Taxi Automation Scheduling System using Adaptive Real Time Shortest Path Algorithm

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Abstract— Taxi Automation Scheduling System using Adaptive Real Time Shortest Path Algorithm Abstract—The taxi automation system involves assigning cab to customers waiting at different areas. A taxi automation system currently in use by a major cab service provider separates the city (in which the system operates) into regional areas. Each area has fixed assigned adjacent areas hand-coded by skilled person. When a local area does not have spare cabs, the system chooses an adjacent area to find. However, such fixed, hand-coded adjacency of areas cannot be a discreet indicator because it does not take into consideration cyclic changes in traffic patterns and road structure. This causes dispatch officials to limit the system by manually compulsory movement on taxis. The proposed system effectively modifies the closeness of dispatch areas. The proposed technique will decrease the total waiting time due to calculation of total waiting time includes allotted taxi with spare taxis, is less in ratio with the present system and increases taxi performance in comparison with results of the duplication without self-organization. To manually conquered the drawback of the previous dispatch system can be unfavorable when used with a self-organizing system.

Keywords—Adaptive Real Time Shortest Path Algorithm, Events, Taxi.

I. INTRODUCTION

The taxi dispatch system in the system of allow taxis to customers waiting at various locations, dispatch system satisfies all dispatch parties: clients and cab drivers. If customer want to use this service, it is necessary for the customer to download this app from play store. CustomerFill-up the registration form and then goes to login this app and get a cab for transportation. System managed the all request come from customer and finding the status of taxi and its location after send a response back to the customer. The passenger’s perspective, the waiting time should be minimal. From the taxi driver’s point of view, the travel time of the cab to pick up the customer (empty cruise time) and the idle time should be minimal as well [2]. There are another goals that demand to be taken into consideration such as maximizing the number of dispatched request and maximizing the total number of served request per cab. One of the approaches to clarify this problem is to use fixed regional dispatch areas.

II. LITERATURE SURVEY

A. Taxi Booking and Dispatch Systems in Existing System

The satellite-based dispatch system implemented in Singapore is known as Automatic Vehicle Location and Dispatch Systems (AVLDS). The AVLDS comprises differential GPS, wireless data communication and computerized dispatch systems. Each vehicle is furnish with a receiver and transmitter so as to communicate to the center via the stations that are set up at various locations. With a centralized cab dispatch system, all customers’ taxi booking requests are situated on a first come first serve(queue) basis at the dispatch center [3]. For each request, the system is able to detect the nearest taxi to the customer based on the latitude and longitude (provided by the GPS) and the taxi’s current route. All taxis within10 kilometer’s radius to the customer are able to receive the task via wireless transmission. Upon the human driver get the task via the in-vehicle terminal, the vehicle(taxi) number and its estimated time to reach the customer will be convey to him through his means of booking. In cases whereby no drivers accepted the task, the system continues to search for the next nearest taxis and the task is dispatched again, till successful matching. Over the years, three similar systems had been implemented in Singapore, namely TIBS-Sky Tre (SMRT Taxi), Comfort Cab Link (Comfort Taxi) and City Net (City Cab), further increase into City Net II by ComfortDelgro, which allows different taxi fleet companies to share a common system while maintaining their business independence and identity, utilizes the General Packet Radio Service (GPRS) technology to wirelessly connect the entire fleet of taxis, and are owned by different taxi companies [1]. The main difference among all these three systems are their booking methods. In other words, the step to pick up location
is to be conveyed in different manner, after which, the backend dispatch system will be similar. All of them can be booked via telephone and SMS, but Sky Trek can be done via web and Cab Link via Fast Call. Fast Call is available in large commercial buildings, hotels and tourist attractions. All a customer has to do is to simply dial a hotline and enter the designated location PIN and a taxi will be transmitted to that particular location.

Issues with the Previous System.
The main drawbacks of these existing taxi booking and dispatching systems are as follows:

1. Customers Unable to Get Through the Line
While request a taxi for travelling via the telephone may be the most conventional means, there may be times when the demand for taxi bookings is also extremely high, such as during a heavy rainstorm or festive seasons. This might cause the phone lines to be blocked with customers (trying to book a taxi) not being able to get through the line to reach the call operators for all numerous attempts.

2. Cab Drivers Unable to Locate the Passenger
The pickup point of a passenger is always conveyed to a telephone operator / entered by the passenger himself and stored into his account. Hence, if merely the street name (of a street that stretched for a few hundred meters) is being told, a taxi driver might not be able to locate the customer exactly. In addition, there may be situations whereby a customer is waiting at the other side or exit of a building, as to where the taxi driver thought him to be. This may result in sadness in both the clients and cab drivers after a period of waiting.

3. Call Centre Having High Operational Cost
A typical call center operates 24 hours a day, 7 days a week; hence in order to maintain a high-quality service call center, the staffing cost will be as high as about 70 per cent of the operational budgets of the call center.

B. Multiagent Self-organization for a Taxi Dispatch System
self-organization technique to optimize the performance in a taxi dispatch system. In this technique develop a computer simulation of a real taxi dispatch system (initialized using actual data obtained from a large cab operator) to demonstrate that its approach outperforms the conventional previous system in terms of clients waiting time (respecting customer satisfaction) and outperforms the simulation of the previous system in terms of the number of dispatched request per taxi (directly proportional to fleet utilization). This work leading the state of the art in taxi dispatch systems by making three main contributions.

First, we develop a realistic simulator of the taxi dispatch problem that is based on real data acquired from a taxi dispatch company in the Middle East. The simulator does not only follow that same dispatch process, but also simulates some human behaviors of the dispatch parties such as taxi drivers and dispatch officials.

Second, to our observation this is the first work to apply a self-organization technique on a cab dispatch problem and benchmark it against the performance of an existing operational system showing superior performance. Third, we list a number of lessons about designs the taxi dispatch domain in order to provide key foundation for further researches.

In particular, by comparing the performance of the simulation with real-world data, we highlight some key human factors that use to be taken into account when modelling this domain.

IV. METHODOLOGY

A. Existing System
In existing system there are some problem which is related to the message broadcasting and concurrent allotment of taxis. The problem was server send a request to all taxi drivers at a time. Because of that system speed was slow. In this propose system we are overcome the drawback of existing system. To overcome that, we will try satisfy customer need as well as driver convenience. Proposed solution has an automated adaptive scheduling and shortest path algorithm

B. Purposed System
This proposed system has been designed in such a way that will overcome the problem of hand coded illuminate by officials.

Proposed solution has an automated adaptive scheduling and shortest path algorithm which has the ability to match driver’s orders and to change their statuses automatically. This system searches a set of criteria including distance between taxi and customer locations, cab driver status and fairness in the orders placement.

Proposed System Architecture

Taxi Dispatch System This is the system architecture diagram of our project. After sending request to web server, web server will find out the first three nearest taxi driver’s requested
location including allotted taxi. To determine the shortest-time path to reach a requested location, we shall considered that a shorter distance path is also a shorter real-time path according to the GMap. For ex Request1 allotted to driver1 from X location to Y location, but Request2 from X. 4 to Z location and driver 2 available at P location, driver 3 at Q location. Distance for driver1 is 8km, driver2 is 18km and driver3 is 22km. But driver completes his request and near to recent request so it’s allotted to driver1. Figure 1 shows the proposed system architecture.

Algorithm

Haversine Formula To determine the distance between source and destination. Haversine formula is used but the system requires time.

Analyzing most essential data, of the previous jobs of taxis following conclusion can be derived:

Case 1: Normal Execution.

\[ ET = \frac{HF}{ES} + Awt \]

Where,

\[ HF \] is result of Haversine Formula.
\[ ES \] is Estimated Speed.
\[ Awt \] is Average Waiting Time.

Case 2: In Case of Failure.

\[ ET = \frac{DT}{AS} + \frac{(HF-DT)}{ES} + Awt + PT \]

Where,

\[ DT \] is Distance Travelled.
\[ AS \] is Average Speed.
\[ ET \] is Estimated Time.
\[ HF \] is result of Haversine Formula.
\[ ES \] is Estimated Speed.
\[ Awt \] is Average Waiting Time.
\[ PT \] is Processing Time.

Scenario 3: finding allotted taxi close to the new source

While selecting the taxi during the allotment the different microeconomic data that is considered includes the following The current status of the taxi/taxi driver. The remaining distance of the journey of the already allocated task to a taxi. Distance from the destination to the source i.e. from where the new incoming request is created. All these constraints are applied on map where the service provider is operational. / Fig: adaptive real time shortest path algorithm For example:- Consider request from Satpuda Botanical Garden to Bharat Nagar. Taxi1 and Taxi2 longer than Taxi3. Taxi3 take 2 min to reach current position destination. After reaching allotted request to destination, distance between the recent requested near than two spare taxis.

So we assign request to Taxi3. After finding minimum distance to request. Within 30 or 45 sec driver use to accept request and corresponding detailed send to customer device. If driver did not accept request within interval time then by default request assign to any three of them.

Sr = \[ DT/AS \] + \[ (HF-DT)/ES \] + Awt + PT + DDS

Where,

\[ Sr \] is Search Result.
\[ DT \] is Distance Travelled.
\[ AS \] is Average Speed.
\[ ET \] is Estimated Time.
\[ HF \] is result of Haversine Formula.
\[ ES \] is Estimated Speed.
\[ Awt \] is Average Waiting Time.

DDS is distance from the destination to source Conclusion A complex problem of efficiently utilizing the resources of taxi service is solved using a new real time adaptive shortest path scheduling method.

VI. CONCLUSION

Using this approach we are going to achieve the smart system of taxi automation which enhance the productivity efficiency and automation process of existing system (Uber, Luxe, Ola cab, Jugnoo).

REFERENCES