One Click Android Application for Shopping Based on Cloud

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ABSTRACT

This paper describes the design and development of an android shopping application for city. It elaborates and shows offers and deals of particular malls and local market. Application shows offers but also provide analytics to the seller. Whole application is organized on cloud. The three-tier architecture includes front-end, middle-ware and back-end. The front-end level consists of location-based mobile shopping application for android mobile devices, for purchasing miscellaneous products from malls and nearby local markets. Front-end level also displays association among the purchased items. The middle-ware level offers a web service to generate JSON (JavaScript Object Notation) yield from the relational database. It exchanges info and data between application and servers in cloud. The back-end level offers the Apache Tomcat Web server and MySQL database. This application is based on cloud that provides application as a service to user.
Keywords: Association Rule Mining, JSON, Agent Based Computing, Mobile Cloud Computing, Location-Based Services.

I. INTRODUCTION

Mobile shopping application contains mobile devices as electronic device. Improvement in smart phones results in the increased rate in its procedure and information anytime everywhere has become style mantra. But mobile devices have restricted memory and processing speed. Cloud in other hand offers large storage and speed for dense data. Increased need of processors and storage devices effects in the improvement of cloud computing. Mobile cloud computing is the region where three things are involved: Mobile devices, network and cloud as a server. Data storage and data processing is carried outside the mobile devices i.e. on cloud and outcomes are displayed through output devices like screen. GPRS, Gmail, Google Drive, and Google Maps are already being used are existing examples of mobile cloud computing. Thus, mobile cloud computing covers the drawbacks of mobile devices like short storage area and processing power.

This research covers these drawbacks and implements association rule mining on the data gathered from mobile application.

This application is specially designed for product purchasing in the city for malls and local market nearby the customer location. It uses Wi-Fi and mobile network to get current position of the customer and displays any registered malls and markets on server from customer's location. Association rule mining as a technique of data mining is used to find the offers associated with products. Technically, data mining is the process of extraction of interesting information or patterns from data in large database. Association rule mining is widely used in market basket analysis. This method benefits retailers in numerous ways for marketing or planning shelf space.

A location-based mobile application for any product shopping was designed and developed to find nearby malls and stores in local markets, association among the products purchased, display association to customer side screen, post order, and it is deployed on cloud. The grouping of web map service API and association rule mining using mobile on cloud, it is potential to gather large scale shopping habit of people, with lower data collection cost.

The computing process solves the problem of inadequate computing power of smart devices. The requirements are organized in queue for the verification of order by the retailer. Web facilities are used to manage the connection between front-end and back-end.

Huge amount of data gathering will be possible using mobile as users can place order from anyplace and service delivery will be easier. Just one click and order will be placed. Also, both consumers as well as storekeepers can take the advantage of mined info for their own profit and also for promoting the products.

II. METHODS AND MATERIAL

A. Related Work

The application based on cloud has been implemented for bakery shopping products [2]. Graphical user interface (GUI) was designed by using location based services and association rule mining. This section discusses the existing projects related to these techniques.

a. Mobile Cloud Computing

Mobile cloud computing consists of three modules: mobile devices, communication network and cloud as a server. In mobile cloud computing assets are stable but application may move. The applications which are large can be decomposed to smaller ones to process concurrently. This method is called as application partition. Offloading is the process of transferring mobile application on cloud. This saves the device memory, processing power and ultimately battery consumption [1].

The classic facilities needed by a mobile cloud client are, synchronization, push i.e. updates the notifications sent by the cloud server, offline App automatically handles synchronization and notification, network, database, inter App Bus provides low level coordination between applications [3].

b) Association Rule Mining

In this paper [4], author proposes a framework the goes to reduce the communication overhead in existing mobile agent based distributed association rule mining (MAD-ARM). MAD-ARM is the Mobile Agent based distributed data mining framework. It contains of knowledge server which works on the generation of association rule and data coming are from different

remote sites. The item sets are always upgrading on remote sites at the immobile agent.

The authors of this paper [5], represented an environment for data analysis. This is clearly based on the environment where data stream mining process runs on user's android handset. As the data streams in continuously, possible concept drift is updated. There is specific central mobile decision agent which switches several others stream mining agents. Stream mining agents working on local mobile phones decides the best possible algorithm to run on local data. Algorithm is chosen dynamically at each handset.
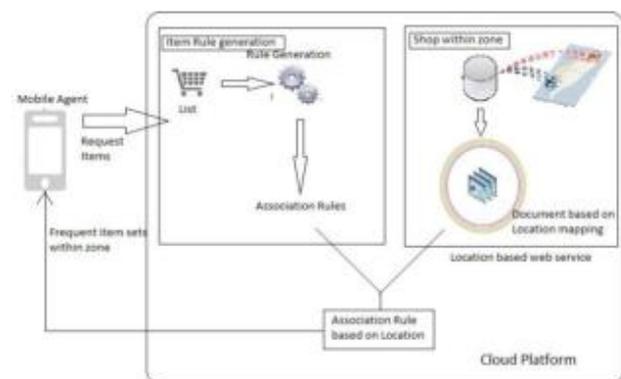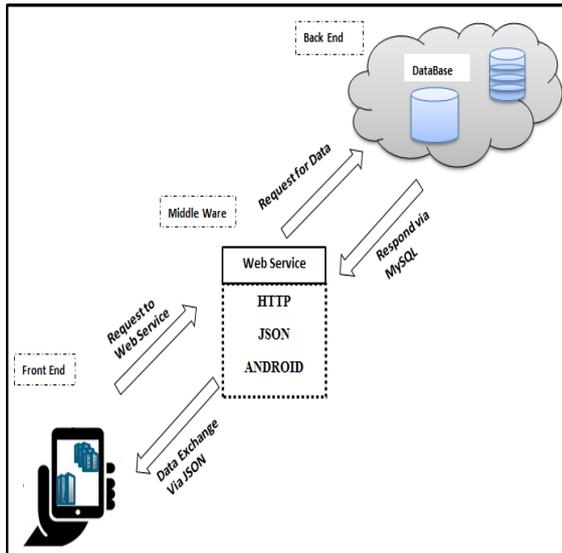
c) Location-based services

Figure 1: Existing system framework.

Any product or application that uses the location data of mobile subscriber is called as location based service. Location based services like GPS uses the latitude and longitude data. A context-based multimedia content management system (MCMS), whose several types of contents are easily collected from everywhere at any time using mobile phones, and stored in a web server as a multimedia database [6]. [7] Defines a location based text mining approach to categorize texts into numerous categories based on their geospatial features, with the goals to discovering relationships between documents and zones. There are three main modules in this framework, including geographic data group and reprocessing, mapping forms into corresponding regions, and framing maximize zones. Data mining and processing is takes place based on zones. Tourism industry has also takes the benefit of location based services. This application is designed and established using cloud based platform. It discovers out the location of tourists, where they are directed or looking. This is

conceivable by using the digital compass. It also computes distance between current location and places, it shows nearby spots, and provides direction. It was constructed on Amazon Web Services cloud platform [8].

B. System Architechture

The architecture of shopping application is divided into three parts as: Front end, Middle ware level and backend.

Figure 2: System Architecture.

The Android open source platform is used to design and develop the shopping application. For end user, in front-end user can able to select particular mall in the city and see the offers available in specific showroom at mall. It also provides offers of local market which are available in users nearby location .The registered retailers can upload and remove their own offers and advertisement from this application.

When user search for specific offers of showroom in mall, then the request is send to middleware level that is to the Web Service. Web service is act like interface for front-end and back-end. The data exchange between front-end and back-end of shopping application happens via middleware level. Android shopping application sends HTTP Request and Web Service will sends Query to fetch requested data from MySQL database located on cloud.

The output of query is the parsed at android application with the help of JSON. Language independency makes

JSON unique for data communication with any programming language. As shown in figure 2 JSON is present in middleware which runs in four steps. In first step, application send HTTP request to web service. Request is accepted in JSON format and in second step the response generated by MySQL, web service is also in JSON format. The query is send back to MySQL database to obtain data from back end. In the third step, Web service generates JSON response which is send to android application, JSON object needed to decode using String which is displayed on application screen. Using JSON, when it comes to mobile application it does not have any specific tag format, which avoids the bandwidth requirement.

Market Basket Analysis

Market Basket Analysis is a forming technique based upon the theory that if you buy a certain group of items, you are more likely to buy another group of items. MBA uses this information to:

- Understand why they make certain purchases.
- Products which are purchased together
- Products which might benefit from promotion.

This application has used the Market Basket Analysis method for analyzing the data. The following techniques are used in the analyzing process:

i   Association Rules

Association rule is a technique which is looking for a relationship among an item with other items. Association rule is generally cast of 'if' and 'then' such as 'if X then Y and Z', this shows if X then Y and Z. To define the Association's rules, it needs to be stated the support and confidence to limit whether the rule is interesting or not.

- Support: A measure that shows how much the level of dominance of an item or item set of the overall transaction
- Confidence: A measure that shows the association between items in a conditional (e.g. how frequently purchased item Y if the person buying the item X).

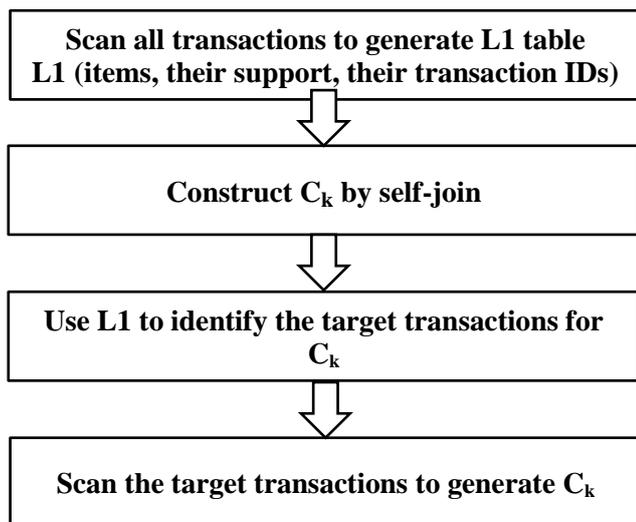### ii   Apriori Algorithm

- **Product_set:** a set of items

- **k-product_set:** an product_set which consists of k items
- **Frequent product_set (i.e. large product_set):** an product_set with sufficient support
- **L_k or F_k:** a set of large (frequent) k-product_sets
- **c_k:** a set of candidate k-product_sets
- **Apriori property:** if an item A is joined with item B, Support(A U B) = min(Support(A), Support(B))

In the process of Apriori, the following explanations are needed:

Definition 1: Suppose T={T1, T2, … , Tm},(m_1) is a set of transactions, Ti= {I1, I2, … , In},(n_1)
is the set of items, and k-product_set = {i1, i2, … , ik},(k_1) is also the set of k items, and k-product_set $\subseteq$ I.

Definition 2: Suppose _ (product_set), is the support count of product_set or the frequency of occurrence of an product_set in transactions.

Definition 3: Suppose Ck is the candidate product_set of size k, and Lk is the frequent product_set of size k.

Scan all transactions to generate L1 table L1 (items, their support, their transaction IDs)
Construct C_k by self-join
Use L1 to identify the target transactions for C_k
Scan the target transactions to generate C_k

Figure 3: Steps for C_k generation

In the proposed approach, scan all transactions to create L1 which contains the products, their support count and Transaction ID where the products are found. And then use L1 later as a helper to generate L2, L3 ... Lk. When to create C2, make a self-join L1 * L1 to construct two product_set C (x, y), where x and y are the products of C2. Before scanning each transaction records to count the support count of every candidate, use L1 to get the transaction IDs of the least support count between x and y, and thus scan for C2 only in these specific transactions. The same thing for C3, construct three product_set C (x, y, z), where x, y and z are the products of C3 and use L1 to get the transaction IDs of the least support count between x, y and z, then scan for C3 only in these specific transactions and repeat these steps until no new frequent product_sets are identified. The whole process is shown in the Figure 3.

III. CONCLUSION

We designed and established a location-based mobile shopping application for malls and local markets for android platform. This application shows nearby local markets and mall's stores that are registered to the application. The main objective of marketing is achieved at a very low cost in comparison of advertisements, announcements, ground level marketing etc. Data exchange among different levels of structural design are operated using web service station and that generated JSON format for data transfer. The server is assembled in cloud by using net in India hosting services. With the service of mobile cloud computing mobile processing and storage is transmitted to cloud as a server, which helps in saving battery consumption and expands the performance or speed of execution. Use of the location based services gives elasticity and eye-catching looks to the application. No additional charges are applied; application can be downloaded and used in regular data charges.

Association between products gives the attraction information of various malls and local markets. Data about often purchased shopping products can help in cross advertising. The development of the project is in such a manner that application can be utilized for any store system.

IV. FUTURE WORK

In future works we can focus on small organization more precisely. Application can feature more options for live stations such as for farmers and small house hold business. A deep market survey is need to done in order to provide marketing and sells for such developers and products.

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