INTEGRATING ASSOCIATION RULE MINING AND MOBILE MAP SERVICE ON CLOUD

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ABSTRACT
Data mining plays an important role in obtaining and analysing the useful information from databases. Mobile computing and cloud computing can be combine together to overcome the limitations of mobile phones while overcoming the communication overhead. Development of location based application becomes easier because of smartphones. A lots of information is been collected from these applications while supporting location based mining. This paper represents the combination of association rule mining and location based mining while developing android application for mobile shopping. Cloud is used for storing data and processing. It reduces the battery consumptions. It also reduces processing overhead. The proposed framework is responsible for achieving this goal. Association rule mining is used for finding relation between items based of their geographic location.

Keywords- Association Rule Mining, Location Based Mining, Market Basket Analysis, Mobile Cloud Computing.

I. INTRODUCTION

Data Mining discovers qualitatively useful information embedded in the databases. Huge amount of data is been collected through different processes and applications. Different data mining techniques are available like clustering, association rule mining, class generation, etc. Association rule mining is responsible for finding the interesting association among data items and correlation among them from a large set of data. Market Basket Analysis is used for association rule mining. There are two processes involved in Association rule mining, frequent item generation and strong association rule generation. Frequent item generation involved finding frequency of particular set of items that provides at least minimum support threshold. From this itemsets some declarations are made and are called as strong rules.

There is another emerging area in the field of data mining called as Geospatial Data Mining. Because of the advancements in mobile phones Geospatial
Data Mining can be broadly used for location-based services. Due to advancement in mobile phones smartphones and tablets can be used to record any kind of information on hand. Also, with developing technologies different kind of information based services can be made available. Various type of information like sensor-based information, location-based information can be recorded and processed. This is useful in obtaining accurate and desired information very easily.

In this paper, we propose an approach that performs association rule mining on nearby mobiles, which creates business opportunity that can encourage m-commerce.

The rest of the paper is organized as follows: Section II briefly describes mobile cloud computing. In Section III we review related works followed by Section IV that presents the proposed framework and paper is concluded in Section V.

II. MOBILE CLOUD COMPUTING

Mobile cloud computing is integration of cloud computing in mobile environment. [11] Says the goal of mobile cloud computing enables execution of rich mobile application as it provides business opportunities.

Cloud which is nothing but the cluster of servers mainly used for data storage and processing and facilitate the scalability to access data. In mobile cloud computing mobile devices provides graphical front end which acts as the mean to access data, while users are unaware about the back end processing fundamentals. As data storage and processing moved on cloud, application overcome the disadvantages of mobile phones like battery power consumption, storage space etc. To experience advantages of smartphones all user need is an application running on mobile device, communication network in the form of internet and server as a cloud. The use of smartphones is increasing day-by-day, mobile phones provide anytime, anywhere access, and use of cloud supports this flexibility of mobile feature.

In [9], author described categories mobile cloud computing in two families, one is general purpose mobile cloud computing (GPMCC) and another one is Application specific mobile cloud computing (ASMCC). GPMCC works on the on-demand manner in which cloud resources are used on mobile when needed. While ASMCC, employs cloud computing. In both the methods ASMCC is more efficient as it makes mobile device more efficient for computing.

Author of [6], introduces the inner working of MCC and their implementation methods. They explain different services needed by both client and server. The client side services include sync, push, offlineApp, network, database interapp bus, this contribute the client cloud stack. The server side services include sync, push, secure socket-based data service, security and management console and form mobile server cloud stack. Several challenges are discussed by authors. As they found the absence of standard issues, authors provides the architecture of Mobile Agent based Open Cloud Computing Federation (MABOCCF). The architecture uses a centralized approach based on task manager. Task manager performs many services and task is encapsulated as data structure. This data structure then sends to cloud.

III. RELATED WORK

The authors of [4] paper represented the architecture which can be used to perform collaborative data mining. A typical scenario for this ad hoc data analysis would include number computationally capable devices like smart phones and sensors, and number of
applications that run onboard these devices. Two stimulating factors have motivated to use the mobile software technology in this application. The first is the autonomous behaviour that the agent framework supports. Communication efficiency using mobile software agents in distributed data mining has been the second factor.

Existing mobile agent based distributed association rule mining frameworks suffers the communication overhead. The author of [1] paper proposes a framework that attempts to reduce the communication overhead. Algorithms used for parallel and distributed association rule mining, Count Distribution, Data Distribution, and Candidate Distribution.

The paper [7] is a location-based mobile tourism application for cultural tourism in Malaysia by using a cloud-based platform with its design and development. This is a three level architecture, front-end, middle-ware, and a back-end level. They are built on Amazon Web Services (AWS) cloud platform. At the front-end level, a location-based mobile tourism application for Apple mobile devices is used to explore nearby cultural tourism places. From the relational database an output is generated in the form of eXtensible Markup Language (XML) using web services provided in the middle-ware level. This is responsible for exchanging the data between the mobile application and servers in the cloud.at the back-end level WS cloud platforms are used which provides MySQL database server on Amazon Relational Database Service (RDS). It also provides a cloud storage that uses Amazon Simple Storage Service (S3), which gives flexible, auto scalable, and secures servers for providing required services.

In [3], paper, describe a location based text mining approach. This classifies texts into various categories based on their geospatial features. It aims to discover relationships between documents and zones. There are three main components in this framework, including geographic data collection and reprocessing, mapping documents into corresponding zones, and framing maximizes zones.

In [8], author studied the relationship between Data Mining Techniques and Web Usage Mining. Author reviewed and explained different data mining techniques that include Association and correlation, classification, clustering, regression, sequential patterns and decision trees and also mentioned types of web data mining which includes web structure mining, web usage mining, and web content mining. They proposed a system that can explain web usage mining by applying corresponding data mining techniques. Banking systems can take the advantages from this research to target marketing, find unusual activities and just-in-time availability of information.

As cloud computing provide the huge processing speed and storage, author of [5], proposed a prototype of a mobile app that is based on cloud computing platform and data mining. These techniques verify all stored apps routinely and filter out malware apps by collecting the statistics of number of active Android apps and average number of apps installed in android device with expanding ratio of mobile apps. Cloud computing provides the big platform for detecting defending malware in mobile app markets.

In [10] author, propose a new data mining method named two-dimensional multilevel (2-DML) association rules mining. This 2-DML can efficiently discover the associated service request patterns. It considers the multilevel properties of locations and services. The logs on users’ activities are maintained and information of location and services are also collected.
There are three algorithms studied by [2], for association rule mining: Apriori algorithm, FP-growth algorithm and Dynamic FP growth algorithm. Comparative analysis shows that among these three algorithms best performance is obtained by FP-growth algorithm. Performance of these algorithms depends on the support factor and number of transactions.

**IV. PROPOSED FRAMEWORK**

The Framework presented in Fig. 1 is the working principle of this project. It clearly shows the combination of two technologies under one platform, one is Association rule mining while another one is location based services.

![Fig. 1 Proposed Framework](image)

Association rule mining provides the item rule generation on items selected by the customers via mobile whereas, location-based services provides the regional information to the customer i.e. information associated within its geographical zone or area. The combination of both the concepts provides the Association rule based on Location. And the frequent itemset within zone is sent to the customers on mobile.

Fig. 2 gives the idea of system architecture. In this architecture customers, administrator and shopkeepers and three leading actors. Our aim is to find the purchasing habit of customers by providing location based information to them. The main task of association rule mining and location tracking is done by administrator. When customer places the order, he will get the list of shops within its zone sorted by the previous pattern matching record. And shopkeeper will get the location of a customer for delivery of the products.

![Fig. 2 System Architecture](image)

**STEPS OF PROJECT PROCESS**

- There are two active users considered for using this application. One is customers and second is retail shopkeepers. For using this application both have to register i.e. they have to create their own accounts.
- Sign in by customer:
  - Once sign in customer will be provided with the list of shops and items, in which customer can choose nearby shops and then choose items from the list.
  - In the option of choose by items, customer can choose items first and then list of nearby as well as shops from which the items are purchased frequently is provided.
  - In both the cases, customer will get the association
among itemsets of previous record.

- Sign in by shopkeeper:
  - Once sign in shopkeeper can upload the list of items available in shop and make it accessible to the customers.
  - When shopkeeper gets order from customer he will confirm the order and look for the location of customer.
- The location will be displayed on map.

METHODS OF IMPLEMENTATION:

This project can be implemented in two ways: one using clouds platform as a service method and another one is establishing client-server and deploying it on cloud (Fig.3).

**Methods of Implementation**

- Using Cloud’s Platform as a service
- Establishing client-server and deploying application over cloud

**Fig.3 Methods of Implementation**

The objective of this project is to integrate the knowledge discovered from data by using market basket analysis based on the geographical location of the users.

**A. Using clouds platform as a service**

Cloud computing is the collection of different services, like Infrastructure as a service, Platform as a service, Software as a service. The clouds platform as a service architecture involves multiple cloud components communicating with each other. These components are nothing but cloud resources, services, middleware, software components, their geographical location, and relationship between them. The Clouds Platform as a Service (PaaS) architecture provides a powerful foundation for cloud development and deployment services.

The PaaS provides middleware on top of IaaS. PaaS takes the platform concept further to support the complete development, testing and deployment lifecycle of Java applications.

**B. Establishing client-server and deploying application over cloud**

Another way of implementation is to establish a client server and deploy the whole application on the cloud. For our project on client side we will develop as android app using adt bundle for eclipse which is useful for GUI. Processing and storage of data will be done on the server side. Server side machine is configured with server and database.

This type of development has the advantage as the application can be used in either way. If the client-server system is deployed over a cloud this application will work on-line and if the application is stalled without deploying it over cloud its off-line advantages can be taken.

**V. CONCLUSION**

In this paper, Firstly, we discussed two technologies, association rule mining and location based services. Secondly, we reviewed mobile cloud computing basics and found related work on various areas that include data mining, location based mining, mobile computing and cloud computing. Finally, we proposed the system that combines the features of data mining and location based services. The
resultant app will give the analysis of customers’ market basket.

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