



Indoor Map Generation and Intelligent Suggestions for Real-Time Shopping

Raghottam Talwai, Balesh Tiwari, Satendra Varma, Prof. Suvarna Chaure
S.I.E.S GST, Mumbai, University
India

Abstract— *Shopping at Retail Stores, Shopping Marts and Malls involve the end user to go through huge number of products placed at different places across the store. This makes the shopping experience hectic, time consuming and lengthy. The app, précis, aims at providing an accurate and efficient means of shopping by considerably reducing the amount of time spent by a person to buy products on his/her shopping list. This app, Developed on Android platform, will allow the customers to locate the products with ease along with suggestions based on the buying patterns of the customers, thereby enhancing the shopping experience. This application will be also useful for the retailers because we will be providing solutions to arrange the products by observing the behaviour of the customers. The arranging of products is done by using apriori algorithm. With the help of this application, the person can perform real-time shopping in comparatively less time and in more efficient and fruitful manner.*

Keywords— *Android Platform, effective meaningful time saving real-time shopping, buying patterns of customers, smart phone, Apriori algorithm*

I. INTRODUCTION

As the world is moving towards a rapid development with the globalization, people have become very busy currently. They have started on a race and do not have time even to spend on fulfilling their day to day needs. Shopping for household goods is one main factor that people are currently not having enough time to engage in. Shopping is a very time-consuming affair in super marts as large amount of time is consumed in searching for the product. As consequences of the development of modern technology now there are methods such as online shopping through which you can get your goods delivered to your door step very easily. But there are pros and cons of these methods. Especially when considering buying goods for your household kitchen, there are many disadvantages in online shopping over real time shopping.

Real time shopping is considered to be best form of shopping because here the customer can very well analyse the products. There are certain products such as fruits and vegetables that need to be consumed in fresh form, and then real-time shopping provides most convincing solution to this problem. In real time shopping the customer has the right to his sensory organs to check whether the product is proper or not. This convenience is not present in virtual shopping. Virtual shopping does not assure you about the product. Therefore, we find that everything cannot be transformed into virtual shopping.

The biggest problem with real time shopping is that it is very time consuming. Sometimes searching for a particular product may divert the customer to another product. Real time [1] shopping can be made better with help of techniques that will reduce the time to complete online shopping. Shopping in super marts has become very difficult because there are no proper guidance given by the retailers. This creates a drift between the customer and the retailer. There should be some methods by which the retailer can communicate with the customer. This will be beneficial for the retailer as well as he can advertise the product in more efficient way. The customer should get suggestions from the retailers about the brand of products and the new arrivals in the supermarket. This will lead to more cordial relations between retailer and the customer. To reduce the disadvantages of real time shopping, we have introduced a android application known as précis.

II. RELATED SURVEY

A survey [1] was conducted taking stores, selected from an urban area into consideration. The customers were studied to identify their behaviour exhibited during shopping in order to verify the need to enhance real-time shopping. The survey conducted afterwards, was very helpful to get requirements for the application and at the need of introducing an approach for real-time shopping.

According to the prevailing situation some means should be provided to enhance the shopping process by saving time of busy people existing in our surrounding. Huge bulks of customers were studied to draw conclusions about the buying patterns of specific products. The survey is done by analysing a huge number of people with different mindset.

Need	Importance
Convenience in the method of shopping	2
Safety of the transaction	3
Safety of goods	3
Freshness of goods such as vegetables, fruits and flowers	3
Select the best products	4
Ideas and suggestions for new products in the market	3
Save Time	4
Enjoy shopping	2
Get a good experience	2

Fig.1: The table gives the description of the need analysis required in various aspects of shopping

- We usually don't shop online for groceries and other basic day to day usage items and even if we do, the delivery depends on the distance and time taken for it. Therefore, a total assurance cannot be expected on their freshness
- Compared to real-time shopping, online shopping does not allow us to buy things at the moment we need them.
- We cannot be sure that products would be delivered without any defects and damages and many a times the items have to return as they turn out to be faulty. Hence reliability is not assured.
- Safety of products as well as the safety of the transaction cannot be assured when you buy things in online-shopping because the amount of exposure to risk is comparatively high.

The web site of Alamanda [3], a shopping mall in Malaysia, had used a JavaScript based indoor map to locate the shops in its shopping mall but not the products in the stores. The super marts have generally been a poor and light user of data mining .The problem of arranging the shelves is solved by using the apriori algorithm [2]. The analysis technique used over here is market basket analysis. Market basket analysis also known as association rule mining is one of the data mining methods focusing on discovering purchasing patterns by extracting associations or co-occurrences from a store's transactional data. Data mining can be used by the retailer to improve his sales. They noticed that, the sales of certain products become decrease when they made some arrangement to the shelves. These arrangements made by the retailer contribute to the decreasing number of sales.

The analysis is based on the products table in the database. Technically, data mining is the process of finding correlations or pattern among dozens of fields in large relational databases and distributes result that can be used in an automated decision support system. The discovered knowledge has been used in a wide array of applications such as market analysis, fraud detection, customer relationship management and other business decision making pro.

III. METHODOLOGY

The system is a composition of two main sub systems; Shelf Locator Sub System and the Intelligent Agent Sub System. In addition to the customer cantered portion; the system also includes an Administrator portal.

A. Shelf Locator Subsystem

A coordinate system is used to achieve this task along with the CANVAS technology in android. The indoor map is developed Classes Surface View, Canvas the Android API. A Canvas works for you as a pretense, or interface, to the actual surface upon which your graphics will be drawn — it holds all of your “draw” calls. Via the Canvas, your drawing is actually performed upon an underlying Bitmap, which is placed into the window. The Android framework APIs provides a set of 2D-drawing APIs that allow you to render your own custom graphics onto a canvas or to modify existing Views to customize their look and feel. The Canvas is a system used to draw a 2-dimension image. The most convenient aspect of doing so is that the Android framework will provide you with a pre-defined Canvas to which you will place your drawing calls. The Surface View is a special subclass of View that offers a dedicated drawing surface within the View hierarchy. The aim is to offer this drawing surface to an application's secondary thread, so that the application isn't required to wait until the system's View hierarchy is ready to draw. Instead, a secondary thread that has reference to a Surface View can draw to its own Canvas at its own pace.

TABLE II
DATABASE TABLE

Item ID	Item Name	Unit Price	Suggestions	X Coordinate	Y Coordinate

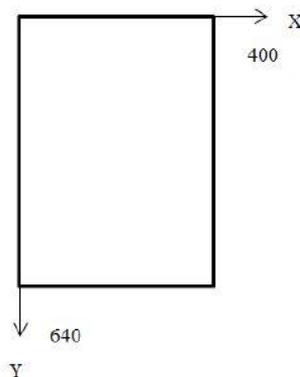


Fig. 2: The table shows us how the entries of products will be made in database of products for mapping them

The sub system is used to calculate the minimum distance between two points. The distance between two points is calculated by using Euclidean distance algorithm. The system will start from the position from where the customer enters the store. The customer and the administrator can log in the system. The basic task of the administrator will be to make the list of products he wishes to purchase and submit it to the administrator. The responsibility of administrator is to manage the items in the store. The administrator can manage the items by removing or adding a specific product. The administrator will have access to the system where the number of products will be checked and accordingly changes will be made in position of the products. The responsibility of arranging the products in particular shelves is with the admin. By observing the buying pattern of the buyer the various items will be arranged in the shelf accordingly.

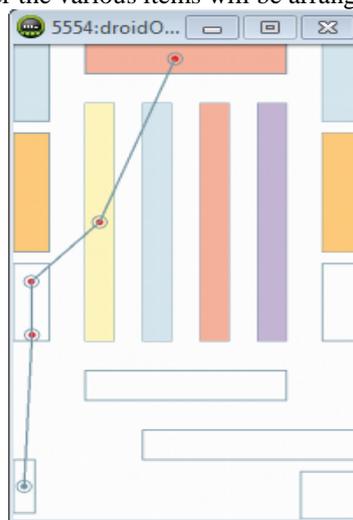


Fig. 3: The layout of map that will be shown to the customers for mapping the products.

The system will locate the nearest product to the entrance and generate the map to the product. This process will continue as long as the list of the products is not complete. The system will also provide suggestion to the customer about the products he needs to purchase as per his buying pattern. These items might have been missed by the customer in his list. The suggestions will be provided by the retailer. The application could be a very good source of advertising the products. Generally the retail store does not have any facility to advertise the product. The advertisement can be done by putting the product in the suggestion list. The system will also keep the track of the total amount collected by the products. This will be very useful to the customer as well as to the retailer. With the help of this method the retailer can keep a track of the sum collected by each product. This will act as a platform for the retailer to advertise their products in front of customers. The grand total of the transaction will also be given to the customer after he has picked all the products.

B. Intelligent Subsystem

The task of intelligent agent subsystem is to provide suggestions to the customer. These suggestions [2] are useful to the customer for buying any specific type of product. The intelligent agent subsystem works on the apriori algorithm. This subsystem will track the buying pattern of the customer. As per the buying pattern of the customer suggestions will be given to him. Suggestions can be given to customer to advertise any specific brand of product which may be relatively new in the market. These suggestions will help the customer to buy the product which he might have left in the list.

These suggestions will be of great help when the product list is been prepared by the customer. The important technique used over here is Market Basket Analysis. Apart from customers we have additional facilities for retailers and owners of super mart as well. We have designed a interface for retailers as well owners where they can check the records of products which are sold frequently.

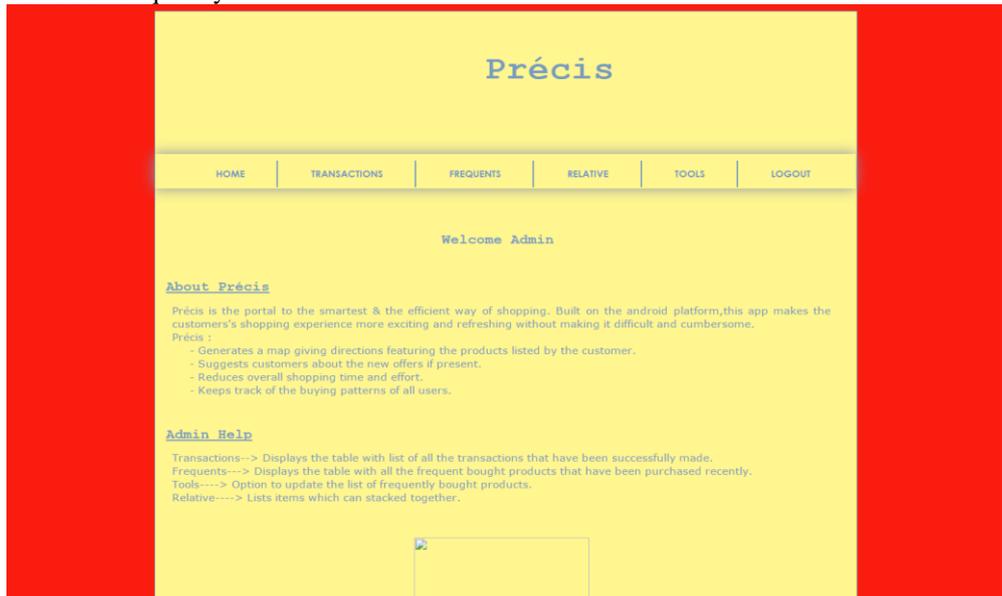


Fig. 4: Home page for admin

The other important task of intelligent agent subsystem is to arrange the shelves dynamically. Various data mining algorithms such as apriori algorithm can be done to find the buying pattern of the customers. The algorithm used over here is Apriori algorithm. The departmental store management has generally been a poor and light user of data mining. The various patterns will help us to put products together. The co-occurrence of the product will be calculated. A database table will keep record of all the co-occurrence. The product combination with the maximum co-occurrence will be arranged adjacent to each other. This will be a very useful market strategy for the retailers. The product combinations with all the products will be taken early on. The products with maximum co-occurrence ratio will only be placed in the system. The analysis which is done here is called market basket analysis. The objective of data mining is to extract useful knowledge from a volume of data. One frequent item sets can generate association rules and find the confidence.

The test result will show the information on what kinds of product are frequently bought at the same time by the customers. This information will give additional consideration for retailers of any store to make the further decision in arrangement of products at retail store. They can access the list of frequently purchased products and make changes accordingly.

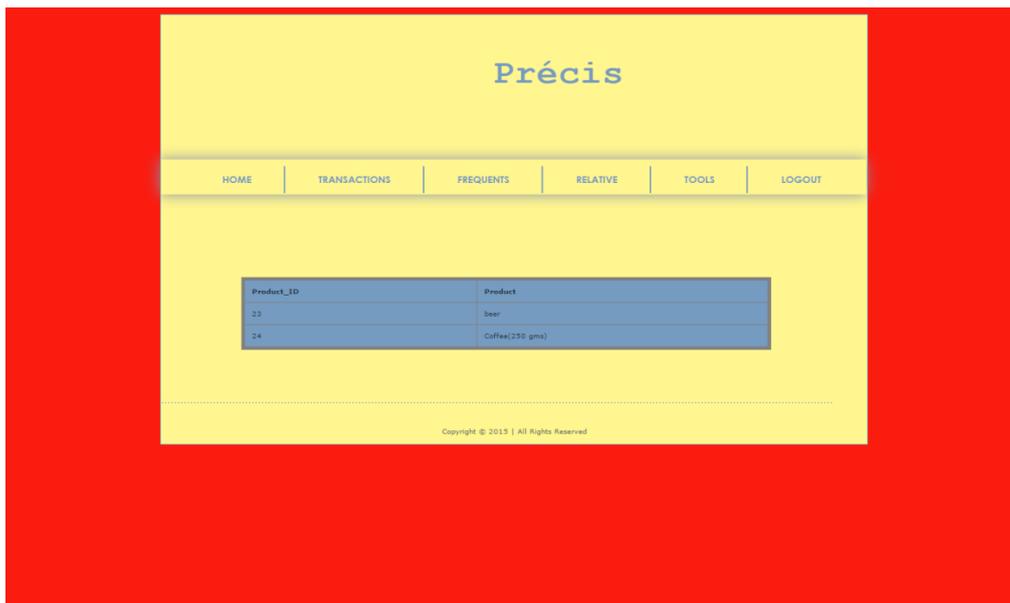


Fig. 5: The most frequently purchased products are displayed here

Market Basket analysis also keeps a count of number of products purchased by customer. This counter helps the administrator to keep a track of items sold in the supermarket. The products are paired by analysing the co-occurrence table obtained by incrementing the counter variable.

	Potato Chips	Cold Drink	Chocolate
Potato Chips	---	3	0
Cold Drink	3	---	2
Chocolate	0	2	---

Fig. 6: The co-occurrence of various products are displayed here

The probability [6] of the product been purchased by the customer increases when the customer sees the product in adjacent shelves. The motivation given for the development of association rules is market basket analysis which deals confidence greater than a certain threshold called minimum confidence. The rules show what the latent relationship between items purchased was and the best arrangement between items that can be placed side by side or in a same retail area so that the items can be frequently sold together and yield the sales of the store. The admin can access the list of products which are frequently brought together.

The pattern helps attract customers' attention by locating the items side-by-side in order to remind customer of related items and this purchasing pattern can increase the sales of the store.

IV. CONCLUSIONS

The novel approach is introduced with the aim of reducing time to a certain limit. The aim of enhancing and speeding-up the process of real-time shopping has proven to be a promising venture in customer experience. The ultimate objective of the application is to provide comfortable shopping experience to the customers and better facilities to the retailer as well. A larger number of data mining and shortest path algorithms will be used in designing the application. The concept developed along with its future enhancements would make shopping very easy for the customers and the retailers if the project is fully implemented.

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