Survey Paper on Vehicle Tracking System using GPS and Android

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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 propose system will give the exact location of vehicle with distance between user and vehicle. The proposal allows organizations to track real-time information about their proposed vehicle during travel.**

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. Also the paper gives brief information about GNSS (Global Navigation Satellite System) like GLONASS and GALILEO.

Index Terms— ***GALILEO, GLONASS, GPS, GSM***

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 us 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 will inform where your 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.

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II. GNSS (Global Navigation Satellite System)

A. GPS (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.

A GPS receiver can measure the pseudo range, i.e. the apparent range between satellite and receiver, using the code phase measurements, which provide an estimate of the instantaneous ranges to the satellites, or the carrier phase measurements, which is the difference between the phase of the carrier signal generated at the receiver and the carrier received from a satellite at the instant of the measurement [4].

The carrier phase measurement is given in a fraction of a cycle, but this does not contain any information about the number of complete cycles (called integer ambiguity).

Requirements for developing the GPS systems from the signaling point of view are as follows:

a) Multiple access capabilities so that no interference in the GPS signals from other satellites should take place.
b) Avoiding some amount of multipath interference.

c) Minimization of interference from jamming, spoofing of signal etc. up to a certain level.
d) Low power signal so that it should not interfere with the microwave line of sight communication signals.

Features:

- Satellite Constellation: 32 Satellites(initially run on 21 active and 3 redundant satellites)
- Multiple Access: CDMA
- Modulation schemes used: BPSK (1), BPSK (5), BPSK (10), BOCsin(10,5), TMBOC(6,1,1/11).
- Center Frequency: 1575.42 MHz, 1227.60 MHz, 1176.45 MHz
- Frequency Bands: L1, L2 and L5 [7].

B. GLONASS

GLONASS is another new emerging Radio based satellite navigation system. Initially the GLONASS was developed for the use by soviet military in 1976, to overcome the problems of Tsikada system. Tsikada system was able to provide accurate position but required 1 to 2Hrs signal processing [5].

In this way till 1995 twenty six satellites were obtained in orbit, but due to failures and satellite design expiry older satellites were taken away from the project.

Hence, till 2001 only eight satellites were present in GLONASS. As the Russian Government was an invested lot of fund in this project, to change this situation. The Russian government organized a program "Global Navigation System" on August 20, 2001[5].

The Indian government also joined this program and become a partner of GLONASS to ensure funding.

On May 18,2007 Russian president 'Vladimir Patin' signed a decree(wwwGLON), to provide open access to civilian navigation signals of the GLONASS system to Russian and foreign consumers for free of charge and without any limitations.

As the development and maintenance of GLONASS system is conducted by Petrol space agency (ROSCOSMOS, MOD). By 2010 GLONASS had achieved 100% coverage of Russia's territory and in Oct 2011 the full orbital constellation of 24 satellites was restored, enabling full global coverage.

Features:

- Satellite Constellation: 24 Satellites (21 Active + 3 Redundant)
- Multiple Access: FDMA
- Modulation Schemes used: BPSK(0.511), BPSK(5.11), BPSK(4), BPSK(2), BPSK(8)
- Center Frequency: 1598.0625 MHz-1605.375 MHz, 1242.9375 MHz-1248.625 MHz, 1201 MHz
- Frequency Bands: L1, L2 and L3 [7].

C. GALILEO

Galileo, the first satellite positioning, navigation and timing system specifically designed for civil use, will offer state-of-the-art services with outstanding accuracy, availability, integrity and guarantee [6]. It is a joint initiative of the European Commission (EC) and ESA.

Definition, completed in 2003, produced the basic specifications for the system. It will be validated by deploying four satellites of the overall constellation together with the ground stations and control centre. Four satellites are the minimum to guarantee precise positioning and time services at specific locations [6].

Early in this phase, the GIOVE (Galileo In-Orbit Validation Element) mission will employ two satellites, GIOVE-A and GIOVE-B, and their mission- and ground-control segments. GIOVE is securing access to the Galileo frequencies allocated by the International Telecommunications Union (ITU), characterizing the radiation environment of the Medium Earth Orbits(MEOs) planned for the Galileo satellites, testing the most critical technologies (such as the on-board atomic clocks, signal generator and user receivers), and characterizing the novel features of the Galileo signal design [8].

Galileo will begin full deployment, covering the entire ground network and launching the remaining 26 satellites to complete the constellation.

Features:

- Satellite Constellation: 30 Satellite (27 active +3 redundant).
- Multiple Accesses: CDMA.
- Modulation Scheme : CBOC(6,11,1/11),BOC(15,2.5), BPSK(5), BOCcos(10,5), AltBOC(15,10).
- Center Frequency: 1575.42 MHz, 1278.75 MHz, 1191.795MHz
- Frequency Bands: E1, E6 and E5 [7].

Suggestion:

According to survey GLONASS & GALILEO provides more accuracy then GPS but their receiver costs very high.

As per the project 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.

III. PROPOSED METHODOLOGY

Project Components:

It consists of two units:

1) Transmitting Unit:

Transmitting Side contains GPS, GSM and GPRS functionality which is preloaded in a smart

phone. Therefore the mobile will be used as transmitting unit.

a) GPS:

The United States Department of Defense (DoD) has developed the Navstar GPS, which is an all-weather, space based navigation system to meet the needs of the USA military forces.

GPS has made a considerable impact on almost all positioning, navigation, timing and monitoring applications.

GPS was started developing in 1973 and completed its construction in 1960s.

It became fully operational in 1994 with 24 satellites.

b) GSM:

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.

GSM Provides recommendation not the Requirement. It defines functions and interfaces requirement in detail but do not address the hardware.

2) Monitoring unit:

Monitoring unit can be an Android Application or a Web Application through which user will get to know the actual position of proposed vehicle.

The Application will display the different co-ordinates (longitude and latitude) receiver from tracking device and plot them on Google Maps.

IV. WORK FLOW

Tracking Device:

1) The tracking device will continuously request to the GPS satellite for its location information.

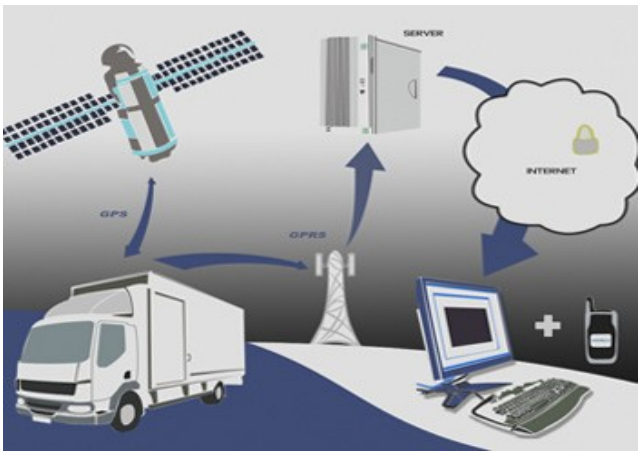
2) At the same time GPS satellite will provide the location information to tracking device installed in vehicle.

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.



Ref. http://www.dogo.co.in/

Fig.3 Architecture of System

V. APPLICATIONS

1) Security Department like Police Department, Military Department Etc.
2) To keep track of Public Buses (PMT Buses, State Transport Buses etc.) and Private Buses as well as Vehicles.
3) Companies like Food Delivery, Car Rental and College Transport can also use this system.

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.

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