An IoT Based Approach for Very Low Cost Real Time Vehicle Tracking System

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ABSTRACT

In recent time, the world is becoming more faster because of its evolutionary development of advanced technologies. Recently, most of the fields are becoming automated based on Internet of Things (IoT). As the population is increasing day by day, the dependency on transportation is also increasing. The common peoples are suffering from the traffic jam problem badly. The vehicles can't reach the destination in proper time. The notification system to the passengers is not available in public vehicle services (for example bus services in developing country). So, the peoples are wasting their valuable time in the station waiting for vehicles arrival. Considering these problems, in this paper we have implemented a real-time vehicle tracking system using the GPS of smartphone and Google map API. As the availability of smartphone and internet rise almost in everywhere, our system can track the vehicles within very low cost and a short time.

Field of Research: Computer Software and Application

Keywords: Vehicle Tracking System, Very low cost, GPS, Internet, Smart Phone.

1. INTRODUCTION

With the fast advancement of technology, smart phones are now affordable to masses of people. With other facilities, almost all smart phones provide us with the facility of navigation through its GPS navigation units. Global positioning system (GPS) is a satellite-based navigation system that sends coordinates in earth and time information to its receiver such as smart phones [1]. GPS provides precise geolocation using a group 24 satellites in earth's orbit and 3 extra satellites are ready

to use in case of any fails [2]. Using the computing power mathematical principle and resources such as location maps, important points, topographic information, and much more, GPS receivers such as smart phones are able to convert location, speed, and time information into a useful display format.

In many countries like Bangladesh there is lack of public transport against its demand and most of the time vehicles are late to start off as the vehicles are stuck in traffic jam. It is very irritating and wastage of important time to the passenger as wait for the vehicles and does not access to the information when the vehicles will arrive. Internet of things is an idea to connecting ordinary things like lights and doors and everything to a computer network to make them intelligent [3]. IoT allow people with efficient and effective access to information without requiring human-to-human interaction. A Vehicle Tracking System (VTS) using the concept of IoT can help to alleviate the unease of passenger as the passenger can get the information such as current position of the vehicles, approximate time to arrive etc.

In this paper, we have proposed a smart phone based Vehicle Tracking System with the addition of GPS technology. We use GPS because it has no subscription fees, has access to all and can work accurately in all weather conditions, anytime and anywhere in the globe. The system is designed to provide real time vehicle tracking facilities using the smart phones. It ends up arriving early, arriving late to the station and it also ends up missing the vehicle.

This paper is organized in several sections as follows. The section II contains related works in this field we have worked for. In section III, the methodology is described briefly. The implementation and result analysis are discussed in section IV. The last section V contains the conclusion and the future expansion of the work.

2. LITERATURE REVIEW

Different approaches for vehicle tracking system is proposed and are existing all over the world. All most all approaches used GPS to track vehicles.

Pradip V Mistary and R H Chile designed an embedded system based VTS architecture [7]. GPS and GSM network is used to detect vehicles in this method.

Md. Marufi Rahman, Jannatul Robaiat Mou and Kusum Tara proposed an Arduino based VTS addition with GPS and GSM module [8]. The tracked location is displayed on LCD and Google map displays the location with name on Smart Phone.

GPS, GPRS, GSM are included with a Raspberry pi to the Vehicle Tracking System proposed by Prashant A. Shinde and Y.B. Mane [9]. In this system GPS module collect positioning information send to server by GPRS module and GSM module is used to send information back to vehicle’s owner.

In Bangladesh, Grameen Phone the largest mobile phone operator provides real time vehicle tracking facilities using USB powered vehicle tracking device, satellite GPS and GSM communication. Vehicle information is accessible from smart phone and website [4]. This service is very expensive.

Bangladesh Railway (BR) provides passengers with facilities of tracking train location through messaging system from mobile phone but only for intercity trains. Approximate delay times are sent to the passenger based on the current position of the trains [5]. This messaging is very costly.

In London, TFL bus service provides real time tracking of buses using bus stop codes, route number, area or street name, postcode. They provide their service through smart phones app, messaging from phones, or website [6].

3. METHODOLOGY

A. The System Architecture

The proposed system architecture is the combination of two different parts as shown in Fig. 1. One is Vehicle part that the vehicle to be tracked and the other is End Users (Passengers) part who will track the vehicles. Actually, each of the part have to have a smartphone. An application has to be installed to each of the smartphone. The application installed to the vehicle smartphone is different from the application installed to the passenger's smart phone.

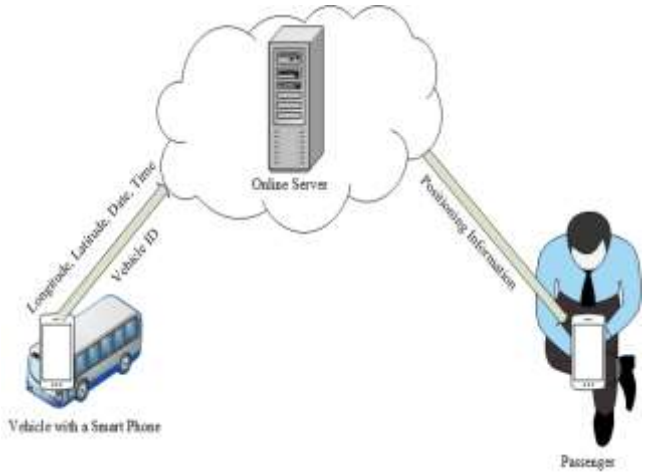


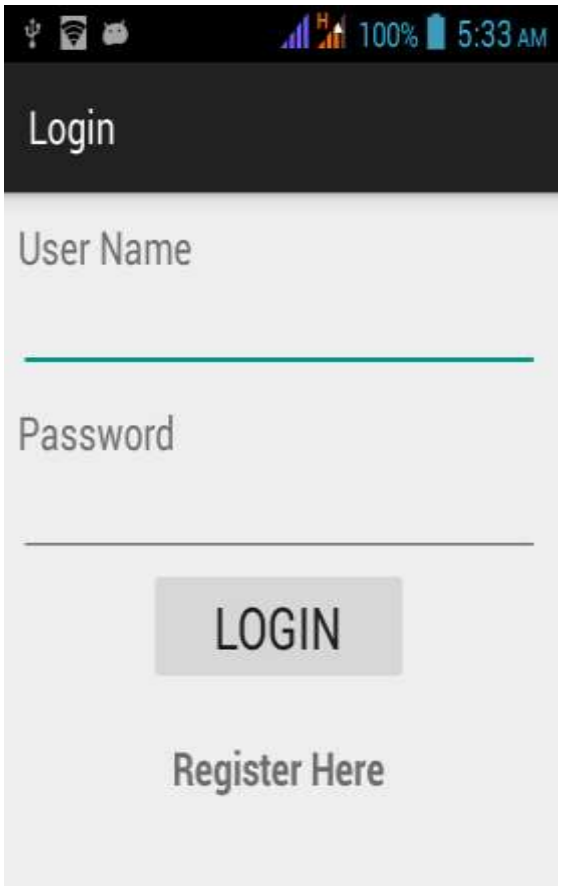
Fig. 1 Overall System Architecture

B. How the system works?

1) Vehicle Application: The application installed in the vehicle smart phone can be operated by the driver or supervisor of the vehicle. When the vehicle starts its journey, the driver or supervisor have to turn on the application. At first, the application operator need to be logged in to the application as shown in the Fig. 2.

After completion of login, the operator has to press the “Start Updating Location” button of the application as shown in Fig. 3. In every minute the application updates its location using GPS and google map API. The location is stored in a online server.

The data uploaded by the vehicle application are vehicles ID, latitude and longitude of the location where the vehicle currently available, the time and the date when the vehicle is available.



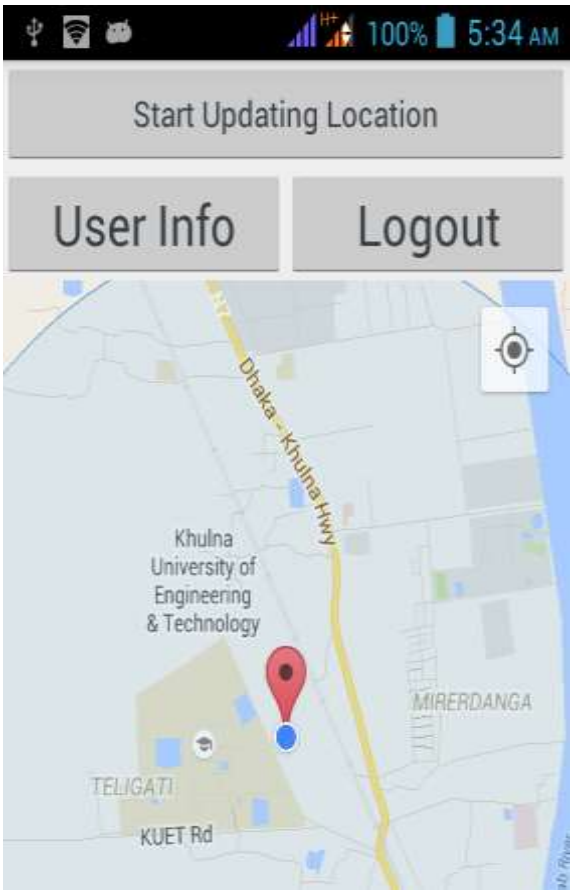


Fig. 2 Login activity of Vehicle app operator. Fig. 3 Turn on automatic location update.

2) Users Application: On the other hand, the users or the passengers or the common people’s application retrieve the data uploaded by vehicle application from that server. By the latitude and longitude, the application determines the location of the vehicle. For example, a vehicle was last updated its position from Banani Overpass, Dhaka, Bangladesh and the passenger’s application locate the vehicle as shown in Fig. 4.

It also determines the distance from the passengers to the vehicle, the road by which the vehicle traveling and an estimation time to reach the vehicle to the passenger’s station as shown in Fig. 5 and Fig. 6.

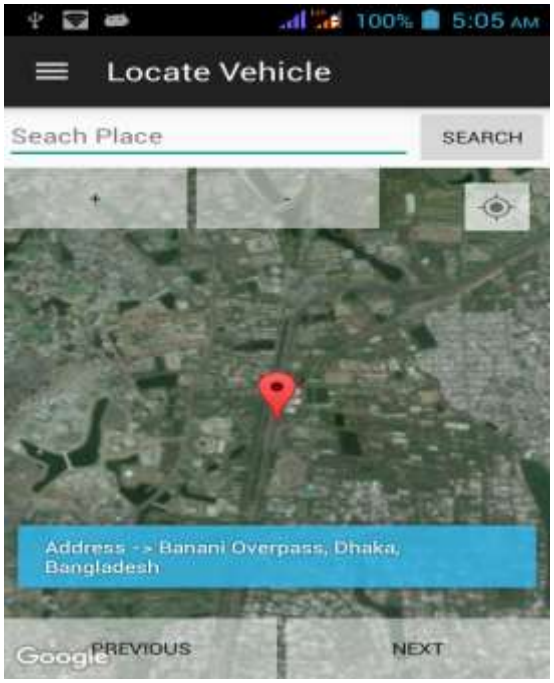


Fig. 4 Determining the vehicle location

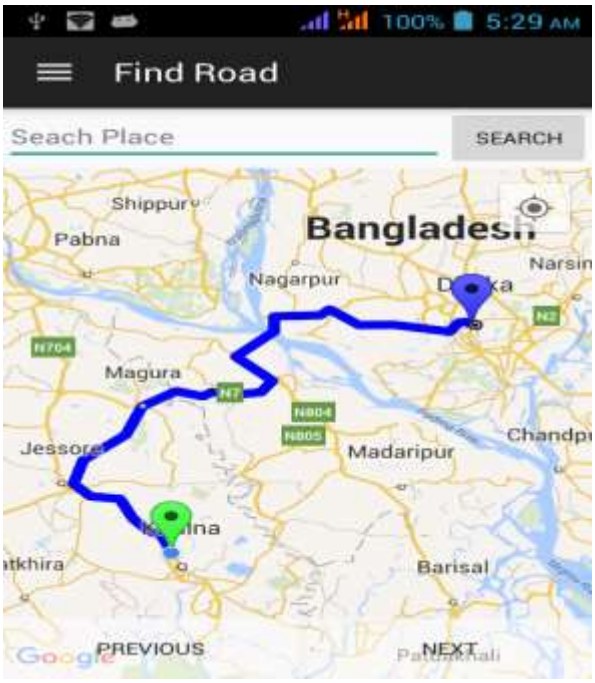


Fig. 5 Finding the road between passenger station and vehicle.

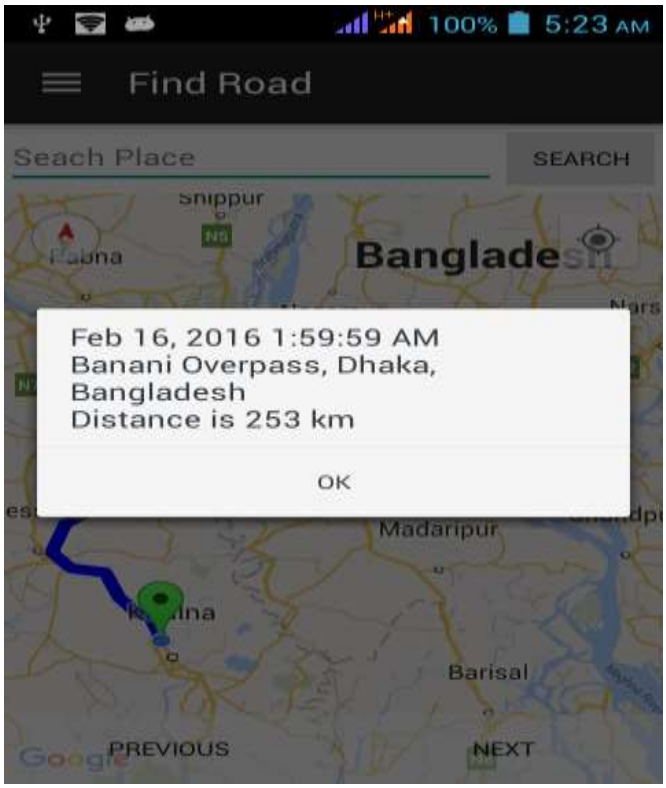


Fig. 6 Finding the distance and time

Here the green pointer of google map is the passenger station and the blue pointer is the vehicle current position. The history of the previous information can also be seen by pressing the PRIVIOUS button as shown in Fig. 4.

4. RESULTS and DISCUSSION

For the implementation, GPS of smart phones, google map API are used. Data uploaded by the vehicle smart phone stored in an online server (We have used www.000webhost.com for free web hosting). MySQL Database Management System (DBMS) and PHP scripting language are used here to manipulate the data. The Json parsing also used to retrieve the data from the online server.

The result is generated using only the smart phone application. There are many others device used to track the vehicle which might be expensive. But in our tracking system, a passenger can track the vehicle if he/she installs the application. For this, passengers only need the internet connection to connect with the server from which the vehicle real time data can be retrieved.

Source code available at: https://github.com/AA-S/An-IoT-Based-Approach-for-Very-Low-Cost-Real-Time-Vehicle-Tracking-System

5. CONCLUSION

In this paper we have implemented an IoT based approach for vehicle tracking system. The suffering of common people in transportation system especially in developing country like Bangladesh motivates us to do this work. The main advantages of this work are its cost is very low, only internet connection is the requirement in terms of cost, it will save the valuable time of common people etc. We have done the job in Android operating system. But the system can be developed for variety of operating system like iOS, Windows or LINUX etc.

REFERENCES

[1] https://en.wikipedia.org/wiki/Global_Positioning_System [Accessed 5 Oct. 2017].

[2] Rohit Minni; Rajat Gupta “Low Cost Real Time Vehicle Tracking System” 2013 Fourth International Conference on Computing, Communications and Networking Technologies (ICCCNT)

[3] https://simple.wikipedia.org/wiki/Internet_of_things [Accessed 5 Oct. 2017].

[4] https://www.grameenphone.com/personal/digital-services/mobile-services/vehicle-tracking [Accessed 5 Oct. 2017].

[5] http://www.railway.gov.bd/site/page/304c9d19-6eff-44de-818a-5d26766b4eed/%E0%A6%9F%E0%A7%8D%E0%A6%B0%E0%A7%87%E0%A6%A8%E0%A6%9F%E0%A7%8D%E0%A6%B0%E0%A6%BE%E0%A6%95%E0%A6%BF%E0%A6%82%E0%A6%AE%E0%A6%A8%E0%A6%BF%E0%A6%9F%E0%A6%B0%E0%A6%BF%E0%A6%82%E0%A6%B8%E0%A6%BF%E0%A6%B8%E0%A7%8D%E0%A6%9F%E0%A7%87%E0%A6%AE 6. http://www.tfl.gov.uk [Accessed 5 Oct. 2017].

[6] http://www.tfl.gov.uk [Accessed 5 Oct. 2017]

[7] Pradip V Mistary, R H Chile “Real time Vehicle tracking system based on ARM7 GPS and GSM technology” 2015 Annual IEEE India Conference (INDICON)

[8] Md. Marufi Rahman, Jannatul Robaiat Mou, Kusum Tara, Md. Ismail Sarkar “Real time Google map and Arduino based vehicle tracking system” 2016 2nd International Conference on Electrical, Computer & Telecommunication Engineering (ICECTE)

[9] Prashant A. Shinde, Y. B. Mane “Advanced vehicle monitoring and tracking system based on Raspberry Pi” 2015 IEEE 9th International Conference on Intelligent Systems and Control (ISCO)