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ShareMyRide: Real-Time City-Scale Taxi Ridesharing

Divya Bhosale¹, Bhoopalsinh Musale²

Student, Department of Information Technology, Vidya Pratishthan's Kamal Nayan Bajaj Institute of Engineering and Technology, Baramati, India^{1,2}

ABSTRACT: The proposed system is a taxi ride sharing system, where it accepts taxi rider's real time ride request sent from smart phones and according to that schedules taxi to pick them up. Then the system schedules proper taxis to pick the riders via ride sharing. Ride sharing is according to time, space and monetary constraints, where monetary constraints include incentives for both riders and drivers. Riders will not pay more compared with no ridesharing also taxi driver does not earn less than without taxi sharing. Benefits of such system are saving energy consumption and satisfying commute of people. Taxi drivers and riders use the same smart phone app. The geographical positioning system (GPS) is used to track the current position of the taxi. This system is mobile cloud architecture based taxi sharing system. So cloud first finds candidate taxis according to spatio-temporal index and schedules them using taxi scheduling algorithm for a particular ride request with minimum travel distance.

KEYWORDS: Ride request, taxi status, spatio-temporal index, pickup window, delivery window.

I. INTRODUCTION

Taxi has been one of the most important mode of travelling. Taxi demands are usually much higher than the number of taxis, this results that many people spend a long time on roadsides before getting a taxi. Increasing the number of taxis seems to be a solution. But this brings some negative effects, like, additional traffic on the road and more energy consumption, and decreases taxi drivers income. To address this issue Real-time taxi ridesharing system is proposed, that schedules proper taxis for the rider's real time ride request that are sent from the smartphones. The system saves energy consumption and also eases traffic problems. Also increases the driver's income and decreases the rider's fare. In contrast to existing ridesharing system, real-time taxi ridesharing is more challenging because both ride requests and positions of taxis are highly dynamic and difficult to predict. First, the passengers are often lazy to plan for a taxi trip in earlier, and usually the riders submit a ride request shortly before the departure. Secondly, a taxi constantly travels on roads, picking up and dropping off passengers. Its destination depends on that of passengers, while passengers could go anywhere in a city. In this system we are proposing a taxi sharing system based on mobile cloud architecture that accepts passengers real-time ride requests sent from smartphones and schedules proper taxis to pick up them via taxi-sharing with time, capacity. The cloud integrates multiple important components like taxi indexing, searching and scheduling. It consists of a spatio-temporal indexing structure, a taxi searching algorithm and a scheduling algorithm. The money related constraints in ride-sharing are considered and modelled. These constraints provide rewards for passengers as well as taxi drivers. Passengers will not pay more as compared with no ridesharing.

II. LITERATURE SURVEY

- 1. Real-Time City Scale Taxi Ridesharing:** Here a taxi-sharing system is developed that accepts taxi passenger's real-time ride requests sent from the smartphones and proper taxis are scheduled to pick up them via ridesharing, considering time, capacity, and monetary constraints. The monetary constraints provide incentives for passengers and taxi drivers where passengers will not pay more compared with no ridesharing and get compensated if their travel time is increased due to ridesharing. Also taxi drivers will make money for

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all the travelled distance due to ride sharing. While such a system is of significant social and environmental benefit, e.g., saving energy consumption and satisfying people commute. To this end, a mobile-cloud architecture based taxi-sharing system is developed. Taxi riders and taxi drivers use the taxi-sharing service provided by the system via a smart phone app. The Cloud first finds candidate taxis quickly for a taxi ride request using a taxi searching algorithm supported by a spatio-temporal index. A scheduling process is then performed in the cloud to select a taxi that satisfies the request with minimum increase in travel distance. The proposed system demonstrates its efficiency, effectiveness and scalability.

2. **An Exact Method for the Car Pooling Problem Based on Lagrangean Column Generation:** Carpooling is a transportation service organized by a large company which encourages its employees to pick up colleagues while driving to or from work to minimize the number of private cars travelling to or from the company site. The car pooling problem consists of defining the subsets of employees that will share each car and the paths the drivers should follow, so that sharing is maximized and the sum of the path costs is minimized. The special case of the car pooling problem where all cars are identical can be modelled as a Dial-a-Ride Problem. They proposed an exact and a heuristic method for the car pooling problem. The exact method is based on a bounding procedure that combines three lower bounds derived from different relaxations of the problem. A valid upper bound is obtained by the heuristic method, which transforms the solution of a Lagrangean lower bound into a feasible solution. The computational results show the effectiveness of the proposed methods.
3. **T-Share: A Large-Scale Dynamic Taxi Ridesharing Service:** Taxi ridesharing can be of significant social and environmental benefit, e.g. by saving energy consumption and satisfying people commute needs. They define the dynamic ridesharing problem and propose a large-scale taxi ridesharing service. It efficiently serves real-time requests sent by taxi users and generates ridesharing schedules that reduce the total travel distance significantly. In this method, we have proposed a taxi searching algorithm using a spatio-temporal index to quickly retrieve candidate taxis that are likely to satisfy a user query. A scheduling algorithm is then proposed. It checks each candidate taxi and inserts the query's trip into the schedule of the taxi which satisfies the query with minimum additional incurred travel distance. To tackle the heavy computational load, a lazy shortest path calculation strategy is devised to speed up the scheduling algorithm. By learning the spatio-temporal distributions of real user queries from this dataset, they built an experimental platform that simulates user real behaviours in taking a taxi. Tested on this platform with extensive experiments, their approach demonstrated its efficiency, effectiveness, and scalability.
4. **A Fast Heuristic For Solving A Large-Scale Static Dial-A-Ride Problem Under Complex Constraints:** This paper presents a heuristic, which concentrates on solving a large-scale static dial-a-ride problem bearing complex constraints. In this heuristic, a properly organized local search strategy and a diversification strategy are used to improve initial solutions. Then the improved solutions can be refined further by an intensification strategy. The performance of this heuristic was evaluated by intensive computational tests on some randomly generated instances. Small gaps to the lower bounds from the column generation method were obtained in very short time for instances with no more than 200 requests. Although the result is not sensitive to the initial solution, the computational time can be greatly reduced if some effort is spent to construct a good initial solution.
5. **Where To Find My Next Passenger? :** This system presents a recommender for taxi drivers and people expecting to take a taxi, using the knowledge of:
 - 1) Passengers mobility patterns
 - 2) Taxi drivers pick-up behaviours learned from the GPS trajectories of taxicabsFirst, this recommender provides taxi drivers with some locations (and the routes to these locations), towards which they are more likely to pick up passengers quickly (during their routes or at the parking places) and maximize the profit. Second, it recommends people with some locations (within a walking distance) where

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they can easily find vacant taxis. In their method, they propose a parking place detection algorithm and learn the above knowledge (represented by probabilities) from trajectories. Then, we feed the knowledge into a probabilistic model which estimates the profit of a parking place for a particular driver based on where and when the driver requests for the recommendation.

III. RESEARCH METHODOLOGY

Problem Definition: A fixed number taxis are travelling on road network and a sequence of ride request are arriving. These ride requests are served according to first come first serve basis. The taxi which satisfies all constraints is selected to serve the request. The main aim of proposed approach is to schedule proper taxi to the ride requests using real time taxi sharing.

Project Scope: A system based on mobile cloud architecture, which enables real-time taxi-sharing in a practical setting. Taxi drivers independently determine for when to join and leave the service using an app installed on their smartphones. Passengers submit real-time ride requests using the same app. Each ride request consists of the origin and destination of the trip, time windows constraint when the passengers want to be picked up and dropped off. On receiving a new request, the Cloud will search for the taxi which minimizes the travel distance increased for the ride request and satisfies both the new request and the trips of existing passengers who are already assigned to the taxi, subject to time, capacity, and monetary constraints. The updated schedules will be given to the corresponding taxi drivers and passengers. To existing carpooling systems our proposed ridesharing model considers more practical constraints which include time windows, capacity, and monetary constraints for taxi trips. The system proposes efficient searching and scheduling algorithms that are capable of allocating the right taxi among tens of thousands of taxis for a query in milliseconds. A spatio-temporal indexing structure, a taxi searching algorithm, and a scheduling algorithm are used. Supported by the index, the two algorithms quickly serve a large number of real-time ride requests while reducing the travel distance of taxis compared with the case without taxi-sharing.

Project Objectives:

- To enable ridesharing for riders.
- To increase drivers income.
- To decrease fuel consumption.
- Also minimize the road traffic congestion.

Project Constraints:

The aim of the taxi sharing problem is to dispatch taxis to ride requests, with respect to certain constraints. A taxi status V , satisfy a ride request Q if following constraints are met.

1. **Vehicle capacity constraint:** The number of riders that sit in the taxi does not exceed the number of seats of a taxi at any time.
2. **Time window constraints:** All riders that are assigned to V should be able to depart from the origin point and arrive at the destination point during the corresponding pickup and delivery window, respectively.
3. **Monetary constraints:** These constraints provide certain monetary incentives for both taxi drivers and riders. That is, a rider does not pay more than without taxi-sharing; a taxi driver does not earn less than without taxi-sharing when travelling the same distance.

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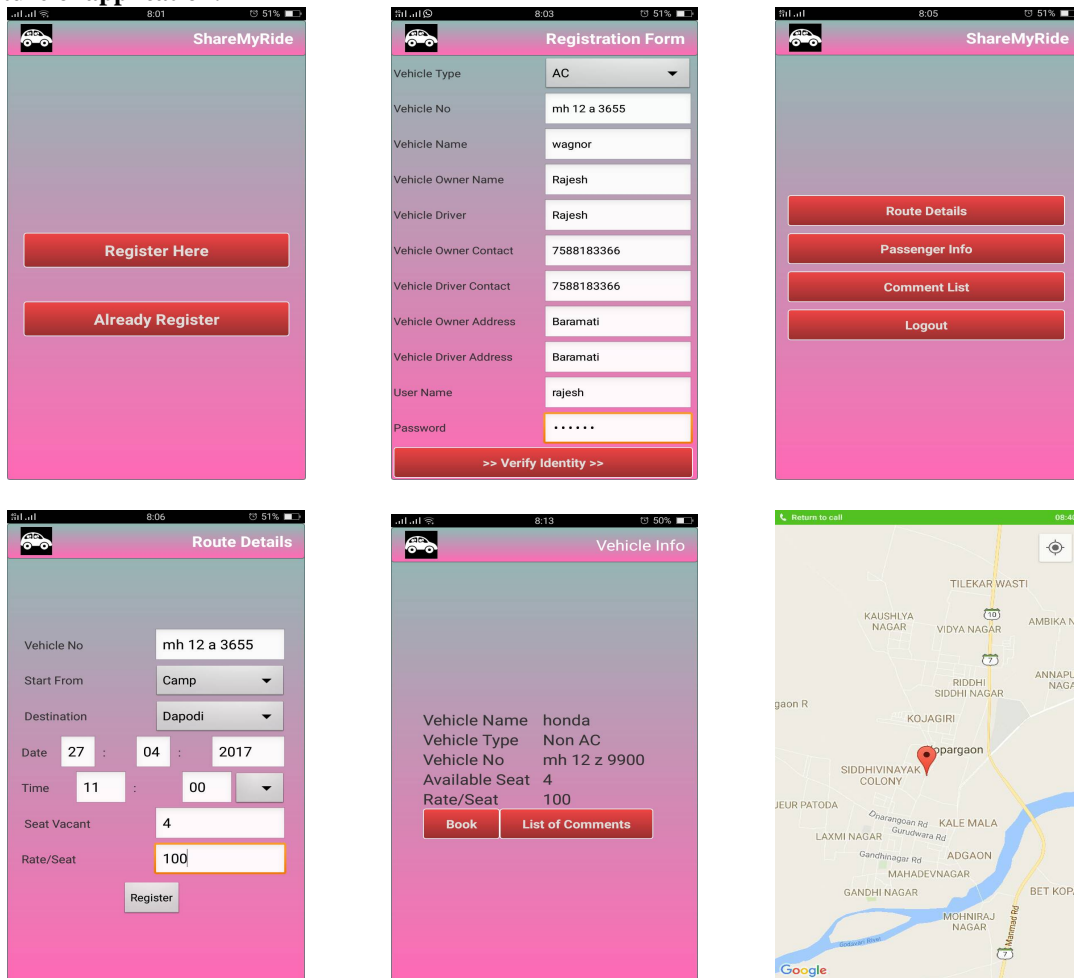
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IV. EXPERIMENTAL RESULTS

Structure of application:



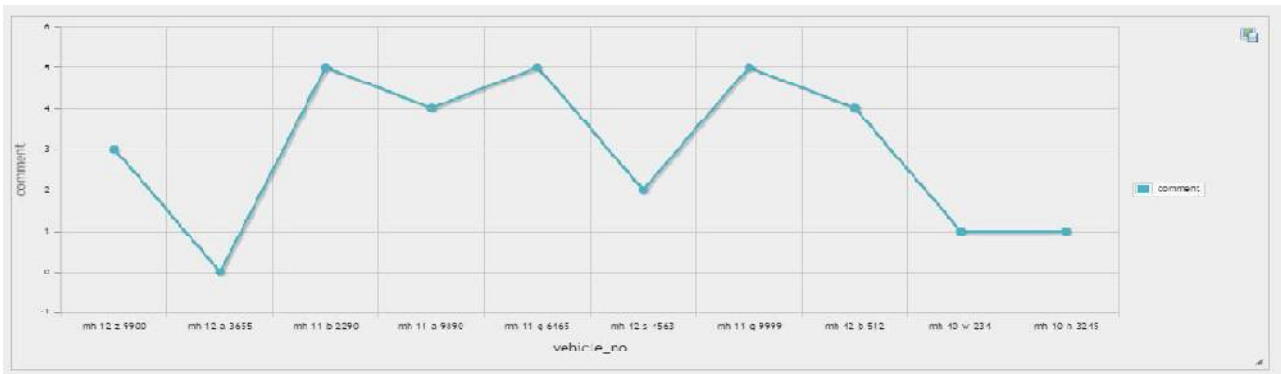
- In the base paper a dual side searching algorithm is used for searching taxis on origin and destination side. In our system we have done searching on origin and destination point within server itself by executing a nested query on database. This approach minimizes the efforts for sending and retrieving the data from server again and again.
- Taking into consideration the carpooling approach, there they have implemented the system for organizational level whereas, in our system we have generalised the approach so as to satisfy the commute of people.
- Rating provided for taxi: We have considered a set of data where the passengers provide comment i.e. ratings for a particular taxi. From this sample data we have analysed which taxi has more rating.

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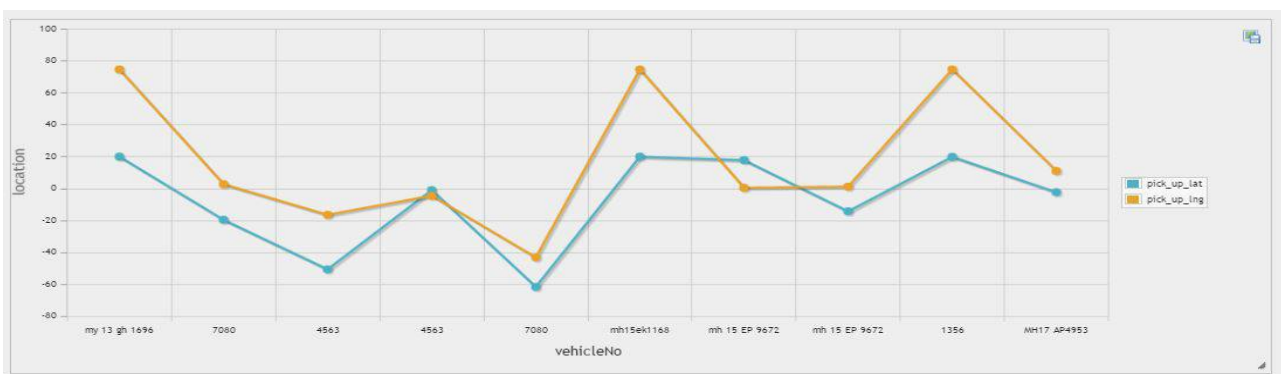
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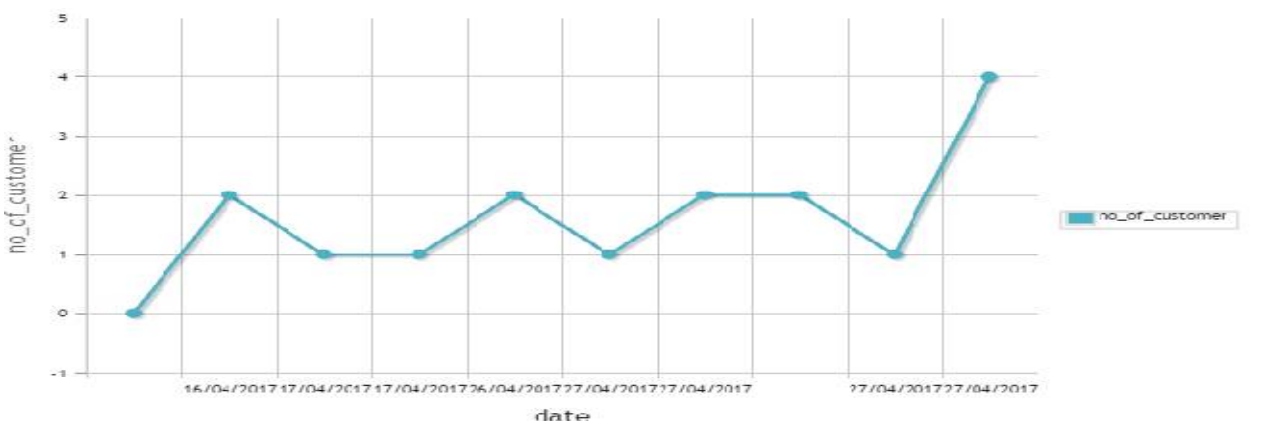
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- Locations of taxis: Here a sample data is considered which analyses which taxi travels which locations. We can get the information of the travel locations of a particular taxi. Also we can get information like which locations are most preferred for travelling.



- Number of customers for a particular day: The sample data contains number of customers that are travelling along with their date of travel. Plotted graph shows how many customers travelled for a particular day. Using such information we can decide which day had more rush.



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IV. CONCLUSION & FUTURE SCOPE.

Conclusion:

Hence, we have implemented taxi ride sharing concept in which the driver's income will be increased due to ride sharing taking into consideration constraints like vehicle capacity constraint, time window constraint and money related constraint. Also due to ridesharing fuel consumption and traffic congestion will be decreased.

Future Scope:

In the future, we consider using paytm to pay fare online. We consider incorporating the creditability of taxi drivers and riders into the taxi searching and scheduling algorithm. We also consider refining the ridesharing model by introducing social constraints, such as gender preferences, habits preferences (e.g., some people may prefer co-passengers who do not smoke).

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