GPS Based System for Vehicle Tracking

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ABSTRACT: An effective vehicle tracking and monitoring system for monitoring the movement of a fitted vehicle from different places at different times is designed as well as implemented. The device proposed good use of a common technology that integrates a microcontroller and a smartphone based application. The engineered in-vehicle device uses a Global Positioning System (GPS), a Global Mobile Communication System as well as a General Packet Radio Service (GSM / GPRS) technology that serves as one of the most effective ways of locating vehicles. A vehicle whose location is to be calculated and tracked within real time, mounts this device. GPS, GSM and GPRS modules are powered by a microcontroller. The GPS module used in the vehicle tracking system for collection of the geographic coordinates of the vehicle at regular intervals of time. The movement and update of the location of the vehicle in a database is done by a GPS module.

KEYWORDS: GPS, GSM, GPRS, Vehicle tracking, system.

INTRODUCTION

Vehicle tracking systems are employed in many areas all over the world, including vehicle location tracking systems, intelligent transport systems (ITS) [1], fleet management systems [2] and the vehicle anti-theft systems [3] for tracking.

One way of preventing or detecting unauthorized access is to deploy an anti-theft system of tracking to various valuable devices. Authors namely, Ramadan, Al-Khedher, and Al-Kheder [4] have proposed that a vehicle tracking as well as anti-theft system that can be designed and implemented to protect a vehicle from the attack of any intruder using technology of GPS [5] or GSM [6] based tracking systems.

When the ignition of a vehicle is turned on, an SMS confirmation is sent to the owner of a vehicle that the vehicle is running now. If in case the vehicle is illegally accessed, the owner of that vehicle will send an SMS for turning off of the vehicle. A Google Earth-embedded laptop is used to monitor and display the position and status of the vehicle on map. An alternate to the work of laptops is smartphone indeed. The proposed system is clearly illustrated in figure 1.
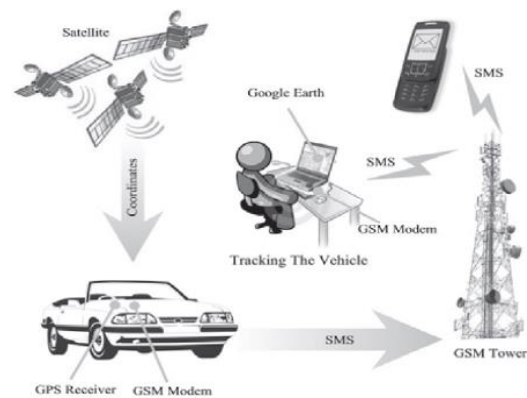

Fig. 1: Layout of a General Vehicle Tracking System

GSM BASIC ARCHITECTURE

A cellular network is made up of several base stations in the Base Transceiver Stations (BTS) [7] housed by a GSM topology. BTS manages the mobile station or MS radio system. The BTS comprises of antennas serving as cells for the honey comb.

Generally, a BTS design is a three cells positioned in hexagonal sectors where 120 degree is covered by each of these three sectors. Each cell is configured with multiple radio frequencies that depends on each cell's capacity requirements that are generally referred to as TRx. A BTS category is managed by a

BSC [8] whereas the count of BTS under each of the BSCs depends on the total capacity of BSC's to handle transmission or maximum ability to anyhow handle the traffic load.

There are several BSCs that are connected to MSC [9]. The MSC carries out the functions of system's telephony switching. It controls the calls to and from the other systems of data and telephone. Functions like interfacing the network, toll ticketing, signaling the specific channel and so on.

Additionally, VLR [10] or Visitor Location Register is a database containing a subscriber's temporarily contained information required by MS.

Generally speaking, VLR and MSC are integrated with each other. MSC is connected to other similar components like HLR i.e. Home Location Register, AUC i.e. Authentication Center, EIR i.e. Equipment Identity Register etc. Figure 2 depicts the basic architecture of a GSM.
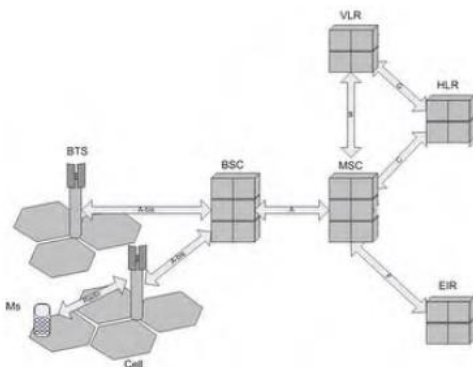

Fig. 2: Base Architecture of GSM

GSM Module

The Global Positioning System (GSM) in a vehicle tracking system is generally employed to provide details to users anywhere on the Earth, these details include location coordinates, time, and speed and so on. To implement this in-vehicle device, a GPS receiver and a GPS module that are available on the Sparkfun website has been adopted in this research work. For the GPS receiver, an antenna is deployed in the GPS module. Figure 3 shows a picture of a GSM module.

Fig. 3: Illustration of A GSM Module

TECHNOLOGY

Fig. 4 indicates the configuration of our vehicle tracking system that can help to understand how a project is being carried out. As illustrated, a satellite is placed at the top of the diagram. The GPS module receives the geographical coordinates from various satellites. The information relating to the location of the vehicle is interpreted by the microcontroller system from the GPS module. The location data of the vehicle as well as the vehicle's ID are thereafter transmitted via the GSM or GPRS [11] network to the related web server, Figure 4 describes the vehicle tracking system.

The GSM / GPRS module has various functionalities for the IEEE World Forum on the Internet of Things (WF-IoT) 356 TCP / IP connectivity 2014. The information relating to the location of the received vehicle as well as the vehicle's ID will be sent to the server by using the GET process.
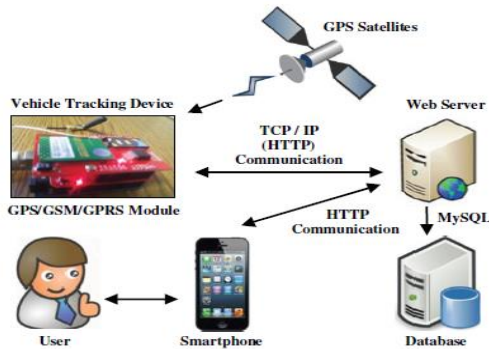
Fig. 4: Layout of the Proposed Vehicle Tracking System

A SIM or Subscriber Identity Module will be held inside the car that is to be tracked with the help of the special package and is capable of receiving incoming calls. The SIM card number will be dialed through the interface between the MSC and BSC with the help of a specially designed program. As mentioned above, the call will be instantly identified as the kit is itself capable of automatically receiving a phone call. Figure 5 illustrates the flow diagram of the proposed software.
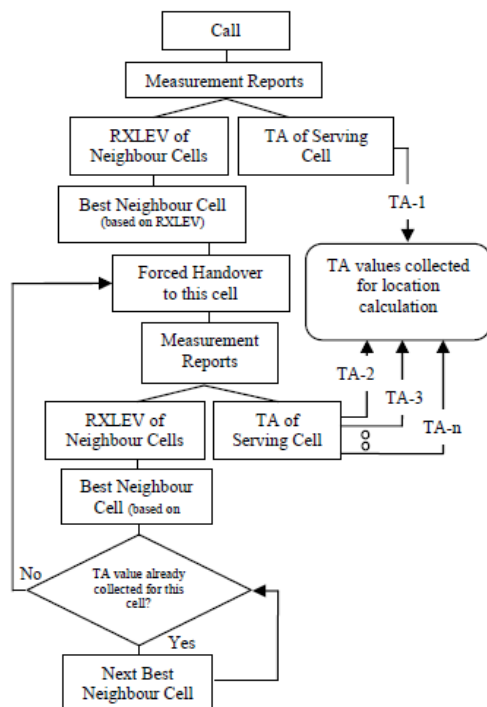

Fig. 5: Flow Diagram of the Proposed Software

CONCLUSION

A new vehicle tracking system is discussed, proposed and analyzed by using the established GSM network. The advantage of the system is that it does not require any modification in the current system, neither does it require any additional hardware, making it a cost-effective solution. The software once embedded for a different GSM network is actually the only new element.

The precision of the location is measured and described mathematically. The system is anticipated to be regarded as a notable value-added service or VAS if implemented in a GSM based network. The potential consumers of such a VAS are both private car owners and large transportation service providers to control and track their multiple vehicles operating concurrently at various geographical locations.

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