GPS Tracking and Smart Route Selection of Public Transport

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ABSTRACT

In this modern lifestyle, everyone is in rush to reach their desired location. In general situation, a common man makes the use of the public transportation to reach its destination. The main problem in the use of the public transportation like buses is that the person may not be aware of the factors like its bus stop location, which bus to choose to reach the destination etc. Even if the person is aware of this factors he/she cannot predict the bus arrival time and journey time which may result in a person to reach late to his/her destination. This may lead to decrease in the productivity of the person's work. To avoid this all the information should be available to the person which will avoid the decrease in the productivity of his/her work by helping the person to make the better travel decision by making proper use of the available information.

Keywords: - *Transportation, Location based service, GPS, Data Mining*

1. Introduction:

The transportation system must be easier and reliable, a well-organized, planned, efficient, a transport system is required where it would be easy for the public to use public transportation with minimum efforts. If we have a better transportation system which is very effective in moving people and goods it leads to a better standard of living by providing social and economic growth to the society. Actually, the transportation system is a backbone of any country or organization. It can also be called as the heart of the system. The amount of increase in privately owned vehicles is increasingly drastically which led to increase in air, sound, pollution. Such problems can be tackled by various means. Here for instance by increasing use of public transport.

Public transportation systems are the main system which plays an increasingly important role in the way people move around their communities. Being very cost effective mode of transport. Due to many reasons such as heavy traffic and roadwork, far distances etc., most of the buses gets delayed. People have to wait for longer time at the bus stations without proper knowledge of when the bus will arrive. Anyone desiring to use the public transportation

system, can find the arrival time of buses at the particular destination even from their homes and plan their departure from their home accordingly. But the bus arrival time cannot be guaranteed due to unexpected delays in traffic congestion.

Public transport structure currently is a fracture or not up to the mark due to various reasons, it is very difficult to encourage more use of public transport. Also, public transport for example Bus transport is much unorganized, public undergoes several hardships such while traveling by public transport such as waiting for buses, missing bus due to unavailability of proper timing charts etc. If the shortcomings in bus transportation are solved, by means such as providing various means of traveling timings charts, stops, traveling times, travel fares, waiting time, alternate modes, providing route choices etc. For such purposes extra facilities can be provided such as real-time tracking of buses and provide miscellaneous travelling options such as bus fare, traveling time, route selections, waiting time etc., current location of bus i.e. real-time tracking of bus, it would be very reliable for public and it would encourage to use public transportation mode frequently.

2. Literature Survey:

Dr. (Mrs.) Saylee Gharge et al [1] developed a system that assists pedestrians from Mumbai city for making a decision whether to wait or get any other accomodity for their task. There system consists of a transmitter module which is installed on buses and receiver on bus stops. A passenger information system is installed at bus stops for displaying information to the user. The proposed system is a standalone system that could be deployed around the city for displaying the real-time location of buses, where the system will be consisting of a power source, battery, microprocessor, led, rf transceiver.

Christeena Joseph et al [2] proposed a system to find out the current location of the college bus using GPS and GSM phone and without using the internet at the user's end. With the help of GPS and GSM, the user can get the location of the bus by sending an SMS. The memory of microcontroller stores a database which contains various location details. To locate the bus database is used. The tracking device contains various systems which include GPS, GSM modem, and the microcontroller. Location name and GPS coordinate values are stored in the microcontroller as an LUT (Look Up Table). As SMS request for the location bus is received by GSM modem, the microcontroller looks for nearest location match in LUT for the received GPS coordinates. The matched location detail is sent by an SMS to the user using GSM modem.

Süleyman Eken, Ahmet Sayar [3] developed a location-aware smart bus stop system that any passenger with the use of smart phone or mobile device will the scan QR codes placed at bus stops by which they can view bus arrival times, and buses current locations on the maps. A user can also view bus routes on the map with their geographic and non-geographic components. They have used the C4.5 algorithm for estimation of bus arrival time. GPS and Google Maps are used for displaying current locations of buses on the maps, together with the related route information. If the user is registered to the system, it can be informed of routes and bus arrival times via SMS and e-mails.

Aswin G Krishnan et al [4] proposed a system that gives the location as well as the time taken by the bus to reach its station. This system is designed in such a way that, the information regarding the current location of the bus and the time will be transmitted by a transmitter which is mounted on the bus when bus driver press a pushbutton when he reaches a station. This information is then received by a receiver and shown on the LCD screen. These screens are

installed in the city at all the bus stations. This will help the passenger's in making the decision whether to wait for the bus or to take an alternate means of transportation.

Swati B Patil, Saroja M. Kulkarni [5] developed a system to predict the arrival time of the bus along with its location and distance which is derived from aspects like bus availability, average running speed and bus current location. They have developed various algorithms like dividing routes into segments, mapping bus location onto segment and finding accurate information for user's query for analyzing these aspects. Their main goal is to enable passengers to easily access bus arrival time they are interested in. Buses are marked on a real-time map with a label so that the user can easily identify the location of each bus.

A. Srikanth Reddy Nagadapally et al [6] used GPS tracking and the mobile application so that user can have the current location of the bus with accuracy by displaying the current location of the bus on a map and saving the time and resources of the passenger and reducing the dependability on other less accurate techniques. If there is no data connection in the mobile and maps are not downloaded offline the tracker will not be able to share the accurate location of the bus.

S. Priya et al [7] developed a vehicle tracking system as it is one of the most commonly used app providing features for tracking vehicles, checking real-time current locations and movement of vehicles. Android devices are used in this paper for the task which is used as both transmitter and receiver. It is used commonly in urban areas for tasks such as vehicles tracking, public transport tracking etc. A vehicle tracking system combines the use of automatic vehicle location in individual vehicles with software that collects these fleet data for a comprehensive picture of vehicle locations. Although other types of automatic vehicle tracking can be used but modern vehicles mostly use GPS technology via google maps. It is used for issues such as vehicle theft, accidents etc.

G. Jemilda et al [8] developed an Android mobile phone application that gives information about buses, bus numbers as well as bus routes both online and offline. As android provides open source development which provides a user friendly environment, thus android is preferred the platform. For the task of tracking the current location of the bus and getting estimate time for the bus to reach its destination, this paper uses location-based services by using client-server technology by using GPS. As today most of the mobile phones are equipped with GPS systems, it is very helpful to travelers, tourists, adventurers etc. for getting their location and also for services such as finding hotels, malls, petrol pumps etc.

Manini Kumbhar et al [9] developed a bus tracking system to reduce the burden on the public as due to the population. Hence a user needs a smart system which provides real time information of bus by the remote location. Thus the system handles data consisting of the current location of bus, management and their schedule which will be helpful for user and user can take decisions from the remote location. The proposed system tracks bus in real time and result information is given to the user. In the system technologies such as GPS, google maps, GPRS, are used for development. Due to unexpected delays in traffic congestion, the bus arrival time cannot be guaranteed. Thus the main focus of the system is to provide such a system to a remote user which will reduce waiting time for the bus and will provide the user with all necessary details regarding the arrival/departure time of the bus, its real location and expected waiting time.

3. Summary:

The main purpose of the system proposed in this paper is to help users in making better and effective travelling decisions making the public transport more effective and productive.

If the proposed system is to be explained is layman terms it can be explained in following manner. The user will need to enter its destination and depending on this request received the system will search for the nearest available buses going to that particular destination and out of this available options will give the most optimal solution. Along with this option of searching the buses to reach the destination, other features provided in the proposed system will be tracking the current location of any bus and searching for nearest bus stop to the user.

The Proposed system will have three different modules

   a) The User Module
   b) The Bus Module
   c) The Server Module

A. The User module:
This is the only part of the proposed system that will be made available to the end user. This module will consist of a user android application through which the user will be able to interact with the proposed system. This application will have bunch of different features such as Searching for the current location of any bus required, searching for the nearest bus stop to the user and the most important feature i.e. searching for the optimal bus to reach the desired destination. The purpose of this application will be to get the user requirements and send them to Server module for further calculation and then display the returned results from the server module to the user.

B. The Bus Module
This module of the Proposed System will be controlled by the particular bus driver. The purpose of this module will be sending the details of bus journey to the Server Module during the commencement of the journey and whenever requested by the Server. In this module there will be an android application which will have the option to enter the bus id during the commencement of the journey. After this the bus module will send all the details regarding the bus journey like the bus number, bus route it will take, number of bus stops, ticket fares, time when the journey started, last visited nus stop, etc. Apart from this it will continuously send the bus location to the Server Module at a fixed interval of time.

C. The Server Module
This is the most important module of the proposed system. All the queries passed by the user and bus module will be received by this module and depending on the queries will do the calculations and return the required result to the user module. The Server module will be divided into two parts. In the first part all the calculations will be done depending on the queries received from the user module. The second part will be a MySQL database which will have all the data regarding the Proposed system like bus numbers and their corresponding bus routes, number of bus stops in a particular route and the order in which they will be visited, ticket fares, current status of bus journey, location of bus, location of the bus stops. All the data in the database will be dynamically updated as and when the new data is received from the user module and bus module upon request from the server. The database will also consist the user information which will be created during the User registration step in User Module.

4. Results:

This system can be implemented in any city which needs proper utilization of its Public transport. In this section we will be discussing the results of this system. In this example we have a user who is standing at location 'A' and needs to reach destination 'D'. The proposed system will first search for the nearest bus stop 'S' to the user and will give the shortest route to reach 'S'. After this the system will search for all the buses going to destination 'D' from 'S'.

Upon receiving the result the system will do some calculations keeping in mind the 'Waiting time' and 'Travelling time' of each bus and give out the most optimal bus so that the user will reach destination 'D' from source 'S' in shortest time possible.
In above example there are four buses B1, B2, B3 and B4 which will go to destination 'D' from source 'S' but has different waiting time and travelling time.
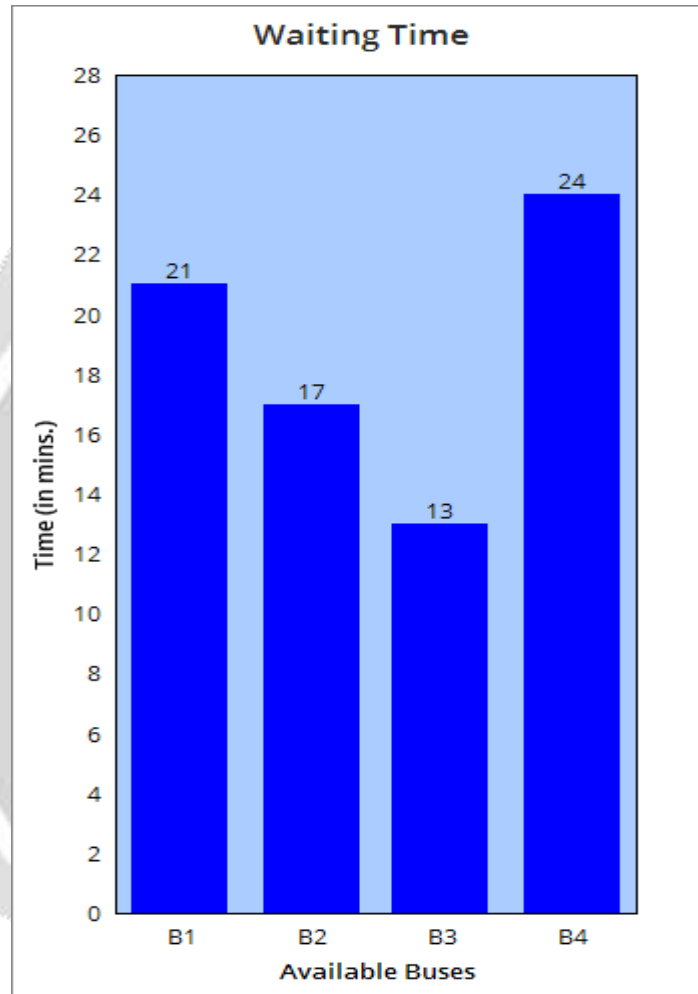
Waiting Time

Fig. 1. Waiting Time

Here we can see that bus B3 has lowest waiting time and this bus can be selected to reach the destination. But this is not the only factor for finding the optimal solution. So let us consider the other factors as well.
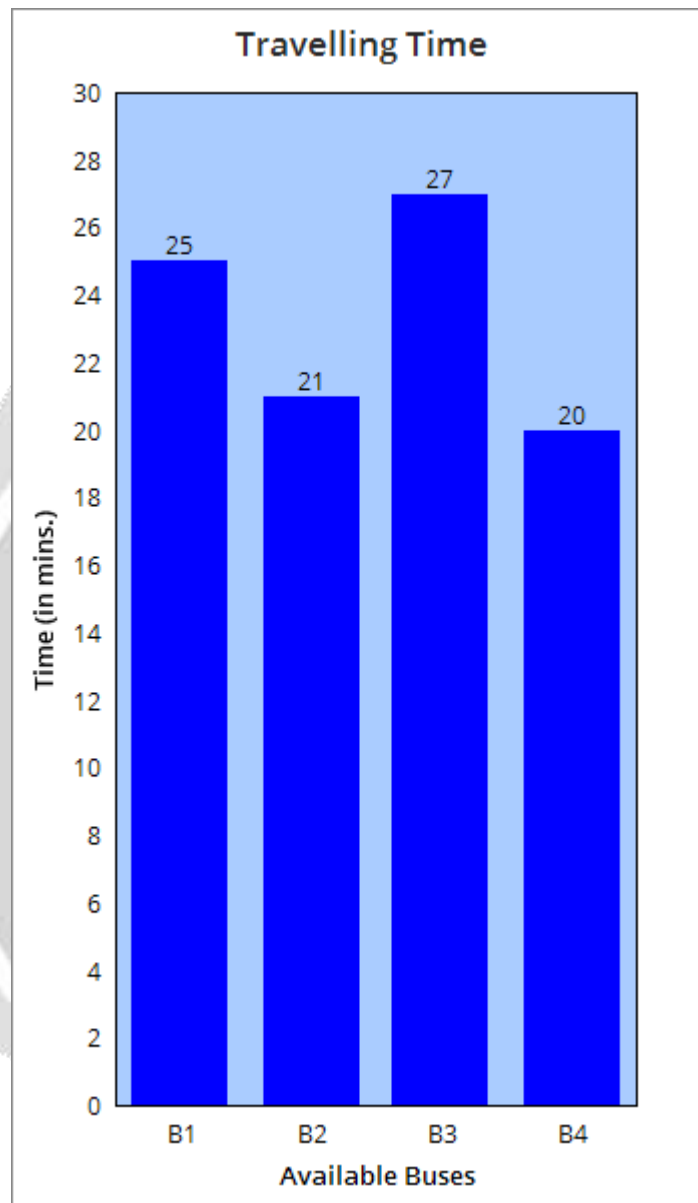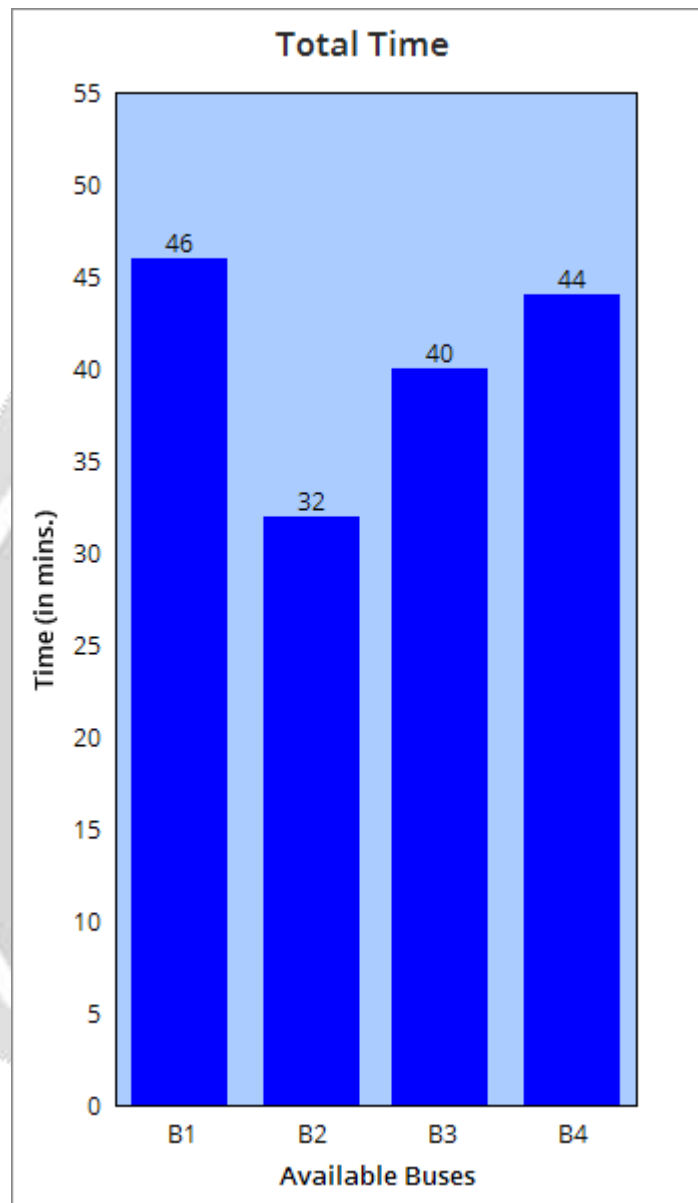
Travelling Time

Fig. 2. Travelling Time

In this we can see that bus B4 has lowest travelling time and which is important for making travelling decisions. But if this is combined with waiting time the result generated can be different.

Total Time

Fig. 3. Total Time

Here we can see that Total time is the addition of Waiting time and Traveling time, and which will give the optimal solution to reach the destination.

Here we can see that in waiting time bus B3 had lowest time and bus B4 had lowest Traveling time but none of this can bus can be selected as the result is not completely optimal.

But when we consider the Total time bus B2 has lowest time and which gives the optimal solution to the user to reach the destination 'D'

5. CONCLUSIONS:

We reviewed various papers which has previously worked on this topic and studied them thoroughly. There were some papers which worked only on GPS tracking of buses. Some papers showed the works wherein the RFID technology was used to display the current location of buses and other information on bus stops. Some worked on Automatic fare collection technology. All this works can prove to be very useful in improving the public transport if implemented properly. But there were some shortcomings like none of the paper showed the user or at least helped RMDSSOE, Department of Computer Engineering 2016 94 him in finding the optimal bus route so that he can reach his destination faster and effectively. So in this project of 'GPS Tracking and Smart Route Selection of Public Transport' the outcome will give the user the optimal path to reach its destination effectively keeping in mind various factors like waiting time, travelling time and ticket cost.

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