



Recommendation System for Taxi Drivers

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Abstract— *There are many options available for travelling from one place to other within city. One of the popular options is TAXI. Taxi is more popular due to convenience. Though it is more popular, Taxi drivers are not getting that much money in this business. To earn more money they only accept long trips and this creates trouble for passengers. For long trips taxi drivers have to roam around city, while roaming most of the time they do not get passenger for long time. Due to this they do not earn more money. Here is solution for them, i.e. a recommendation system which helps them to find passenger easily and increasing their profit. This is mainly created for taxi drivers but this also can help passengers to find taxi for their trips.*

Keywords— *Global Positioning System (GPS); Recommendation System; Cab.*

I. INTRODUCTION

The Global Positioning System (GPS) is a space-based navigation system that provides location and time information in all conditions [1]. Taxi with GPS System helps to identify their location in city.

Taxicab, also known as a taxi or a cab, is a type of vehicle for hire with a driver, used by a single passenger or small group of passengers, often for a non-shared ride. A taxicab conveys passengers between locations of their choice. This differs from other modes of public transport where the pick-up and drop-off locations are determined by the service provider, not by the passenger, although demand responsive transport and share taxis provide a hybrid bus/taxi mode[2]. A taxi is important transportation type in cities because its not like other public transportation systems. Passenger decides where to go by which rout. But sometimes taxi system also creates some issues like if a passenger is waiting for taxi since long time and one more passenger gets taxi immediately just because they walked few meters. Or sometimes what happen you are trying to catch taxi from your place and while walking towards road from your place you see some vacant taxies are going, you are very near still you can not catch those taxies and after that you have to wait for long time for next taxi. This is very much irritating for passengers. These are some situations where passengers are suffering but in some ways even taxi drivers have same kind of issues. Imagine two taxies are coming from two different lane and one passenger is waiting for taxi, here only one who will come earlier to passenger will get next trip and other one have to wait for next passenger. These are some issues with traditional taxi system.

Everything is changing as time going on. In transportation system there are many changes happened by the time. Now a days we do not have to wait for too long to catch up taxi. A new system of booking taxies for trips is available now. In this latest system we just need to book a taxi from starting location to end point using some applications. Examples of this system are: OLA, MERU, TAXIFORSURE and many more[3].

These are two systems which are currently in use. Traditional taxi system is not that good for passenger but the latest one is very helpful for passengers. But if we consider these two systems from taxi drivers point of view, both are not that much helpful for them to increase the profit.

The solution to these problems is efficient taxi recommendation system. With the help of this application taxi drivers can decide where exactly they are suppose to go to find passenger and passenger can book taxi from their location. And in this way taxi drivers will get more business and hence increase in their revenue. This is main objective of this application.

II. RELATED WORK

In this area some work had done by many researchers. Luis Moreira-Matias et al. [4] proposed an online taxi stand option for taxi drivers in their research. According to that theory if taxi drivers know where they want to stand to get more passenger then waiting time will get reduce by some amount. In that approach only waiting time is reduced by some amount but that not ensures increase in revenue. Here in our case we are suggesting them information related to current trip and upcoming trip too. Another work done in this area by Nicholas Jing Yuan et al. [5]. They proposed a system which helps taxi driver to find passenger and passenger to find place where they can probably get taxi for trip. This system helps passenger to get taxi but not from the location they want. Passenger will get recommendation about location where they can get taxi. In our system we are trying to overcome this issue because it may not be possible for passengers to travel till some other spot to get taxi.

Jing Yuan et al. [6] presented a direction system for drivers to help them to reach particular place as soon as possible. For this they used GPS system to get information about source location of trip and destination of same trip. In our system,

we are also using GPS system to track taxi driver and passengers, this will help in fast service. Y. Yue, Y. Zhuang et al. [7] focused on clustering techniques for identifying locations where taxi is in demand, so that no. of trips get increase resulting in more income. Similar work is done by Junghoon Lee et al. [8] to find out nearest place where vacant taxi drivers can get passenger depending on some previous data.

All the above mention system have their own drawbacks such as some systems are design to help only taxi drivers and on other side some systems are able to help only passengers. But here in our system we are trying to help taxi drivers to increase their revenue. At the same time we are providing some facilities to passengers such as passengers will get notifications about confirmation from taxi driver and waiting time for trip. Though this system is mainly design for increasing profit of taxi driver we are trying to attract passenger towards system by providing facilities. And this will help in increasing passengers for our taxi drivers.

III. PROBLEM DEFINITION

To increase revenue, it is very important to find out how exactly we should work i.e. strategic planning is important part of every profitable business. Taxi driving is also one kind of business. In this case drivers must think about right location for getting passengers. If they know where exactly they should go to get next passenger then their waiting time will get reduce. Once waiting time is reduce by some amount it may be possible for them to take more trips than previously. And ending day with more profit in hand. As well as when taxi drivers are roaming around the city to find passenger of their choice and convenience, they waste fuel and increase pollution. This extra fuel consumption decrease their day to day income by some amount. Keeping this thoughts in mind we are planning to create something that can help taxi driver to increase revenue.

IV. IMPLEMENTATION DETAILS

In our recommendation system we are trying to help taxi drivers to select best trip and with this, the application will also help passenger to get taxi at their doorstep. The system model of recommendation system is as follows:

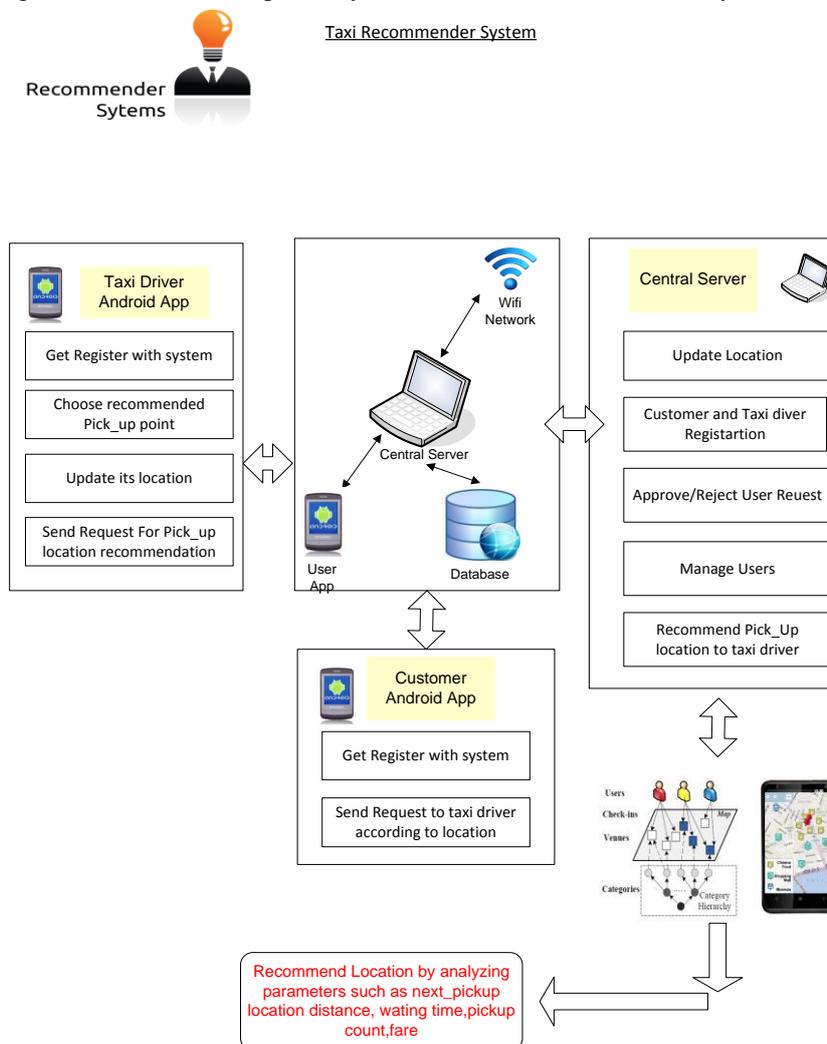


Fig. 1 System Model

V. APPLICATION DETAILS

The application is user friendly, so that anyone can easily handle this. This application help taxi driver to select trip and passenger to book taxi. To use this system every user of system should follow some steps.

Whenever a new taxi driver wants to use this system to increase business, taxi driver need to register on this system. The registration process is very simple. Taxi drive have to enter name, phone no, username and password for this system. After registration with this system taxi driver is all set to use this. Now taxi driver can accept or reject the request from passengers as displayed on phone. Taxi driver can see no. on trips per day, accepted and completed trips per day as well as revenue per day. This will help taxi driver to analyse day to day profit.

Passengers also get some help from this application. They have to register to system and then they can raise request for taxi ride at particular location on time. After Taxi driver’s acceptance ,passenger will get notification related to ride.

VI. MATHEMATICAL MODEL

For this application we are creating some slots to collect taxi drivers and passengers ride data. To collect more data for better results we are making slots of information, i.e. one day one slot.

- The average waiting time of a place is obtained by dividing the total waiting time by the number of times that passengers get on a taxi in that place.
- Distance between two clusters is calculated from fixed size of each cluster. Average revenue of each cluster is calculated by dividing the total revenue of each cluster by the number of occupied trips.
- The transition probability $p(L_{end}/L_{start})$ represents the probability that passengers starting location at cluster L_i and destination location at cluster L_j , is calculated as:

$$P_{ij(start-end)} = \frac{\text{Num}(L_{j-end}|L_{i-start})}{\text{Num}(L_{i-start})} \quad -(1)$$

Where $\text{Num}(L_{i-start})$ is number of trips in which passengers start location is at cluster L_i and $\text{Num}(L_{j-end}/L_{i-start})$ is number of trips in which starting location is at cluster L_i and destination is at cluster L_j . [9]

- The transition probability $p(L_{start}/L_{end})$, which represents the probability of the passengers getting off a taxi at cluster L_i and the taxi driver going to pick up the next passenger at cluster L_j , is calculated as:

$$P_{ij(end-start)} = \frac{\text{Num}(L_{j-start}|L_{i-end})}{\text{Num}(L_{i-end})} \quad -(2)$$

Where $\text{Num}(L_{i-end})$ is number of trips of last passengers destination is at cluster L_i . $\text{Num}(L_{j-start}/L_{i-end})$ is number of trips with passenger whose destination is at cluster L_i after getting into taxi at cluster L_j . [9]

- Expected revenue can also be calculated as follows: The expected revenue of cluster L_i for a taxi driver is given by:

$$r_i = \sum_{\forall j} P_{ij(start-end)} \times r_{ij} \quad -(3)$$

VII. RESULT

screenshots of application created from above mention data are as shown below:

first is the user interface of of application which is seen on taxi driver’s mobile phone is shown in fig. 2

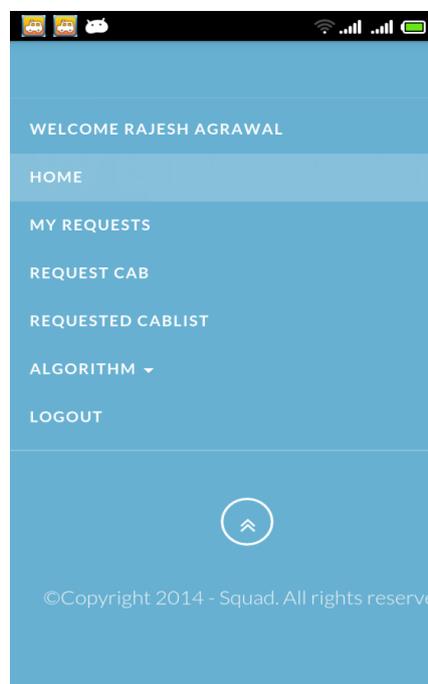


Fig. 2. User Interface on Taxi drivers phone

Next is registration page where taxi driver and passenger can register to system shown in fig.3

The registration form includes the following fields and options:

- REGISTER AS:** Radio buttons for 'Taxi Driver' (selected) and 'Passenger'.
- FIRST NAME:** Text input with 'Rajesh'.
- EMAIL ADDRESS:** Text input with 'Enter email' and an email icon.
- START LOCATION:** Text input with 'Kothrud Depo Pune' and a location pin icon.
- USER NAME:** Text input with 'rajesh'.
- LAST NAME:** Text input with 'agrawal'.
- PHONE NO:** Text input with '9766750000'.
- IMEI:** Text input with '567823456897'.
- PASSWORD:** Text input with masked characters '.....'.
- CONFIRM PASSWORD:** Text input with masked characters '.....'.

Buttons at the bottom right: 'REGISTER ME2!' and 'RESET'.

Fig. 3 Registration phase

Last one is for taxi drivers to know from which cluster they got maximum revenue based on data from their previous days trips. This will help them to decide next days strategy for earning more money. Fig.4 shows two cluster from which taxi driver earn medium and low profit.

Nothing found to display.

CLUSTER 1 (MEDIUM REVENUE CLUSTER)

Sr.No	Start Area Name	No Of Flights	Cluster Distance in KM	Average Revenue	Cluster
8	kothrud depot	16.0	10	200.0	1

One item found.1

CLUSTER 0 (LOW REVENUE CLUSTER)

Sr.No	Start Area Name	No Of Flights	Cluster Distance in KM	Average Revenue	Cluster
10	karvenagar	1.0	7	121.0	0
11	sutar dawakhana	1.0	10	240.0	0
12	fatimanagar	1.0	7	190.0	0
13	roseland	2.0	13	199.0	0
14	gadkari wasti	2.0	8	178.0	0
9	dange chowk	1.0	17	340.0	0

6 items found, displaying all items.1

Fig. 4 Cluster Analysis Based on Revenue Data

VIII. CONCLUSION

In this paper, a system is developed to increase revenue of taxi drivers. From the above data it is clear that if taxi driver will use this system they will definitely get more money than current way of finding passenger because they do not have to waste fuel for finding passenger and also do not need to wait too much time for next passenger at destination location of current passenger. This system showing them many passengers at same time so they are having option of choosing anyone according to their convenience. Though this system is mainly design for helping taxi drivers, system is also useful to passengers.

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