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An Optimized and Efficient Approach for Taxi Management on Critical Days

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Abstract

The use of cabs is increasing day by day, especially in the metropolitan cities, and in a country like India where majority of the public uses cabs for their movement, it is necessary to get a cab at the right time. India, also known as Land of Festivals is an amalgamation of different religions, languages, cultures and beliefs which ensures there is a festival being celebrated in one or the other parts of the country almost every week. Moreover, India, the World's second most populous country, has become a global market where not only technical events, but also various fairs, concerts and huge gatherings are organized frequently. Most of the cab companies use algorithms to share the cabs, uses GPS to get the cab in less time according to the customer's location. Thus, on that particular day it becomes much more difficult to even get a cab not even in time. In this paper, we are focusing on such critical days which consists of two parts: firstly The general use of cab in that particular area on that day of the week. Secondly: The estimated additional load(calculated using the previous data or predicted) that needs to be managed in that area on such critical days which the previous system fails to manage.

Keywords: *Additional load, online cab booking system, vehicle sharing, GPS (Global Positioning System)*

1. INTRODUCTION

Cabs plays an important role as a transportation alternative in almost all parts of the world. Although sometimes called a semi-public transport mode, it is the first public transportation in small towns and villages where the government services has not reached yet. In developing countries like India, cabs are mostly used to supplement inadequate public transport and to fulfill the need of urgent transportation, but due to uneven distribution of cabs, people face a lot of difficulties in getting cabs on time. Various strategies have been used to improvise these above mentioned problems, such as GPS(Global Positioning System)[1][6] to locate the customer to provide the nearest available cab in relatively less time, or Cab Sharing[2] option in which one or more customers can share a cab at a time. But on critical days when events like rallies, concerts, exams, fairs etc come about, all these efforts ended in smoke and people have to wait long to get a cab. Moreover, when the working hours of many firms get over, there is a lot of employees waiting for cab while the number of cabs are less, in lue of which they don't get a cab in time or have to share a cab undesirable. Here, we are providing a way to overcome such problems effortlessly and providing customers a better service whatever the conditions may be.

2. RELATED WORK

The cab system so far consider the location of the customer to dispatch the taxi from their centralised system or from the distributed systems using the GPS technique which can reduce the travelling time of a cab to reach a customer thus managing

May – June 2020
ISSN: 0193-4120 Page No. 5512-5515

time[1][4]. Moreover, the centralised cab booking systems are highly prone to a single point of failure and hence distributed systems are preferred over them[3]. In addition to this, analysis has been applied on from where a customer books a cab. While some cab companies also allow the cab sharing option[2] if allowed or asked by the user at the time of booking a cab which not only reduces cost of travel using cab but also increases the efficiency of a cab system and profit by using less number of cabs and travelling comparatively less distance to make a number of customer travel in relatively less time. The cab sharing system also increases city's traffic system efficiency. Thus, the focus on improving the cab service has been for long. A customer always wants not to wait for a taxi long and get it as soon as possible at its demand. Cabs are also used to meet the urgent transportation needs which the government services often fail to provide so all such improvements in services will motivate a cab customer to use and upon the highly improved system of cabs for any need of transportation.

3. PROPOSED SYSTEM

Big Data Analytics is largely used in the industries over the collected data for better results, finding hidden patterns, and for better customer satisfaction. The same is being used in the project to find the approximate no of trips in an area on any date as per the previous collected data in the same area over a period of time using the dataset-1 which consists of base station number, date, number of trips taken, and active number of vehicles in that area on that particular date as shown in figure 1.

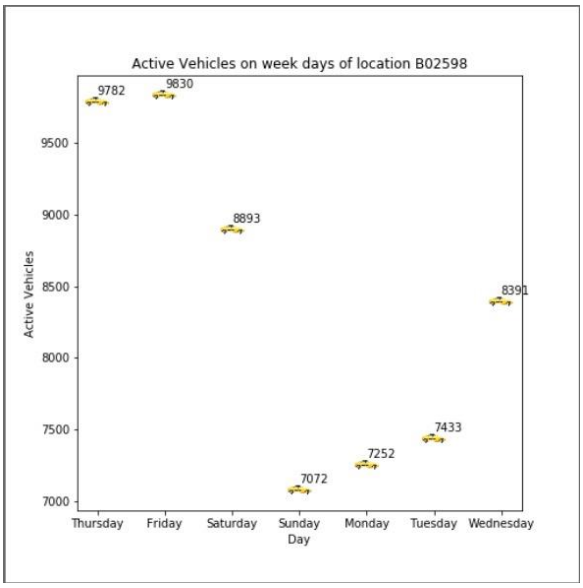

Fig 1: Number of trips taken from a location on a day of the week over a period.

Dataset-2 which consists of the base number, date, no of trips(predicted or null) taken, is being used to calculate the additional load to be managed on those particular base stations on that given date. The additional load is predicted if the event is unique in itself and has not been organized before or can be calculated programmatically if the event or any similar event is organized before and the data related to it is collected and stored in dataset-2. The additional load being calculated is that extra load that needs to be managed in those particular base stations(area) where event(s) is going to be organized.

The additional load is managed by distributing it among the cabs present within the city itself or in a nearby area on that particular days by keeping in mind the ratio between numbers of trips taken to the active number of vehicles present in that area(s) should be the same as that of cabs in other areas. To make the ratio the same, a different number of cabs needs to be shifted from various base stations(areas) to other base stations.

The mechanism to calculate no of vehicles required

May – June 2020
ISSN: 0193-4120 Page No. 5512-5515

1. The approximate number of trips in that area is estimated using the previous data on that day.
2. The additional load is calculated from the dataset-2 if an event has been organized before else predicted by its fame and following.
3. Now the no. of trips is modified by adding the additional load in those base stations respectively where the event is organized.
4. Now the ratio of no. of trips to no. of vehicles is calculated in that area using the below formula:
   `r = ∑no of trips / ∑no of active vehicles`
5. Now for every base station required number of vehicles are calculated by the formula below:
   required vehicles = no of trips / r.

The additional load can be maintained by transferring the vehicles from those base stations where vehicles are more than required vehicles and can be transferred to those base stations where vehicles are less than required vehicles.

The mechanism to maintain the additional load

1. For every base station, if required vehicles > no of active vehicles in that area, extra vehicles = no. of active vehicles - required vehicles
2. For every base station, if required vehicles < no of active vehicles in that area, fewer vehicles = required vehicles - no. of active vehicles
3. Now from base stations where extra vehicles > 0, vehicles can be transferred to those stations where fewer vehicles > 0.
4. Once transferred from a base station to another base station,
   extra vehicles= extra vehicles-min(extra vehicle, fewer vehicle)
   fewer vehicles=fewer vehicles-min(extra vehicles, fewer vehicle)
5. The transfer of vehicles can be done using the Dijkstra Algorithm from one base station to another.

4. CONCLUSION AND FUTURE WORK

In this paper, we have constructed an algorithm to maintain additional load on days when events are organized keeping the number of vehicles the same. Moreover, if additional vehicles can be bought to handle the event it can also be done by placing them in the area where the event is organized at the time when event is to end and in other areas before the start of the event to bring more number of customers in the event thus getting more number of customers when the event ends. The analysis can also be applied on the real time data using the same algorithm. In an era, where time is the most important and valuable thing for a person which reflects his commitment and sincerity to work, we are saving time as much as we can of all cab customers.

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