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Restaurant Recommendation System Using Customer's Data Analysis

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Abstract:
Selecting a good appropriate restaurant for an event is a common problem for people. There are times when people are stuck in situations where they are completely new to a particular place due to lack of location information. Recommendation system filters and recommends only relevant data to the user using different filtering techniques. Study of users' behavior is increasingly becoming a topic of research because of innovations in technologies. Services such as restaurant recommendation would definitely benefit from such research. The prime objective of this project is to understand, analyze and suggest restaurants on the basis of user behavior and restaurants ranking using Zomato's api. To achieve this, we propose an android and web application which focuses on user's behavior and generate suggestion based on user's location and restaurant popularity for users. Also, the application will notify the user with the nearest restaurants when user is in motion.

Keywords: User's behavior; Restaurant Recommendation; Android; Web application; Zomato api,

I. INTRODUCTION

Due to rapid increase of information on the internet recommendation systems are widely popular nowadays and have been broadly used in research work to filter out the relevant information according to user preferences or past behavior. Recommendation system are applicable in numerous domain such as E-Commerce site, music, movie, book location and Restaurant recommendation. Restaurant recommendation system is a very popular service whose accuracy and sophistication keeps increasing every day. With the advent of wireless communication, Smartphone and internet services like 4G, this has become accessible by every consumer. People can obtain any information they want whenever and wherever by using their mobile phone. Recent years, recommender system has become an effective way to provide people personalized and useful information. In addition to the main features of restaurants (e.g. food style, price, and taste), a good recommendation system should also consider diners' context information. Although there are many context-aware restaurant recommenders, most of them only focus on location information. Some system use only content based filtering whereas some use only collaborative filter. A good recommendation system should consider users behaviour and his location .Users interest can be understood by his way of selecting the filters. For example if he selects the chinese cuisine every time than it states that he likes the chinese restaurants. So by considering the users pattern of selecting filters we can know their interests and recommend them by their sorting behaviour.This is the main factor consider in our system. We also notifies user with nearby restaurants when the user is in motion

II. LITERATURE SURVEY

Score As mentioned in [2] Location, Time, and Preference Aware Restaurant Recommendation Method paper they have proposed a system where the recommendation score is computed by offline and online calculations. The offline calculations are done by considering the user's visiting trends, discovering user's preferences, discovering restaurant's popularity, modeling restaurants' operation times and the online calculation is done by calculating restaurants' distance and generating recommendation. This paper recommends using content-based algorithm which emphasizes on user's data only. [9]In Hotel recommendation based on surrounding environments paper they have evaluated each hotel's surrounding environments with the help of POIs databases, calculated the preferences of the users using their reviews of hotels that they stayed, calculated the similarity between the environment of each hotel and user's preferences and select the top-k hotel to recommend to the user. [1] In Location Based Personalized Restaurant Recommendation System for Mobile Environments paper where did recommendation by using user's foursquare data and by locating the user's location. The system recommends the restaurants to the new user by using his foursquare data. [5]In Social graph-based location recommendation using user's behavior paper, they have extracted the check-ins from Facebook accounts of users and generated trends-based suggestion for users to travel best.[3] In a restaurant recommender system based on user preference and location in mobile environment paper their recommendation system has adopted user's visited restaurants and utilizes location information. Baidu map cloud service is used to implement the proposed recommender system. Our system will recommend restaurant to new user by his location and by restaurant popularity and for old user restaurant will be recommended by his behaviour. we have used both content based and collaborative algorithm. We will develop a web and android application. The system is developed in such a way that there is less user participation where user will be notified with restaurants as per their movements. It also provides flexibility with certain features like cuisines, location of his interest.

III. SYSTEM ARCHITECTURE

The front-end system gives graphical user interface (GUI) where in the customer can register, login, and use the

application for finding restaurants. Backend includes searching the restaurant based on user's location and user's data. Firebase Auth is used for user authentication. Firebase provides real-time database and backend as a service. The user will be recommended with restaurants by considering their location, interests and restaurant's rank. The recommendation is done by using both collaborative and content-based filtering making our system more effective. The user will be notified with the nearest restaurants too while he is in motion. When the user is in motion, i.e., his geo-position changes notably, the system goes online and recommendation module becomes active, retrieving nearby and restaurants and ranking them, based on their properties, according to the scores generated.

IV. PROPOSED SYSTEM

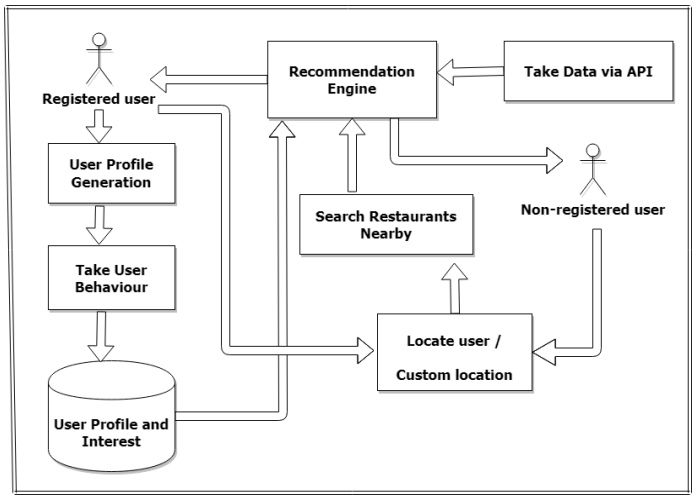

Figure.1. Architecture Diagram

The system architecture in the figure shows that when the user is a new user or a non-registered user he will be recommended with the restaurants based on his location and restaurants popularity. And for the new user the recommendation engine will recommend restaurants based on his location, restaurant popularity and based on the users past behaviour while using the application. Also, when user is in motion, i.e., his geo-position changes notably, the systems recommendation module becomes active, retrieving restaurants by ranking them, based on their properties, according to the scores generated the user will be notified with the restaurant.

Recommendation Module

The recommendation for new user is done by considering the user's location by tracking his location through gps, and by the ratings we got from Zomato's API. The restaurant which is nearby to the user, whose ratings are high will be recommended. For the old user we will consider his behaviour while using the application along with his location and restaurant popularity.

- **Normalization**

$z_i = x_i - 0.4 / max(x)-min(x)$

Where,

$x_i=(x_1,..,x_n)$ x_i i^{th} is the user and z_i is now your i^{th} normalized data .

min(x) = min value of variable **x**

max(x) = max value of variable **x**

If **max(x) = min(x) then** normalized (z_i) is set to 0.5

1. Shortest Distance ($d_{i,j}$)

In table:1 the restaurants distance from the user is represented. Here j are the restaurants and d_j is the distance between user and restaurant

Table.1.

Restaurants (j)	Distance (d_j)
A	6
B	4
C	1
D	5

In Table:2 restaurants are assigned with certain values. The restaurant with the smallest distance is assigned with the higher value.eg The restaurant C is assigned with the value 4 because its distance is 1, smallest distance while comparing with the rest of the restaurants. Then by considering their respective assigned values normalized value is calculated.

Normalizing:

For restaurant A,

$Z_A = (d_{i,j}) = x_j - 0.4 / max(x)-min(x)$

$= 4-0.4/4-1$

Similarly, for B, C, D restaurants the normalizing values are calculated.

Table.2.

Restaurants(j)	Distance (d_j)	Assigning values (x_j)	Normalized value($d_{i,j}$)
C	1	4	1.2
B	4	3	0.8667
D	5	2	0.5333
A	6	1	0.2

2.Overall Restaurants Ratings ($a_{i,j}$)

As shown in Table:3 the ratings of restaurant taken from the Zomato's api is normalized. The range of ratings is [1-5].

Table.3.

Restaurant (j)	Ratings ($a_{i,j}$)	Normalized value ($a_{i,j}$)
A	4	1.8
B	4	1.8
C	3	1.3
D	2	0.8

1. Recommendation score ($p_{i,j}$)

As shown in Table:4, the recommendation score is calculated as:

$p_{i,j} = d_{i,j} * a_{i,j}$

For restaurant A the recommendation score $p_{i,j}$ is :

$p_{i,j}=1.2*1.8$ [From Table:2, Table:3]

$= 2.16$

Similarly, the recommendation score for restaurants B, C, D is calculated. In case if the recommendation score for two restaurants is same so in such situation, the one with the shortest distance will be recommended first.

Table.4.

Restaurant (j)	Recommendation score ($p_{i,j}$)
A	0.36
B	1.558
C	2.16
D	0.4264

Final result

Table.5.

Restaurant (j)	Recommendation score ($p_{i,j}$)
C	2.16
B	1.558
D	0.424
A	0.36

V.RESULTS

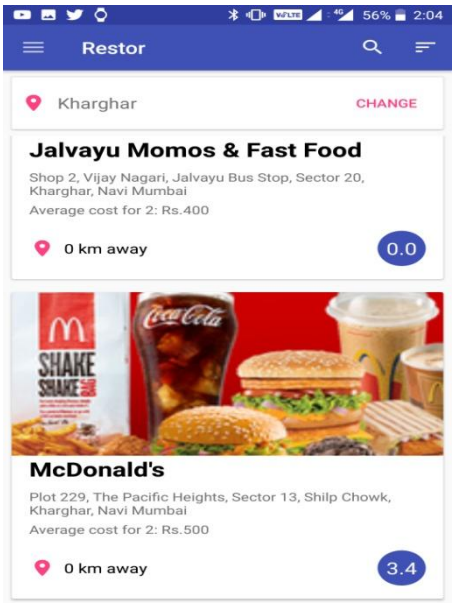

Figure.2.Displayed restaurants according to algorithm

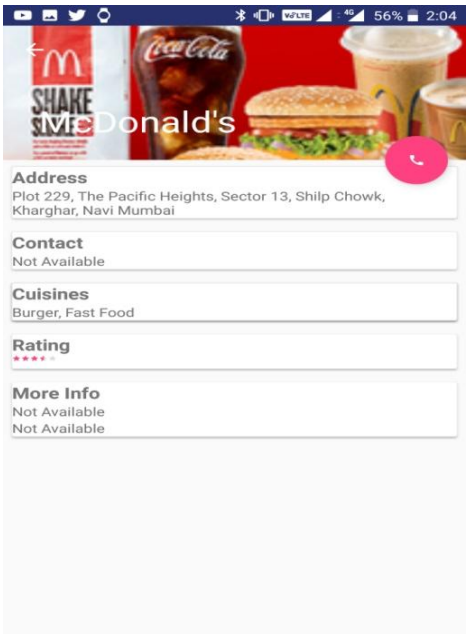

Figure.3.Displayed restaurant details

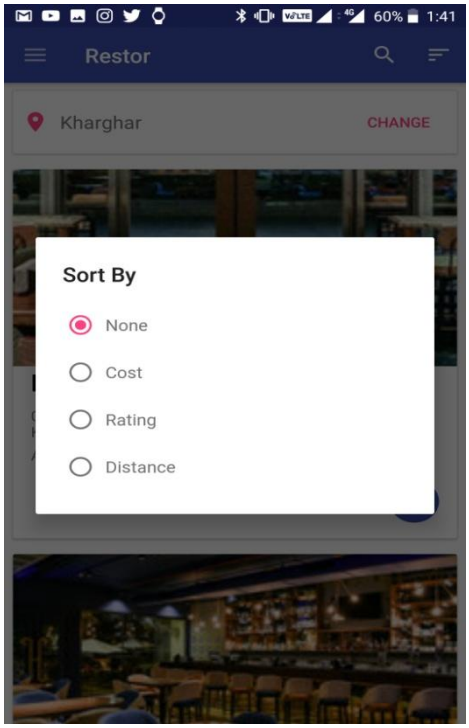

Figure.4. Sorting list

VI. CONCLUSION

As major half of the world is becoming socially active we made efforts to generate recommendations using ratings from Zomato's API, user's location and behaviour of user while using the application. We have used content-based filtering as well as collaborative filtering which makes our system more effective. Also, we have provided a search box for user if he wants to get information of some particular restaurant. We will develop a web application as well as a Android application. Thus, we can conclude that the proposed restaurant recommender system can effectively utilize user's preference, location information, and available ratings of restaurant to recommend the personalized and suitable restaurants for different users. This recommender system adopted a user preference model by using the features of user's visited restaurants, and also utilized the location information of user and restaurants to dynamically generate the recommendation resultS

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