Analysis and Recommendation of Hotel Menu System
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Abstract—In this research, we are creating an android tablet based interactive hotel menu system. We are integrating data mining algorithms in the system to extract all the orders’ data, and subsequently observe trends in the orders. We use these analytics to help improve the menu with recommendations and combo-offers. Also, we are using clustering analysis to make customer groups, so as to reach out to them in a more personalized way with customer loyalty offers and extra discounts. Additionally, we are creating a dynamic JSP website on which the customers can view all the items remotely, and call for a home delivery. All these things will essentially help the hotel business gain even more happy customers and henceforth, more profits. 

Key words: Analysis, Apriori, Classification, Clustering, Data Mining, Hotel Menu, K-means, Recommendation, Trends

I. INTRODUCTION

In this decade, everything and everyone is going digital, and there is good reason why. Unfortunately in the previous decade, and the current decade so far, the hotel menu and item ordering has been largely non-digital and non-interactive. A lot of customer-waiter interaction takes place, and not every waiter knows everything. Most waiters aren’t always efficient in their working. Here we introduce a low cost, yet hugely more efficient way we transact when it comes to eating at a restaurant. We take the system from a monotonous plain paper based menus and customer interactions with the waiter, to make it digital, error-free, interactive and lively. We do this by using data mining techniques such as Apriori and K-means. This ultimately results in efficient operations, and even more importantly, customer satisfaction.

II. RELATED WORK

In, PAR PixelPoint [v] company uses this software for managing the restaurant. The system consists of the company’s software and hardware. This network system is compatible to TCP/IP, enabling information sending through both wireless and conventional networks.

![Table 1: Comparison of our system with similar existing systems](image)

LRS Restaurant Server[vi] Pager Starter Kit This system improves the food-ordering service quality in restaurants and reduces the waiting time of clients. The on-site paging system is used at UHF frequency or the frequency range of 467 MHz for sending the order data.

Implementation of Network-based Smart Order System the Smart Order System in Restaurants (SOSIR) [vii] has been modified to take order from the client’s table through RS-232 signal, which is sent to the cashier counter. The cashier counter system is connected to a database. When the clients’ orders are sent the cashier counter system will screen and prioritize the orders before sending the information to the kitchen for the chef to cook.

In Digital Ordering System for Restaurant Using Android [i] they have implemented a digital ordering system where there will be a tablet/Smartphone on each table which will allow customer to browse the food items, search particular food item according to name, price and category. The food items will be sorted according to price, season and user ratings. The menu includes the approximate time to be served of a particular food item. The items which are not available in a particular time period are not displayed on the menu card which will be modified by kitchen manager. The Restaurant owner can post various offers on tablet. Customer can enter the feedback about the service and the food served which helps the Restaurant owner to analyze the service and make necessary changes if needed.

III. THE PROPOSED ARHM-SYSTEM

A. System Architecture:

![Fig. 1: ARHM-System Architecture](image)

On the software side, on the front end we are making use JSP and Android. Back end we make use of MySQL. The Webserver we are using is Apache Tomcat. The IDE used for the development is Eclipse Indigo and SQLYog.

B. Project Flow of Our System:

Tablets will be given to the customers, for them to view the menu, and the detailed picture, description and prices of all the items on sale in the restaurant. The customer will be able to search any item and place the order. While placing the order, food ordering recommendations will be suggested to

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the customer. Also a discount for combo offers from the items the customer is currently ordering will be suggested to the customer. This system will make use of Apriori algorithm which uses association rules in data mining. Whenever the orders are confirmed, those orders will be visible on the screen located in kitchen. There will be another screen which will be visible to the owner at all times. This will give him the overview of all the transitions per table in the restaurant. The ready to serve food is then delivered to the customers on their respective tables. The customer can keep ordering more things as they require, their table number being their identity.

Once the customer asks for the bill, the transitions for the customers on that table will be closed. After the bill is generated, it will be displayed on the tablet along with the feedback form. Whenever the customer fills the feedback form, that customer’s bill amount and phone numbers will be noted. We will use clustering in data mining to decide the bill-group in which the particular customer is classified. According to that, discount offer SMS and emails will be sent to bill-group having higher than fixed value.

C. Scope of Project:

1) To design an android based system for customers who will enable to search any item and place the orders and generate bill.
2) To design a Dynamic JSP Web Page for remote customers, to be able to order food from home (Home Delivery)
3) To analyse the data of the items ordered by the customer using Apriori Algorithm.
4) To implement a system, which will be able to send SMS and emails to particular customer as per bill group using K-means algorithm for clustering

D. Algorithms:

1) Apriori Algorithm:

1) Association rule generation is usually split up into two separate steps:
   - Minimum support is applied to find all frequent item sets in a database.
   - These frequent item sets and the minimum confidence constraints are used to form rules.

2) Calculate min_support
   - Support = occurrence / total support

3) Compare each item set with minimum support to find frequent item sets.

4) Eliminate any item set that is not frequent.

5) Repeat step 2 and 3 for next combination

6) The algorithm terminates when no further successful extensions are found.

E. K-means Algorithm:

- Step 1: Choose the number of clusters.
- Step 2: Set the initial partition, and the initial mean vectors for each cluster.
- Step 3: For each remaining individual...
- Step 4: Get averages for comparison to the Cluster 1: Add individual’s A value to the sum of A values of the individuals in Cluster 1, then divide by the total number of scores that were summed.
- Step 5: Get averages for comparison to the Cluster 2: Add individual’s A value to the sum of A values of the individuals in Cluster 2, then divide by the total number of scores that were summed.
- Step 6: If the averages found in Step 4 are closer to the mean values of Cluster 1, then this individual belongs to Cluster 1, and the averages found now become the new mean vectors for Cluster 1.
- If closer to Cluster 2, then it goes to Cluster 2, along with the averages as new mean vectors.
- Step 7: If there are more individual's to process, continue again with Step 4. Otherwise go to Step 8.
- Step 8: Now compare each individual’s distance to its own cluster’s mean vector, and to that of the opposite cluster. The distance to its cluster's mean vector should be smaller than its distance to the other vector. If not, relocate the individual to the opposite cluster.
- Step 9: If any relocations occurred in Step 8, the algorithm must continue again with Step 3, using all individuals and the new mean vectors.

If no relocations occurred, stop. Clustering is complete. Again, in case the algorithm never settles on a final solution, it may be a good idea to implement a maximum number of iterations check.

IV. BENEFITS

1) Wastage of papers will be avoided as our implementation is on tablet.

2) Interactive visual hotel menu application that performs analysis of orders using Apriori algorithm and Customer loyalty program using K-means algorithm

V. CONCLUSION

In this system, we present an interactive hotel menu food ordering system to improve customer experience. This system is user friendly, intuitive, more convenient and accurate. In future system scope can be expanded by adding payment gateway into the application itself. This will enable the customer to pay directly from the application using any of the e-payment portals.

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REFERENCES


