information which supports the company to make better decisions by processing a large number of data in commercial databases. The various methods adopted are 1) Clustering2) Classification 3) Association Rule.

Gao Hua [3] focuses on the customer classification and prediction in commercial banks based on Naïve Bayesian Classifier that accommodates the uncertainty inherent in predicting customer behavior. With the rampant competition in the domestic and international business, the Customer Relationship Management (CRM) has become one of matters of concern to the enterprise. CRM takes the customers as the center; it gives a new life to the enterprise organization system and optimizes the business process. In an effort to help enterprises understand their customers' behavior and the ways to retain valued customers, he proposes data mining techniques. The method adopted is Naïve Bayesian Classifier Algorithm. Bayesian classification is based on Bayes theorem. The naıve Bayesian

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classifier makes the assumption of class conditional independence, that is, given the class label of a tuple, the values of the attributes are assumed to be conditionally independent of one another. This simplifies computation. Bayesian classifiers have also exhibited high accuracy and speed when applied to large databases.

S.Ummugulthum Natchiar, Dr. S. Baulkani [4] states a new feature selection method to resolve loss of data integrity and imbalanced classification. Customer Relationship Management possesses Business Intelligence by incorporating information acquisition, information storage, and decision support functions to provide customized customer service. It enables customer representatives to analyze data and classify data to address customer needs, thereby promoting greater customer satisfaction and retention. CRM takes customer as the focal point and optimizes the business process. The proposed methodology proves its higher performance. The various methods adopted are1) J48 2) Naïve Bayes 3) SVM 4) KNN.

3.PROPOSED SYSTEM

Our project is based on improving customer relationship using data mining. We are implementing it on a hotel management system which includes customer or company registration, checking the availability of rooms, ordering food at the customer point of view. The system would check availability of rooms from database, maintain database of customers, rooms, food menu, etc. Data Mining would be applied to the large dataset and the customers would be segregated as per the criteria selected. This would help the organization to help improve their business. The key features of this system are: large and normalized dataset, improved customer relationship on the basis of frequency of visit or cost, interaction with our valuable customers through E-mail or SMS, providing discount or additional privileges to our valuable customers.

3.1 Modules

1. **REGIATRATION**

The Registration module is used for registration of new users. The users need to provide their personal details such as name, contact details, email-id etc.

2. **AVAILABILITY**

The customers can check the availability of rooms.

3. **DATABASE MANAGER**

Maintains and updates all the customer records, orders, payment etc.

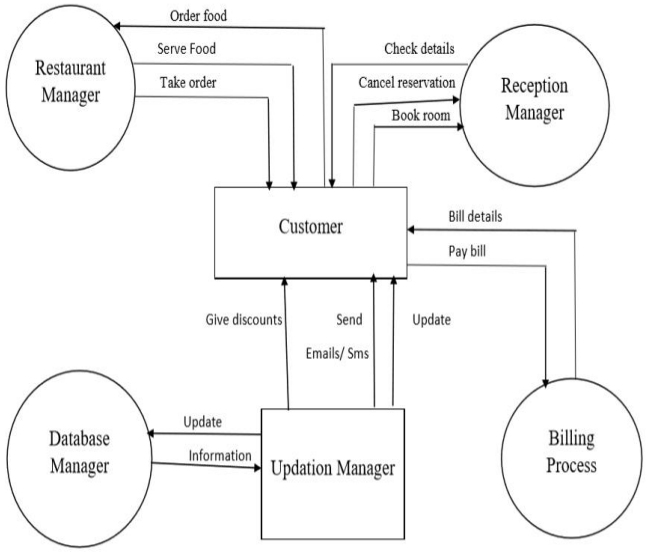

Fig 1: Level 1 DFD for Hotel Management System

3.2 TECHNIQUE TO BE USED

KNN is one of the most simple and straight forward lazy learning data mining technique. It is also called as memory based classification as the training samples need to be in the memory at run time. KNN becomes popular due to its simplicity and relatively high convergence speed. KNN is called lazy learning because it does not have any training phase. In the classification step, we will be given an instance S; whose attributes we will refer to as S.Ai and we wish to know instance class. KNN classification has two stages

1) Find the k instances in the data set that are closest to S
2) These k instances then vote to determine the class of S

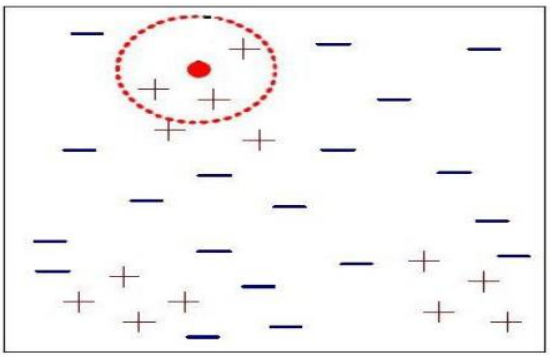

Fig 2: K Nearest neighbor classification

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Assume that we have a training data set T made up of (xi) ε [1, |T|] training examples. The samples are described by a set of features F and numeric features are normalized in the range [0, 1].Each training sample is labeled with a class label Cj ε C. We have to classify an unknown sample S. From [1] for each Xi T we can calculate the distance between S and Xi using Euclidean distance or any other distance formula. Assume if the first instance is (a1, a2, ---an) and the second instance is (b1, b2---bn), the distance between first and second instance is calculated by $\sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2 + \ldots\ldots (a_n - b_n)^2}$

Some other methods are available for classification such as SVM method, Decision trees, Naïve bayes, etc. But the Dataset taken into consideration for classification is built in such a way that K-NN seems to be a better choice due to its simplicity and effectiveness.

4. PROPOSED METHODOLOGY

The project follows the software development life cycle and uses the spiral model. The spiral model consists of the phases shown in the figure.

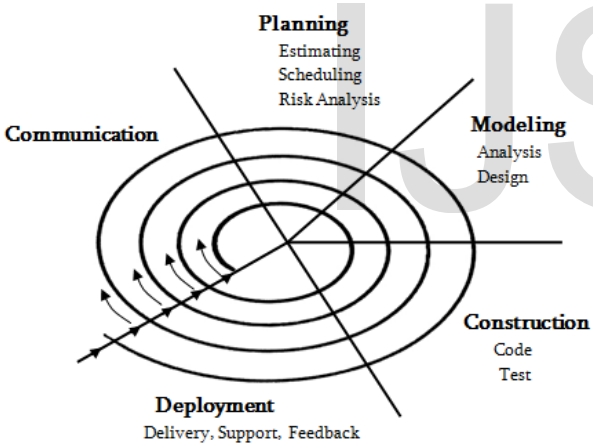

Fig 4: Spiral model

The spiral model is similar to the incremental model. This model emphasizes on risk analysis. The spiral model has five phases: 1) Communication, 2) Planning, 3) Modelling, 4) Construction and 5) Deployment. A software project repeatedly passes through these phases in iterations**.** In the spiral model, planning is the starting phase, then the requirements are gathered and risk is assessed for a given software project. Each subsequent spirals builds on the baseline spiral. In case of Customer Relationship Management System, the aim of each spiral would be to refine both the algorithm and the knowledge base until it is in the satisfactory accuracy range.

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5.EXPECTED OUTCOME

The expected outcome of the CRM project is to obtain an unbiased data set with an enhanced performance of classification. An e-mail/SMS based communication between the client and the server to smoothen the transactions and providing discount or additional privileges to our valuable customers.

6.CONCLUSION

Customer Relationship Management System aims at creating an unbiased data set to provide less noisy and dicey information by using the various techniques of classification. It aims at establishing a smooth communication between the server and the client using email. It provides a platform for the content creators that will help new and latest content from the creators to be exposed due the result of our better Customer Relationship Management system. This project mainly implements a system for the Hotel Management System to meet the basic requirements such as keep the records of the guests and the rooms allotted to them, know the availability of the rooms on that particular date, guests should be able to book the rooms online, keep the record of the food and room services availed by the customer and to generate the bill. It also provides an email based communication for a better retention view and customer importance.

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