

Vehicle Tracking System using GPS and Android OS

Amol Dhumal, Amol Naikoji, Yutika Patwa, Manali Shilimkar, Prof. M. K. Nighot

Abstract—In today's era everyone is using mobile phones for communication. At the same time Mobile Providers are also providing the variety of services to users. In attempt to expand on this, we propose a GPS based vehicle tracking system for an organization to help to find addresses of their vehicles and locate their positions on mobile devices. The organizations are investing money in monitoring and tracking vehicles aiming at improving services and ensuring the safety in cargos transports. The proposed technology allows organizations to track real-time information about their organizational vehicle during travel. Today for local transport most people use Bus as a medium. But due to their irregularity public faces various problems like not reaching on time, bus failure, no proper schedule etc. By this scenario author has created an Android application which provides the exact location of all organizational vehicles.

The system contains single android mobile that is equipped with GPS and GSM modems along with processor that is installed in vehicle. During vehicle motion its location update can be continuously reported to a server using GPRS service. This location information will be plotted using Google maps on monitoring device.

Index Terms— GPS, GSM, Monitoring Unit, Tracking Unit

I. INTRODUCTION

India has progressed on enormous rate that many companies have establish themselves here. These companies have a huge work force. Arranging the transportation to such huge force is difficult task. This transportation is arranged through local transport vehicles on yearly basis. But this has causes many mishaps like rape, burglary etc. Therefore the proposed tracking system will help users in finding the location of vehicle through satellite communication.

GPS and GSM based vehicle location and tracking system will provide effective, real time vehicle location, mapping and reporting this information back to monitoring device and improving the level of service provided [1]. A GPS based vehicle tracking system informs user where the

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vehicle is and where it has been, how long it has been. The system uses geographic position and time information from the Global Positioning Satellites.

Currently, mostly the existent tracking systems use techniques of virtual fence known as Geofence which compares the entity position with a predetermined zone or a point of interest, checking if the entity is inside or outside an area. Those techniques do not allow full coverage of the course, making difficult to determine if a truck or another delivery vehicle is travelling in a planned path [2]. Therefore, we need to use an alternative technique that allows continuous monitoring of travels, obtaining information of probable deviations or even emergency situations.

This system consists of an android mobile which contains GSM and GPS modem along with the processor that is fitted in the vehicle permanently. This device is called as tracking device which is continuously accessing its current location and is sending updates to server. At monitoring device which is an android application is providing the user with the exact location of the vehicles of his interest.

The paper is organizes as following sections:

- Literature Survey is explained in Section II.
- Proposed System is described in Section III.
- Implementation of the System is shown in Section IV.
- Result of the System is shown is Section V.

II. Literature Survey

To determine précised location of object Abid khan And Ravi Mishra have proposed tracking unit which it is attached and using GSM modem this information can be transmit to remote user. This system contains GPS and GSM modems along with ARM processor that is setup in the vehicle. Through SMS the location of vehicle can be reported. GSM and GPS technologies helps to track the vehicles exact information. Real time control is provided by SMS system. You can monitor the location from anywhere using this system [1].

Rodrigo R. Oliveira, Felipe C. Noguez, Cristiano A. Costa, Jorge L. Barbosa and Mario P. Prado has proposed a model to get the exact position of vehicle. The device used for tracking the location of vehicle is named as SWTRACK. The distributor companies use this model to get the location of their respective vehicles. It also provides the mechanism to

monitor the detours coming in the planned route and sends a alarm message through the device [2].

The vehicle Positioning monitoring system was designed by Zechun Huang, Dingfa Huang, Zhu Xu and Zhigen Xu using CORS and Mobile GIS. The accuracy and precision is provided by CORS service network and Mobile which has also verified the feasibility to integrate CORS and Mobile GIS for mobile location services. GPS helps in to get accuracy and high speed for performing in faster way. It is best suited for taxi monitoring and navigation, vehicle anti-theft and other fields [4].

Tushar Saxena, Deepak Kumar and J.S. Jadon has presented all the satellite navigation systems available or in process today. Every system from GPS to IRNSS has been properly introduced and signaling schemes and modulation schemes are studied. Satellite navigation now days are what every country desire to have to become on great power as most importantly it serves military applications and rescue operations. The next generation of satellite navigation are giving services to the civil users and hence a very good market for commercial point of view [7].

To help individuals in finding addresses and locate their services of interest using their mobile devices Hassan I. Mathkour has propose and develop a GPS-based Mobile Service Locator System. To determine the approximate distances between the user and the locations of the desired place this system was developed. This system is flexible and extendible to easily get the location of the users interest places. A main purpose of departure from existing similar systems is that it is the GPS-based rather than the mobile-based service provider to allow for a more accurate location calculation [10].

Using GPS and GLONASS Changsheng Cai and Yang Gao has proposed a model which provides precise point positioning. In order to assess the positioning accuracy and convergence time improvement of the combined GPS and GLONASS data processing, a 2-hour and four 3-hour sessions of datasets have been used in the data analysis [11].

In Vehicle Tracking System for tracking the vehicle any tracking device is required. Now a days, three navigation systems are available and people use those for tracking any object. The GNSS consist of three main satellite navigation systems. They are GPS (Global Positioning System), GLONASS and Galileo. The comparative study of these three navigation systems is mentioned in following table:

Parameters	GPS	GLONASS	Galileo
Satellites per complete constellation	32(Block III)	24	27+3 spares
Orbital Planes	6	3	3
Plane Inclination	55 deg	64.8 deg	56 deg
Radius of Orbit	26650 km	14100 km	23222 km
Period required for complete cycle	12 hrs	11 hrs 15 min	11 hrs 15 min
Civil Data Rate of Satellite	50 bps, up to 100 sps	50 bps	50 bps, up to 100 sps
Accuracy	5-20 m	50-70 m	Claimed 1 m
Operation Bands of Satellite	L1,L2,L5	L1,L2,L3,L5	E1,E5,E6

Table 1: Comparison of GNSS

The Table 1 shows the comparison of three GNSS technologies from which we conclude that GLONASS and Galileo provide more accurate location then GPS but they are still under construction and costly. GPS (Global Positioning System) is highly available GNSS technology. As per the system is concern, GPS is the best technology considering its availability and receiver cost. Because today every Android phone comes with inbuilt GPS receiver installed in it. Therefore there is no need of purchasing a separate GPS receiver for each client. In this system author is decided to use an android mobile which consist of inbuilt GPS and GSM modem.

In existing system owner use to get SMS from tracking device, which did not provide the exact location of tracked vehicle. But it didn't provide the exact location of the tracked vehicle. So as to overcome this system author made a solution. As per the observation existing system provides only some features like SMS services and tracking user location. The contribution which author made was like locating multiple vehicles location on Google Map. This will enhance the user with complete information about his organization vehicle location.

This will be useful for organization to easily track their vehicles. And help the organization to Bann the illegal activities performed by the vehicle carrier.

III. PROPOSED METHODOLOGY

GPS based vehicle tracking system uses the GPS technology, GSM service and Android mobile. As per shown in Fig. 1 this system has three main modules transmitting unit, monitoring unit and server. Transmitting side performs tracking functionality. It tracks the vehicle through GPS and transmits its current location to the server. The main function of monitoring side is to provide

login interface to user and to show the google map with vehicle locations. Server works as a central connector for transmitting unit and monitoring unit. As both transmitting side and monitoring side communicate with each other through Server only. As shown in Fig. 1 mobile application communicates with server and access the remote database. Where at transmitting side Tracker application obtained its current location through GPS technology and update it to server.

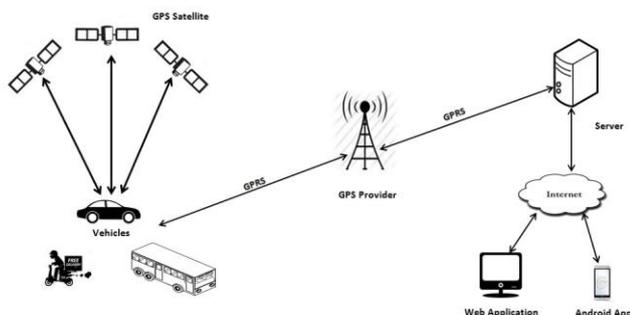


Fig. 1 System Architecture

A. Project Components:

It consists of two units:

1) Transmitting Unit:

Transmitting Side contains Android mobile which has inbuilt GPS, GSM modem and GPRS functionality. Therefore the mobile will be used as transmitting unit.

a) GPS:

GPS stands for Global Positioning System. The Global Positioning System (GPS) is a satellite radio navigation system developed by the Department of Defense (DoD) owned by the United States Government (USG) and operated by the United States Air Force (USAF) [3]. GPS has provided positioning, navigation, and timing services to military and civilian users on a continuous worldwide basis since first launch in 1978. An unlimited number of users with a civil or military GPS receiver can determine accurate time and location, in any weather, day or night, anywhere in the world [3]. The system makes use of a medium earth orbit satellite constellation transmitting microwave signals allowing a GPS receiver to determine its position, velocity and time. Different types of positioning can be carried out using GPS receivers depending on the algorithms, type of measurements and corrections used in the navigation solution.

GPS is a main module in this Vehicle tracking system. As vehicle is tracked using GPS technology. Author has used it to get the exact location of respective vehicles. But to get exact location of any vehicle it need to be in a focus of four satellites.

b) GSM:

GSM is a Global System for Mobile Communications. It is developed by European Telecommunications Standards Institutes (ETSI). It describes the protocol for Second Generation digital cellular networks. A GSM modem is wireless modem that works with a GSM wireless network. It behaves like a Dial-up modem. The working of GSM modem is based on commands; The Commands always start with <AT> (ATention) and finish with a <CR> CRacter. The AT Commands are given to the GSM Modem with the help of PC or Controller.

In Vehicle tracking system author is using GSM service for communication between all three modules.

2) Monitoring unit:

Monitoring unit is an Android Application through which user will get to know the actual position of proposed vehicles. This android provides the user interface through which user communicate with system. It provides login to the system. After login to the system user is will get google map with exact location of vehicles.

B. Work Flow

The workflow of GPS based Vehicle Tracking System is as per the given Fig.2. Users can use this system by performing actions mentioned in flowchart.

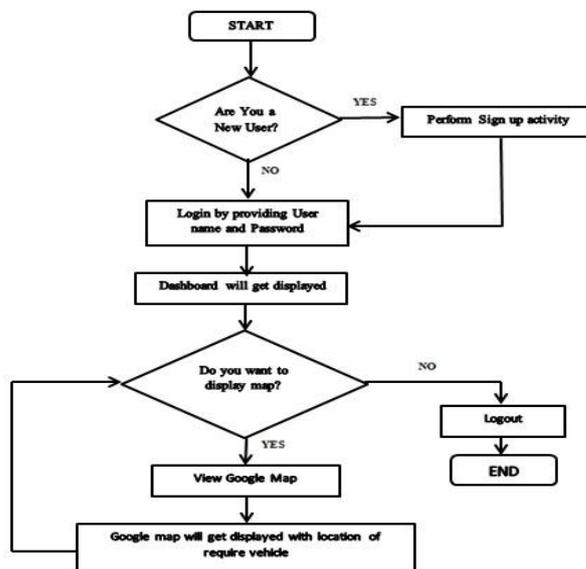


Fig. 2 Work Flow

Tracking Device:

- 1) The tracking device will continuously request to the GPS satellite for its location information.
- 2) At the same time GPS satellite will provide the location information to tracking device installed in vehicle.
- 3) The tracking device will send the location information back to the server through GPRS and continuously update the database.

Monitoring Device:

- 1) Monitoring device will continuously access the database from server.
- 2) From that database the location information will be plotted on Google maps.

IV. IMPLEMENTATION

Monitoring unit, tracking unit and server are the main pillars of GPS based vehicle tracking system. In this system GPRS service is used to perform communication between monitoring and tracking unit to server. Author has used Android platform and Java language for implementation of Monitoring as well as tracking unit. Monitoring side consist of Login page, Signup page and Google Map with the location of required vehicles. As user can easily use this application by sign up and he will get all login rights.

At monitoring side Google Map is obtained by using Google APIs. Author has created online MySQL database server to stores the information receiving from tracking and monitoring units. The database operations are performed through the Structured Query Language (SQL). Tracking device will continuously communicate with GPS satellites and it will provide the current location of vehicle. The tracking device will receive its current location in the form of longitude and latitude and it will send the update to server by using HTTP post method. On the Google map the tracked location of vehicle will get plotted. And we are plotting it with by using the Java Script.

V. Result

After successful implementation of Vehicle Tracking System we obtained following results:

At monitoring side, initially user needs to perform Login activity. Login page shown in Fig. 3 provides Login interface to the user. When user will enter user name and password then system will do validation to check whether the entered username and password is correct or not. If the entered username or password is wrong then system gives an error message. And if it is correct then user gets directed to next page with successful login.

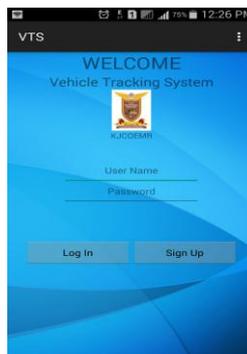


Fig.3 Login Page



Fig. 4 Sign Up Page

If user is operating system for first time then firstly he need to perform signup activity. While signing up user need to provide some basic information i.e. First name, Last name, Email Id etc. Fig. 4 shows the necessary fields which user must fill while signing up. After sign up users all data gets store at server. The user name and password provided at a time of sign up is used for login to application.

As this application is made for an organizational so the all vehicles of organization must be registered. Registration of vehicle required organization name, vehicle no. and username as shown Fig 6. But for registering vehicle user must do login to the application. The login is done by providing username and vehicle no. As you can see in Fig. 6 vehicle registration also requires username. This is because to provide more security to application user.

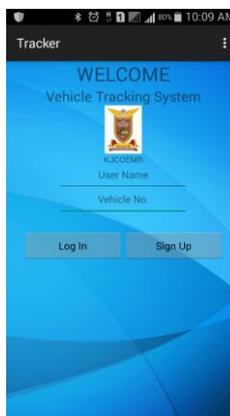


Fig. 5 Vehicle Login page

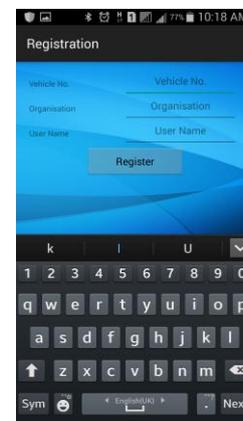


Fig. 6 Vehicle Registration

After clicking on sign up button the following page get displayed. The given information gets store at server. So that when user wants to see his organizational vehicles sever will provide the required vehicles only. And user can register vehicles by providing valid user name only.

For plotting the location of vehicle its Longitude and Latitude must be known. For tracking vehicle author has designed Transmitter Page. Transmitter page provides the current location of vehicle in the form of longitude and latitude as shown in Fig. 7.



Fig. 7 Transmitter Page



Fig. 8 Dash Board

At monitoring side when user login to the application the dash board get displayed. Dash board provides choice selection to user. As shown in Fig. 8 Dash board have two buttons i.e. show map and log out. It gives two options i.e. user wants to leave or stay login.

If user click on show map button then google map will get displayed with the location of required vehicle as shown in Fig. 8.

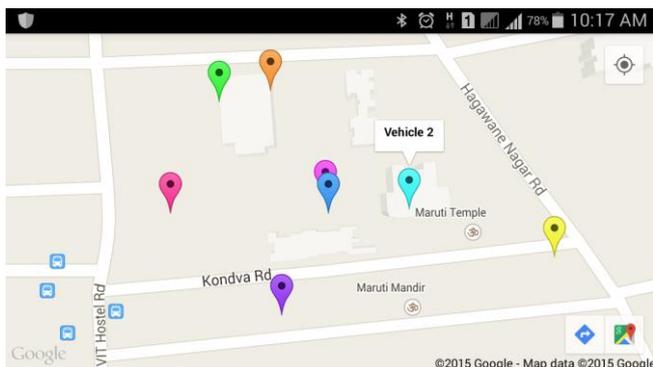


Fig. 9 Google Map

VI. CONCLUSION

This proposed system allows organizations to track their vehicles and to get exact location of vehicle. The system allows those companies to monitor the travelled routes through a web client that uses the Google Maps API and shows colors on the map to indicate if the devices on route. The general evaluation result is that the system proved to be reliable as to view the positioning of the devices.

VII. Future Scope

In the proposed system we can add features like Car locking, thief photo capturing. This will help the user to have an anti-thief feature.

Upgrading this system is very easy which make it open to future requirement without the need of rebuilding everything.

VIII. ACKNOWLEDGMENT

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IX. REFERENCES

- [1] Abid Khan & Ravi Mishra, "GPS – GSM Based Tracking System", International Journal of Trends and Technology, ISSN: 2231 – 5381, Volume 3, Issue 2, 2012
- [2] Rodrigo R. Oliveira, Felipe C. Noguez, Cristiano A. Costa, Jorge L. Barbosa & Mario P. Pardo, "SWTRACK: An Intelligent Model for Cargo Tracking based on off-the-shelf Mobile Devices", ELSEVIER – Expert Systems with Applications 40 (2013) 2023 – 2031
- [3] "Global Positioning System Standard Positioning Service Performance Standard", Department of Defence – USA, 4th Edition (2008)
- [4] Zechun Huang, Dingfa Huang, Zhu Xu & Zhigen Xu, "GPS Vehicle Positioning Monitoring System Integrated with CORS and Mobile GIS", ELSEVIER - Procedia Environmental Sciences 10(2011)2498–2504
- [5] "Federal Space Agency" – Information Analytical Centre [https://glonass-iac.ru/en/index.php]
- [6] Andrew Wilson, "The First Galileo Satellites GIOVE", ESA Publications Division (BR-251)
- [7] Tushar Saxena, Deepak Kumar, J.S. Jadon, "A Literature Study of Various Satellite Navigation Systems with Reference to Their Signalling Scheme", International Journal of Research Aspects of Engineering and Management, ISSN: 2348-6627, Vol. 1, Issue 1, FEB 2014
- [8] "Europe's Satellite Navigation Programmes – GALILEO and EGNOS", European GNSS Supervisory Authority
- [9] Katina Michael & Roger Clarke, "Location and Tracking of Mobile Devices", ELSEVIER - Computer Law & Security Review 29(2013) 216-228.
- [10] Hassan I. Mathkour, "A GPS Based Mobile Dynamic Service Locator system", Applied computing and informatics(2011) 9,95-106
- [11] Changsheng Cai & Yang Gao, "Precise Point Positioning Using Combined GPS and GLONASS Observations", Journal of Global Positioning Systems (2007), Vol.6, No.1: 13 - 22

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