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Customer Friendly Cab Booking System

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Abstract: ***The explosive surge in demand for cabs and taxi services in comparison to public transportation owing to its convenience and safety have recently led to the invention of Internet based methods of booking private transportation. These methods of cab reservation and booking have been revolutionized with the release of internet applications which enable customers to choose among a variety of options with even access and confirmation of the booking in mere seconds. Owing to the wide fame of these applications and competition among the drivers and the different cab booking applications is one of the biggest issues. The major reason for a passenger to prefer one app over the other is the affordability and the reasonability of the suggested costs per trip. Majority of the current cab booking mobile applications in India, use some values of variables defined by the user while booking a cab, according to which the algorithm decides on a fare and chooses a driver. While most present cab booking software use some specific varying variables, a novel approach of using only the distance between the driver and passenger is chosen, the rest of the variables are optional while suggesting a driver. The results produced by this novel method will not be highly customer-defined variables-specific, it will be subject to change base only on the distance. Previous trends in consumerism of cab booking software's and applications have been studied on the basis of research published in multiple peer-reviewed journals. The idea suggests how instead of allowing only the algorithm-selected option, what advantages the concept of leaving the choice up to the customer and the driver would have, with only an optional suggestion given by the algorithm. It is programmed to optimize both end users' experience while at the same time providing a certain amount of profit to the software owning company and the driver while still catering to the passenger's expectations in terms of safety, comfort and speed of response. The proposed solution will help us to compare the prices between different cab booking applications like Uber and Ola which are majorly used by the consumers in India for cab booking. This idea would tackle the problem of having multiple applications for cab booking since the customer will not have to switch between multiple applications. This is a one stop solution which will compare the booking prices offered by different cab booking applications, the user will be able to choose the best, fair and cheapest cab option for their journey.***

Keywords: taxi booking, customer friendly, cab booking, drivers, cab booking application, comparison of fares.

I. INTRODUCTION

The Customer Friendly Cab booking System is a software based system which will help to check and compare prices offered by many other cab booking applications like Ola, Uber and local Taxi drivers (mostly who have not associated with any of the online booking applications). This proposed solution will help to find out the best, fair and cheapest cab booking option for its user while also giving the drivers not associated with an application a chance of receiving the ride request. The user has to enter the pickup location (the location from where the journey commences) and the destination or the dropoff location (address). The application will calculate the distance between the pickup location and destination location based on the latitudinal and longitudinal coordinates. The proposed app will display the prices offered by the different cab booking applications and the local cab fares. Customers using the application can then compare the ride fares and take a more informed decision accordingly.

II. LITERATURE REVIEW

A research based on the rising number of empty, non-passenger taxis in the current times, relates the problem to the spatial distribution of taxis.[1]

The areas where more taxis are required are called hotspots. The paper suggests a solution to tackle the problem with a new algorithm which scans these hotspots during different times of the day, during days during a week, during weekends and observes trends in these information sets. Based on these trends, the requirement of a taxi is notified to a nearby empty taxi thus reducing the number of vacant taxis.

Another, similar research chooses to approach the problem of taxi assignment to the customer by only using the distance as a deciding factor[3].

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Two algorithms each for distance calculation and taxi assignment were used, Euclidean distance and the shortest path using GPS-based routing and the Greedy and Hungarian algorithms for taxi assignment, much like the TaxiScan[1] algorithm, it proves to be efficient after being evaluated by a simulator which is an approximate copy of the urban transportation system. The paper[3] only used the UMMC university locality as its trial area.

A research similar to ours which also discusses comparison between fares, based in India, studies how the rise of cab hailing applications like Ola, Uber and Meru can be used as a tool to predict what fare will be suggested by each application and based in these results, using linear regression and other predictive models the most suitable option can be suggested[4]. They also take into consideration the benefits provided by each application.

Clustering is a widely used technique for classification. A research based on the usage of clustering so as to determine the optimal route to be taken by a taxi uses clustering and the data field energy to accurately choose the route[5]. It aims to suggest a solution for picking up maximum passengers without much driving on the drivers part, or waiting time for the consumers on urban roads. Based on a large amount of training data, the solution proposed by this research has been found to hold good against data which has made traditional clustering models fail.

Another research also using clustering discusses the idea of using the method of studying this spatio-temporal distribution of requests made by the passengers and then using the clustering algorithm to assign the taxis to a group of customers requesting a ride in the area[6]. It uses two algorithms, the greedy algorithm and the approximation algorithm for taxi dispatch and heuristic for online taxi assignment. The cities under observation had been San Francisco, USA and Porto, Portugal.

A third research also concentrating on clustering as its basis for classification uses the Fermi model in addition to the clustering algorithm to determine the best course of dispatch of taxis in urban cities[7]. It also needs the data specifying taxi hotspots in the city. A fourth research concentrating on the density-based clustering algorithm, classifies the hotspots based on the number of taxi passenger hotspots [8]. It overcomes the sensitivity of classic clustering algorithms to incorrect input-output sets and uses simple linear models such as LARS, LASSO and ensemble model. This example of hotspot and forecasting for taxi demand requires only the basic regression models. This model considered the sociodemographic data of the city of Nanjing and Beijing and implemented the regression models over it. Based on the idea of using linear regression models and ensemble models, a research[9] proposes three models for a solution to reduce response times of taxi dispatch from the demand of the customer while maintaining low costs. Different variables like the environmental factors are considered in addition to the spatiotemporal distribution of the demand. It uses combined covariates model (CCM) as one of its models and declares that this model performs much better than than the other two models described in the paper. A newer, more widely accepted idea of taxi sharing and the issue people face while sharing a taxi is described in this new research[10]. The three steps that make up the taxi sharing process were reviewed, i.e., matching, routing, and pricing. It proposes a solution to solve the problems of matching the taxi to its customer, the route to be taken by the taxi driver to receive maximum profit and the third issue of pricing: how to lower the prices to be paid by each customer and how to maximize the profit of the company and the driver. On the issue of rental services provided by cab services in India, an algorithm called AHP or Analytical Hierarchy Process methodology is used to understand the patterns of which factors are agreeable to the customer and to understand the logic of the consumers as a majority[2].

[11] is based on the business model of taxis. It suggests how traditional taxis can be improved for better customer experience because of the rising competition new online car hailing services have given rise to. It focuses on the SCP theory which essentially is a model for improvement of a product or service.

III. METHODOLOGY

We have used co -ordinates obtained from Google map to find the distance between pickup location and drop off location of a customer. The customer will give the location of source and destination based on that the coordinates coordinate will be identified. In order to calculate the distance we are using haversine formula. This particular distance will be taken by as reference and the fares of various cab services will be calculated.

$$a = sin^2\left(\frac{dlat}{2}\right) + \cos(lat1) * \cos(lat2) * sin^2\left(\frac{dlon}{2}\right)$$

$$c = 2 * atan2\left(\sqrt{a},\ \sqrt{(1-a)}\right)|$$

$$d = R * c \text{ (where R is the radius of the Earth, mean radius } = 6371 \text{ km)}$$

where, $dlon = lon2 - lon1$

$dlat = lat2 - lat1$

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Haversine formula calculates how far or close the two points are in terms of their coordinates. We have used Google maps API to fetch the coordinates of the source and destination points. When the respective parameters are updated the fare of the cabs such as normal taxi,ola taxi,uber taxi will be updated.

IV. IMPLEMENTATION

In this paper we have proposed the solution for the cheapest in price cab booking system. The "Customer Friendly Cab Booking System" is used for comparing the prices offered by various cab booking companies like Ola, Uber, etc. This will help the customers to find the cheapest ride possible. The proposed system is implemented using an interface of android studio on which pages of Dart, a programming language with Flutter, is an user-interface software which is freely publicly available. It consists of a developer kit (SDK) where debugging, compiling and executing is easy to use. SDK stands for software developer kit. Libraries and modules which implemented Google Maps were also used to add the features of maps in the application for the purpose of adding the source and drop off location for the customer.
The main components of this interface are - Dart, Flutter, Google maps.

A. Dart

Dart is an extension used on a page like Python, it is also a programming language where the latter has the extension .py at the end of the file name. It was developed by a software company: Google. This programming language can be used to develop a range of websites and mobile applications with just as ease and accessibility as any other programming language. It can also be used to develop server and desktop applications. Similar to the C programming language, it is also an object oriented programming language. It has provisions for garbage collection with C style syntax.



FIGURE 01- Dart logo

B. Flutter

Flutter is also an open source interface. It helps developers to make a user-database interface. It was, similar to Dart, also created by the software company: Google. It is used to developed cross platform applications like iOS, MACos, etc. It too requires libraries, modules and other add-ons to make it complete more complicated actions and cover a larger base of functions. In some cases, not many modules are required to carry out a function.



FIGURE 02: Flutter logo

```
Calculate distance using Haversine formula
final double dLat = _toRadians(dropLat - pickupLat);
final double dLng = _toRadians(dropLng - pickupLng);
final double a = sin(dLat / 2) * sin(dLat / 2) +
   cos(_toRadians(pickupLat)) *
      cos(_toRadians(dropLat)) *
      sin(dLng / 2) *
      sin(dLng / 2);
final double c = 2 * atan2(sqrt(a), sqrt(1 - a));
final double distance = earthRadius * c;
const exp = 15;
```

The above is a method being implemented for finding the distance between two points based on their latitudinal and longitudinal coordinates.

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V. RESULTS AND DISCUSSION

Thus the planned system has been implemented using Flutter 5.0 - Dart. The user interface consists of a map on which the user has to select the pickup location. After successfully entering the pickup location, users have to select the dropoff location. The app will calculate the distance between the pickup location and destination or dropoff location. An output will be generated by app which mentions the price offered by Ola, Uber, and by local taxi

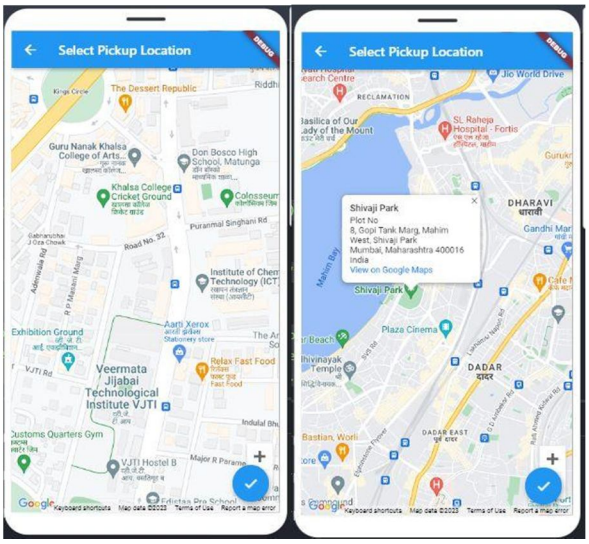
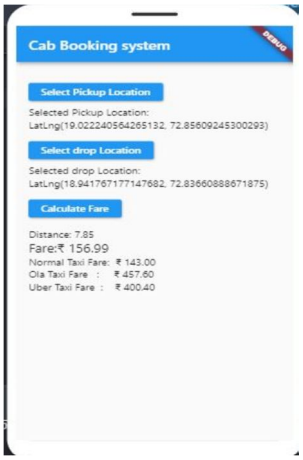


FIGURE 03: Map View of Application Implemented, choosing a drop off location

The different price for the same location by different apps is calculated and the customer can evaluate the best option for themselves.



Distance (in km)	Local Taxi Fare	OLA Fare	UBER Fare
1.84	₹37	₹171	₹149
10	₹143	₹457	₹400
25	₹467	₹874	₹837
15	₹261	₹835	₹730

TABLE 01: An example of fare comparison between applications and a local taxi or cab fare

VI.CONCLUSION AND FUTURE SCOPE

It has been observed that the idea of comparison of fares from different applications increases exposure of customers to the range of prices available. The idea of introducing even non-software prices, i.e. drivers not registered with an application increases the amount of drivers available. It has the probability of reducing high costs during peak time since the fare for cab drivers not registered with an application will always be constant. Supply of drivers for a high number of ride requests can be catered to with this idea.

Like with every other feature, this feature too could be implemented along with the majority already implemented real-world applications. This idea of comparison between applications could act as an add on feature. More drivers can be reached by the user. Even drivers not registered with an application will be given the same preference as the ones registered with an application. A novel approach to handling the overpriced fares during peak hours is to use bargaining as an option. The software could suggest the minimum and maximum fare, while the customer can compare and choose between multiple drivers available in the locality.

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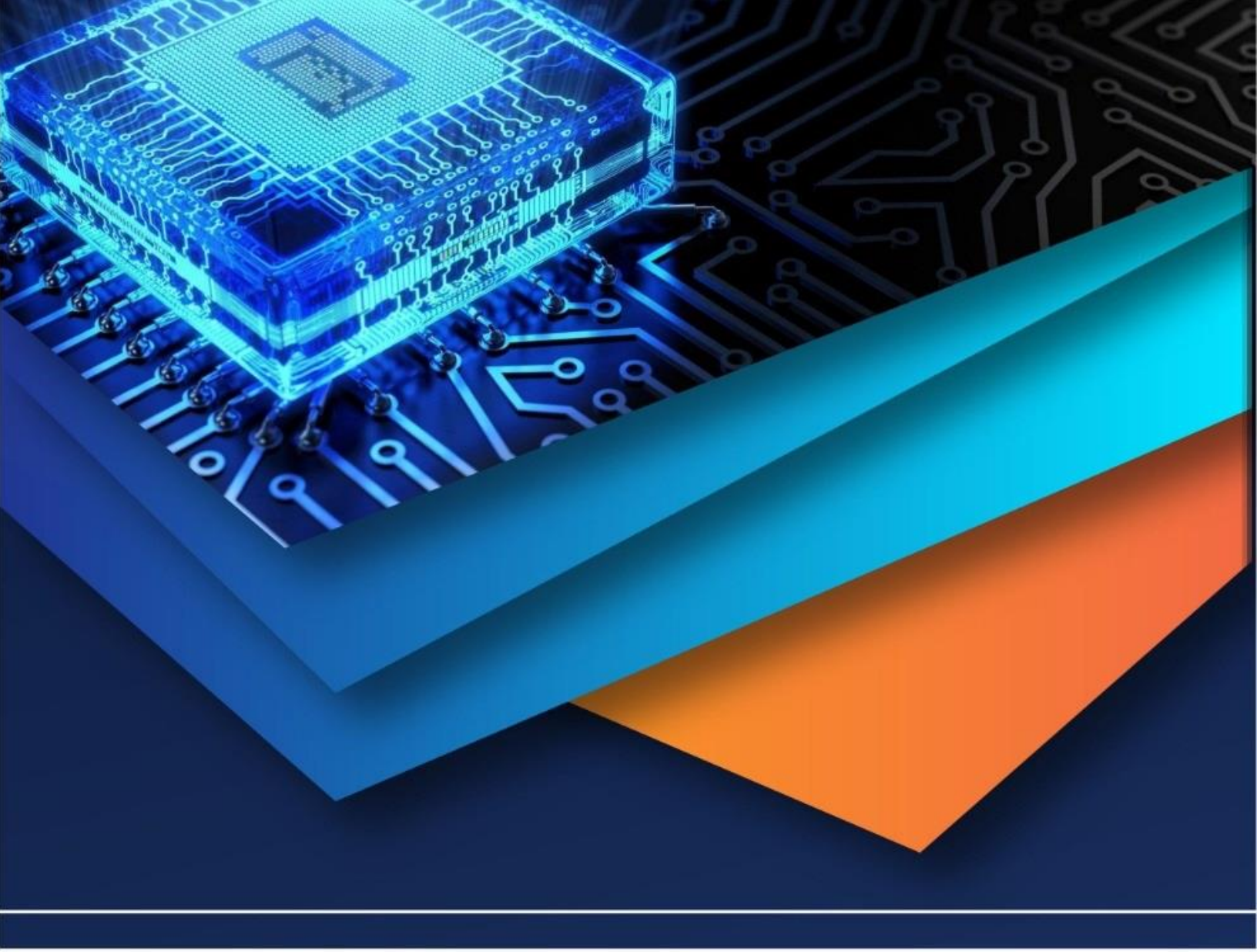
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