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Real-Time City Taxi Ride Sharing

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ABSTRACT

This Project is designed to create a Real-time taxi ride Sharing Application. It works by accepting a real-time ride requests from the passengers sent through smartphones and schedules proper taxis to pick them up via ridesharing. In this application, we have introduced the concept of offer and seek request through which the rider will seek the request and driver will offer the request to the riders/passengers. The monetary constraints of the application are to provide benefits for both passengers and taxi drivers, passengers pay less amount compared with no ridesharing and get compensated if their travel time is lengthened due to ridesharing, taxi drivers will make money for all the detour distance due to ridesharing. This paper gives an overview of the taxi-sharing service, key algorithms for dynamic rideshare matching processes.

Keywords: Taxi-sharing, real-time taxi sharing, ride sharing.

I. INTRODUCTION

Taxi play a very significant role in daily basis. Taxi plays important role in transportation between public and private sectors, delivering thousands and millions of people to different locations in urban areas. However, many people spend a long time on roadsides due to much higher demands of taxi than the number of taxis in peak hours of major cities. Increase in the amount of taxis for the people appears to be a clear solution. But it carries some non-good effects, e.g., bringing more traffic on the surface of the road thus, resulting more energy consumption, and it also cause reduce in taxi driver's income (considering the fact that demands of taxis would be lesser than number of taxis during off–peak hours).To deal with this issue, we propose a real time taxi-sharing application that receive taxi passengers' real-time ride requests sent from smartphones and schedules proper taxis to pick up them via taxi-sharing with time, capacity, and monetary constraints (the monetary constraints guarantee that passengers pay less and drivers earn more compared with no taxi-sharing is used).

In this application, taxi drivers autonomously determine when to join and leave the service using an App installed on their smartphones. Using the same App, passengers submit their real-time ride requests. Each ride request consists of the origin and destination of the trip and based on the distance travelled by them the cost is computed. If the taxi is ridesharing then, the amount is distributed amongst the passengers.

II. OBJECTIVE AND SCOPE

- ✓ It provides real time taxi ride sharing at low cost or reasonable cost.
- ✓ Reducing the traffic ratio i.e. minimum traffic on the road.
- ✓ Transportation facility will be available everywhere.
- ✓ Safety of Rider /person.

III. PROBLEM DEFINATION

Taxi is an important transportation mode between commercial and private transportation, delivering thousands of millions of passengers to different locations. However, the number of taxi is much less than its demand in peak hours of major cities, due to this many people stand at roadside waiting for the taxis. Multiple taxi statues can satisfy a ride request, but the goal is usually to find the optimal taxi. A variety of functions have been used in the existing literature, where a cost function has been combined with multiple factors such as travel distance increment, travel time increment and passenger waiting time, is the most common.

IV. AD-HOC TAXI RIDE SHARING

The problem with the earlier taxi ridesharing system was that people spend more time on road for taxi and their might be some chances of not getting a taxi for travelling. Increasing the taxi ratio seems an obvious solution but, it advances the road traffic, increase the energy consumption and create a non-good environment. Arrival of the taxi at peak time is also a taxi sharing system problem, to address these issues we have created a real-time taxi ride sharing application that accepts passengers real-time ride requests sent from smartphones and schedules proper taxis to pick up them via taxi sharing with time, capacity, and monetary constraints. Though real-time taxi sharing has been studied in several previous works, our work demonstrates three major advantages.

First, the problem definition of this application is more realistic by considering three different types of constraints. Some existing works did not consider time window constraints and none of these previous works explicitly monetary constraints. Second, we analysed the computational cost of each component of the application, proposing a spatiotemporal index and taxi searching algorithm, which significantly improve the system efficiency. Third, simulation results presented here is more convincing as we evaluated our system based on the real data and at a much larger scale than most previous works did.

V. SYSTEM ARCHITECTURE

The System consists of two participants - Driver and Rider. Both of them can access the ride sharing system through the ride sharing application installed in their mobile device. To participate in the ride sharing, both of them have to register for the first time using their mobile application. This registration and login process is affected by the registration service and the user account data is stored in the Accounts profile database. Apart from the login data, the accounts profile database also comprises of other details such as the user address, Phone no, number of seats and the car type in case of a driver.

The process begins with the rider registering his ride through the mobile application. The ride registration data comprising of source, destination address and start time of the ride. The rider after login searches for the ride through his mobile application. The ride request is processed by the ride sharing service. The filtered search result is presented to the rider along with the driver details and cost. After the rider selects a driver, rider request is passed on to the driver's mobile application by the ride sharing service.

After the driver's approval, driver send confirmation message on rider's mobile phone and rider are enabled to communicate through the ride sharing application.

Once the ride starts, ride tracking service starts tracking the ride using the GPS data from the user's mobile device. This data is temporarily stored in the accounts profile database to provide assistance in case of an emergency. After the completion of the travel,

rider provides the rating and comment for the driver which is processed by the riding service and stored along with driver's profile data in the accounts profile database. The cost of the of rider is calculated based on the distance and cost propose by driver.

VI. IMPLEMENTATION DETAILS

Algorithms

1) Taxi Searching Algorithm

A dual-side taxi searching algorithm is used to determine the optimal list of taxis which can satisfy the rider's request. Since the algorithm bases its approach on both origin and destination the result set returned is optimal. The searching and the scheduling are done on the road network by partitioning the network into grids. Each grid holds a list holding a timestamp which is needed in order to determine the location of taxi and the route. The taxi searching module quickly selects a small set of candidate taxis with the help of the spatio-temporal index.

A. Single-Side Taxi Searching

Suppose there is a query Q and the current time is tcur: g7 is the grid cell in which Q:o is located. g7's temporally-ordered grid cell list g7 Fig. 1. g7 is the first grid cell selected by the algorithm. Any other arbitrary grid cell gi is selected by the searching algorithm if and only if Eq. (1 holds, where ti7 represents the travel time from grid cell gi to grid cell g7. Eq. (1) indicates that any taxi currently within grid cell gi can enter g7 before the late bound of the pickup window using the travel time between the two grid cells find all grid cells that hold Eq. (1), the single-side searching algorithm simply tests all grid cells in the order preserved list g7 finds the first grid cell gf which fails to hold Eq. (1). In Fig. 2, grid cell g3, g5 and g9 are selected by the searching algorithm.

$$ti7 \text{ Þ } tcur \_ Q.pw.l \quad (1)$$

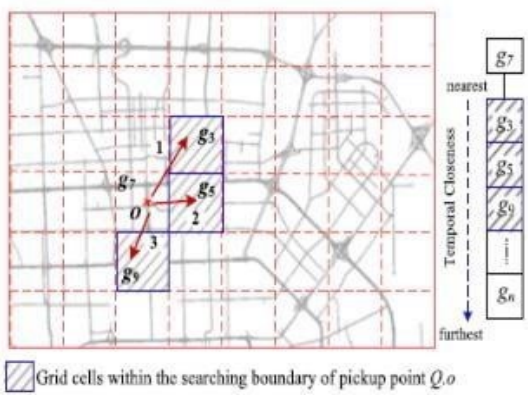


Figure 1. Single side taxi searching algorithm

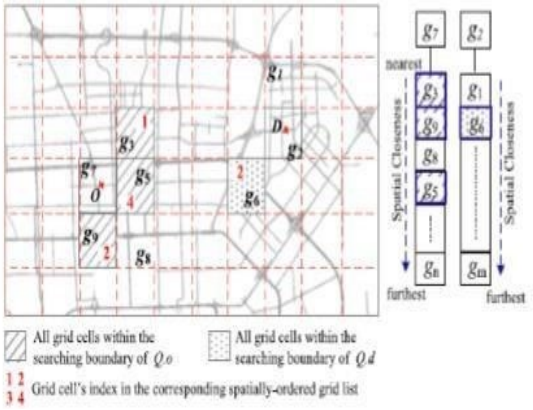


Figure 2. Dual side searching algorithm

B. Dual Side Taxi searching Algorithm

The dual-side searching is a bi-directional searching process which selects grid cells and taxis from the origin side and the destination side of a query simultaneously. Consider the ride request illustrated in Fig. 2 where g7 and g2 are the grid cells in which Q:o and Q:d is located respectively. Squares filled with stripes stand for all possible cells searched by the algorithm at Q:o side. These cells are determined by scanning the temporally-order grid cell list of g7 which holds Eq. (2) is a candidate cell to be searched at the origin side. Eq. (2) indicates that any taxi currently within grid cell gi can enter g7 before the late bound of the pickup window using the latest travel time between the two grid cells.

$$tcur + tj2 <= Q.dw.1 \quad (2)$$

$$tcur + tj2 <= Q.\ dw\ .\ 1 \quad (3)$$

Squares filled with dots indicate the candidate grid cells to be accessed by the searching algorithm at Q:d side select all grid cells which holds Eq. (3), which indicates that any taxi currently in gj can enter the

g2 before the late bound of the delivery window. In this example, g6 is the only satisfying grid cell as shown by Fig. 2.

2)Taxi Searching Algorithm

With given set of taxi statuses retrieved for a ride request by the taxi searching algorithm, the purpose of the taxi scheduling process is to find status which satisfies the minimum travel distance increase. All possible ways of insertion can be created by reordering the points in the current schedule, subject to the precedence rule, i.e. any origin point precedes the corresponding destination point (we refer to this step as the schedule reordering thereafter), insert origin into the schedule insert destination into the schedule.

Modules

There are four main modules in this paper and they are as follows

Module1 (Registration module)

Creation of the account is the first phase of this project. The user has to give the complete details about him/her to create an account.

Module2 (Authentication module)

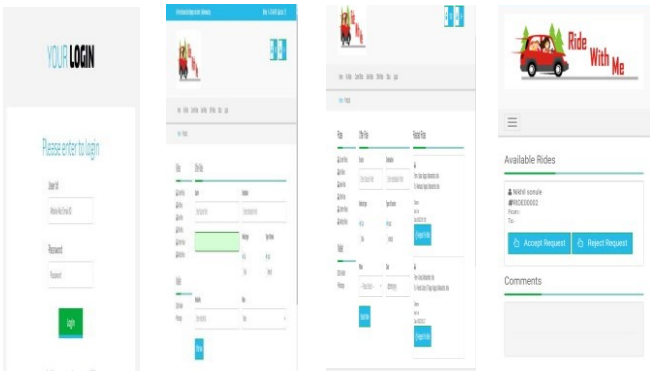
Once the user has submitted his details, his/her information is accepted and they can log-in with the valid username and password. It checks for the unauthorized person and does not allow the unauthorized person to access the data.

Module3 (Accepting and Cancelling ride request)

After providing the necessary details such as name, phone number, email address, etc, the user will be able to get the ride sharing facilities. After validation, the user request will get accepted. For cancelation, the user must be login to cancel the request or ride share.

Module4 (Payment module)

The amount paid through online must be secure and it should be provided by the authorized user. The amount can be paid through online Payment or cash.

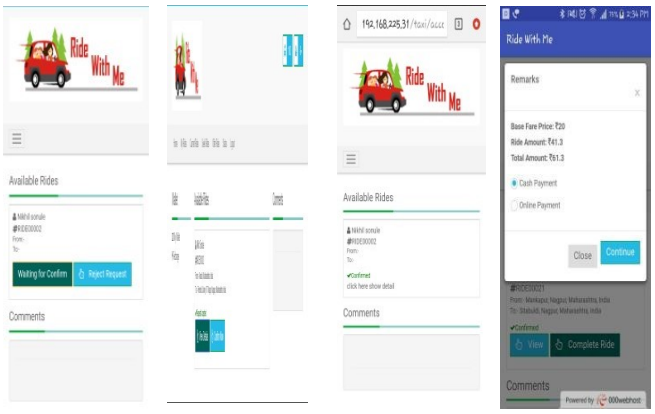


(a) Login page (b) Offer Ride (c)Seek Ride (d) confirmation of ride

Figure 3

The first page of the application is Login page, we have to insert some necessary details like our email id & password. If suppose new users are trying to log in firstly they have to create the new id by clicking upon sign-up option which is at bottom position, then within fraction of seconds the sign-up page will open into the application.

After the successful login of the user as a driver or a rider, the driver will offer rides to the passengers and the passengers will seek the rides offered by the riders. The offer request consists of the source address, destination address, Vehicle type (car or bike), the type of service such as locality or intercity and the Vehicle number. The seeker will seek the ride by entering the essential details such as source address, destination address, vehicle type and the dates. The related rides are also available to the riders/passengers.



(e)waiting for ride (f) confirmation ride from driver end (g) confirmation of ride from both end (h)payment page

Figure 4

The figure 4(d) show the ride request send by rider to driver. The riders request will pass on to the driver and the driver will conform the request if the driver is near-by the passenger otherwise it will forward it to another driver. After the conformation, the driver will pick-up the rider and charge the cost based on the distance. The rider will pay the amount through online or by cash on delivery.

VII. CONCLUSION

Real time taxi-ride sharing application is very effective way to minimize pollution and the congestion of vehicles in cities. Travelling can be done in eco-friendly way. It provides an opportunity to meet new people on daily basis. System saves the total travel distance of taxis when delivering passengers.

Our system can enhance the capability of delivering passengers and can satisfy their needs. The system can also save the taxi fare for each individual rider while the profit of taxi drivers does not decrease compared with the case where no taxi sharing is conducted.

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