Android Based Vehicle Tracking System Using GPS Sensor

Mohammad Sanaullah Chowdhury[1], Nusrat Zahan[2], Israt Binteh Habib[3] and Shamima Akter[4]

Computer Science and Engineering, University of Chittagong, Chittagong, Bangladesh
[1]sana1691@gmail.com, [2]zahannusrat24@gmail.com, [3]isratjahan15.cse@gmail.com,
[4]shamimaakter95@gmail.com

Abstract

Vehicle tracking system is an android based application using GPS sensor which will track and show the nearer vehicles in order to their location. Sometimes it is quite difficult for people to find a vehicle in time of emergency. In this regard vehicle tracking system reduces the suffering of people and also to consume time and energy by creating a contact between the driver and the passenger. Mobile trend and the development of 3G network have changed our lifestyle by making interest in our own smart phone. In such a scenario, mobile application development is one of the most beneficial platforms. Android is one of the largest platforms that run in most smart phone. Vehicle tracking is an innovative android phone based vehicle reservation application which aims to fulfil the demand of user to ease their journey. This paper outlines about vehicle tracking application which helps individuals to hire a vehicle with a phone through sending driver details to passenger. This application helps the user to select a suitable cab and make a phone call to the driver of the cab to pick him up. Java programming language using android operating system for mobile client, PHP as web server, MYSQL as repository, GPS (Global Positioning System) as location provider, etc., benefits are taken in this proposed system.

Keywords: *Vehicle tracking; GPS; Andriod*

1. INTRODUCTION

Vehicle Tracking is based on an android based mobile application and web based management system. The main intention of this system is to render easy use and helpful mobile application to the android users which will make them enable to track a nearest vehicle and reserve sitting from their location comfortably instead of waiting in the road. This system uses smart phone and personal computer in which the first one is used to monitor the vehicle location and the other one act as a tracker. This system uses android mobile phone as mobile terminal because it is more convenient and flexible. Android mobile phone will link to the web server and enter the information. Thus, user can retrieve the information for further action. GPS is used to provide a very accurate location, time, and date. The satellite will transmit the information to the GPS so that GPS can receive the information. By measuring the distance from satellite, it allows the data to identify the location [Kushwaha et al (2011)]. Two types of user can use this application. They are driver and passenger. Drivers have to register the information (name, phone, cab no, email and password). Then driver sign in the information (email and password) that passed to the server. Server checks whether the driver is registered or not. If registered, then next activity will work, otherwise error message will show. Passengers have to register this information (name, phone number, address, email and password). Then email and password passed to the server. Server check whether the passenger is registered or not. If registered, then the passenger can track nearer most vehicle location. Finally, the nearer most driver list is shown and passengers can call the nearest driver.

The users (passengers and drivers) will be much benefited from this vehicle tracking software. This

application will help the passenger (registered) to find the near most vehicles at a short time. It also helps the drivers to find passengers in a short period of times. User friendly interfaces are developed to easy use the software. All information is stored in an organized way easily. This software uses the best searching and finding techniques to enhance the performances of vehicle tracking.

The remaining part of the paper is structured as follows: Section two presents the related works. Section three provides an overview of the related technology. Section four and five presents the architecture, design and implementation of the proposed system. Experimental results and discussion are presented in section six. A conclusion is included to summaries the contribution of the research.

2. LITERATURE REVIEW

Uber is a location-based app that provides hiring an on-demand private driver. Now it operates in 643+ cities in 77 countries. Uber is convenient, inexpensive and safe taxi service for riders. It makes hiring a private driver to pick up passengers and take them to their destination with the tap of a button on any smart phone device. Uber provides drivers an exceptional pay, allows them to be their own boss and even receive tips. After each ride passengers get to rate their driver and overall experience and drivers are reliant on good overall ratings (otherwise they will get the boot). Likewise after each ride drivers get to rate the passenger. So if a rider is troublesome or belligerent, other drivers can get a heads up. Uber is extremely safe for "taxi" service and it has been giving their driver and passenger overall user experience and personal security protocols.

Real time vehicle monitoring system using LCD screens has been proposed for the Mumbai City in India. The main objective of the GPS based vehicle monitoring system is to help the passengers of Mumbai City by giving proper instructions whether to wait for the vehicle or walk or take alternate transport [Chheda et al (2012)].

In SMS Based Vehicle Tracking System, SMS is used over the GSM networks to transfer the coordinates of vehicle location. The vehicle with GPS receiver calculates the latitude and longitude of the vehicle coordinates. This information is directed to the central server using SMS over the GSM networks and is stored in the database. The information can be retrieved by sending the vehicle number and the route number. The arrival time of the vehicle is sent to the user over SMS [Maruthi and Jayakumari (2014)].

Web based application system has been proposed for the Baghdad City in Iraq. This system is developed using the central server system, vehicle-mounted tracking devices and the web based application. Web based application queries about the vehicles real time location and tracks the route on the map through the web application with the embedded Google map and interacts with the database server for the track details. Using the internet access web based application also permits users with diverse operating system platforms to easily query the real time location of vehicle [Salim and Idrees (2013)].

Mobile Application has been proposed for the Pune City in India. Using Android application bus tracking system uses the inbuilt GPS service provided by the Smartphone. In each bus smart phone is mounted to get its GPS coordinates. To the central server these coordinates are transferred. Through android application users can retrieve information about the bus number, route number and the arrival time of the bus. Google maps are used to track the bus and the user graphically [Sardey et al (2014)].

The usage of public transport instead of private vehicles is encouraged in VT and PIS (Vehicle Tracking and Passenger Information System) by APSRTC. VT and PIS (Vehicle Tracking and Passenger Information System) implement APSRTC (Andhra Pradesh State Road Transport Corporation). This system is developed to overcome the crucial problem of road congestion by making it comfortable, convenient, attractive and introducing value added services.

3. RELATED TECHNOLOGY

Different technologies are used to develop this application. The technologies are GPS, Android, XAMPP, PHP and MYSQL. Familiarization of these technologies is given below:

A. GPS

GPS is a radio navigation system that makes allowance for land, sea, and airborne users to determine their appropriate location, velocity, and 24 hours a day, in all weather circumstances, anywhere in the world. GPS stands for Global Positioning System. It is well-known navigation and positioning "technology"—namely the magnetic compass, the sextant, the chronometer, and radio-based devices—impractical and obsolete [Johnson and Russell (1995)]. The GPS satellites are in orbit at 10,600 miles above the earth. Each day every satellite checks the time and position with a ground station and makes any minor correction. By getting bearings from three of the four satellites on the ground, the GPS receiver which contains a computer triangulates its own position. For most receivers, the result is provided in the form of a geographic position - longitude and latitude within a few meters [Brown et al (1995)]. The position can be shown on the map, if the receiver is equipped with a display screen. The GPS receiver may be able to calculate our speed and direction of travel and give us estimated times of arrival to specified destinations, when we are moving. Geographic Information and map making data can be stored by some specialized GPS receivers [Caron and Francois (2006)].

B. Android

The Android operating system is made-up of a virtual machine that runs on the Linux kernel, plus APIs and built-in applications. The open source code under the Apache License is released by Google. Additionally, Android has a large community where developers write application in a customized version of the Java programming language primarily [Meier and Reto (2012)].

C. XAMPP

XAMPP contains Cross platform(X), Apache(A), MariaDB(M), PHP(P) and Perl(P). In both a full and a standard version, self-contained and multiple instances of XAMPP is offered. Without any access to the internet XAMPP is used as a development tool and web server solution stack package to allow website designers and programmers to test their work on their own computers [Dvorski and Dalibor (2007)].

D. PHP

PHP is used in server-side scripting language which is designed for web development and it is also used as a general-purpose programming language. The web server puts together the results of the interpreted and executed PHP code. With a command-line interface (CLI) PHP code is also executed and is used to implement standalone graphical application [Lengstorf et al (2009)].

E. MYSQL

"My while SQL" is the shortening for structured query language. MYSQL is an open source relational database management system (RDBMS) which is introduce in July 2013. It is the world's second most extensively used RDBMS and most extensively used open source client server model RDBMS. [Meloni and Julie (2012)].

4. ARCHITECTURE OF THE PROPOSED SYSTEM

In the following figure, the proposed system architecture has been showed. At first, driver's registration is needed. Then driver can sign-into his account for update his location and availability in such that passenger can track his location. The information of driver is preserved in the server. Then passenger registration is needed and passenger can sign into his account similarly. Now, he enters a distance in which distance he want to find a vehicle. Those vehicle locations are less than the given distance is shown in the vehicle list. Then passenger can call the nearest vehicle.
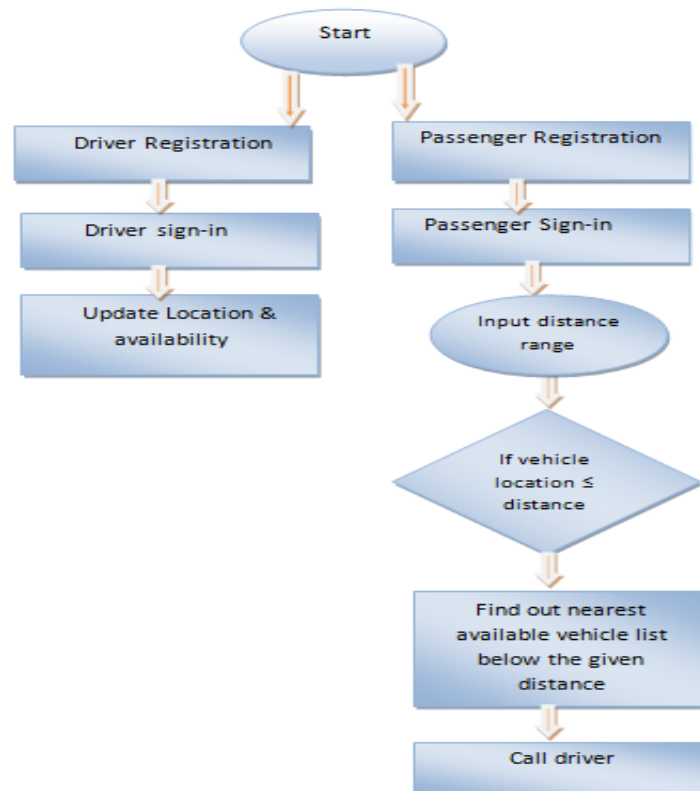
Figure 1. Architecture of the proposed system

In this application, GPS sensor is the root key of the total system procedure. It describes the process of retrieving the GPS location from the user's current location through the android mobile application. For this step, user needs to keep phones GPS on. As soon as, it tracks location at a certain value, it will start its main work on it. The application will retrieve the GPS location of the user's present location.

5. IMPLEMENTATION

We used principle of web languages and tools for the web development and android based languages for making this android application.

The languages are: 1) Java, 2) PHP and 3) MYSQL

The editors are: 1) Android studio and 2) Notepad++.

We have chosen Android studio to implement this application. For android application development, Android studio is the official IDE which based on IntelliJ IDEA. Android studio is one of the top IntelliJ's powerful code editor and developer tools. When building Android application, it offers even more features that enhance productivity, such as:

- A flexible Gradle-based build system.
- Build variants and multiple APK file generation.
- Code templates help to build common application features.
- A rich layout editor with support for drag and drop theme editing.
- Lint tools catch performance, usability, version compatibility and other problems.
- Code shrinking with ProGuard and resource shrinking with Gradle.
- Build in support for Google Cloud Platform, making it easy to integrate Google Cloud Messaging and app Engine.

We have selected notepad++ editor for the server-side scripting language PHP. Our proposed architectural system is server centric and the application server maintains all information in the database. From the server, passengers receive details information of all the drivers on their mobile. Internet works as the medium for transferring user data and service request from mobile to server and the requested information back to the user.

To implement the database, we have selected MYSQL. Here instead of having own database which is stored on the mobile phone we have used central database to reduce the storage overhead on each phone.

6. RESULT

This experiment consists of a single machine which acts as server running windows OS, an android powered smart phone with GPS. Internet connection is initiated between the server and phone. Both the registered users (driver and passenger) can monitor the system.

Register/Login Module: Driver and passenger can register the application by providing the user's information. After the successful registration, they can login by providing email and password as depicted in Figure 2 and 3.

Figure 2. Registration of Driver and passenger

Figure 3. Sign-in of Driver and passenger

Figure 4. Updating location and availability of Driver

Location module: Driver update location and availability as shown in figure 4. Between which distances, the passenger want to get a vehicle, he tab the distance depicted in Figure 5.

Calling Module: The passenger can identify the nearest driver lists between the given distance those are in online that are shown in Fig. 6 and call them to pick him up that shown in Figure 7.
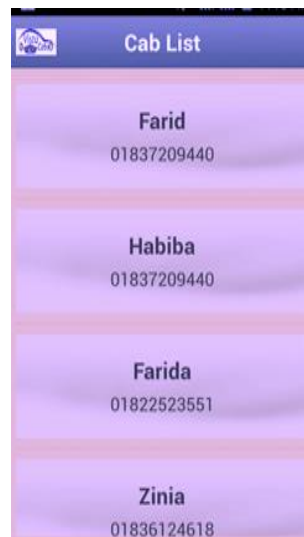
Payment for the trip is calculated as:
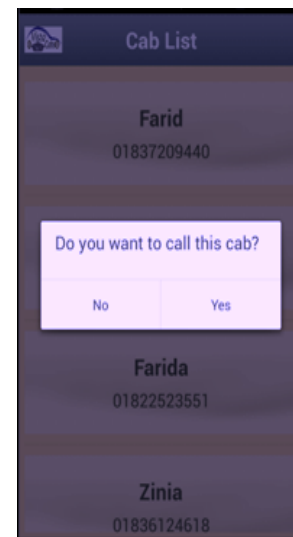**Payment = base fare + time rate + distance rate**

Price for pick up means base fare. Time includes from start to end of a trip. Distance is calculated as miles or kilometres of route. Example: base= $3, time rate= $7, distance rate = $4. Then total payment will be= ($3+$4+$7) = $14.

Figure 5. Find out the vehicles between these distances

Figure 6. Driver List

Figure 7. Calling the nearest driver

7. CONCLUSION

The successful creation of fully functioning of Vehicle tracking system provides a feasible solution to manual complex vehicle reservation system. The system allows users to complete online registration rapidly, helps to track the nearest vehicle providing benefits in terms of privacy. This system introduces the detailed process of the Vehicle Tracking System under Android operating system. The prospect for the mobile phone is very bright, particularly for the smart phone with an Android system. Overall this application is user friendly and shows better performance. This application is only usable for one operating system android devices and not usable for iOS devices. We want to implement it with iOS in future. Without internet connection, this system doesn't work. Record keeping is too much analogous in the existing system. We want to extend this research by solving these problems.

REFERENCES

Kushwaha, Amit and Vineet Kushwaha. "Location based services using android mobile operating System." *International Journal of Advances in Engineering and Technology*, 1.1 (2011): 14-20.

Chheda, G., Gajra, N., Chhaya, M., Deshpande, J. and Gharge, S. Real time vehicle monitoring and passenger information system. *International Journal of Soft Computing and Engineering (IJSCE)*, vol. 1, no. 6, pp. 34-58, 2012.

Maruthi, R and Jayakumari, C. "SMS based bus tracking system using open source technologies." *International Journal of Computer Applications*, vol. 86, no. 9, pp. 44-46, 2014.

Salim, A. K. and Idrees, I. M. "Design and implementation of web-based GPSGPRS vehicle tracking system." *International Journal of Science, Engineering and Computer Technology (IJCSET)*, vol. 3, no. 12, pp. 443-448, 2013.

Sardey, Y., Deshmukh, P., Mandlik. P., Shelar ,S. and Nerkar, M. "A mobile application for bus information system and location tracking using client-server technology." *International Journal of Emerging Technology and Advanced Engineering*, vol. 4, no. 4, pp. 86-91, 2014.

Johnson and Russell, K. "Separated GPS sensor and processing system for remote GPS sensing and centralized ground station processing for remote mobile position and velocity determinations." U.S. Patent No. 5,420,592. 30 May 1995.]

Brown, Alison, K. and Sturza, M. A. *"GPS tracking system."* U.S. Patent No. 5,379,224. 3 Jan. 1995.

Caron and Francois. "GPS/IMU data fusion using multisensor Kalman filtering: introduction of contextual aspects". *Information fusion*, 7.2 (2006): 221-230.

Meier and Reto. Professional Android 4 application development. John Wiley & Sons, 2012.

Dvorski and Dalibor, D. "Installing, configuring, and developing with Xampp." *Skills Canada* (2007).

Lengstorf, Jason, and Hansen, T. B. "PHP for absolute beginners*".* Vol. 1. Apress, 2009.

Meloni and Julie, C. "Sams teach yourself PHP, MySQL and Apache all in one*".* Sams Publishing, 2012.