Vehicle Tracking System using GSM and GPS Technologies

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Abstract: *A vehicle tracking system is an automated device that makes it easier to locate and at the same time monitor the position, timing, and mobility of a carriage. This paper proposes a tracking system that makes use of "GPS" and "GSM" technologies. It works as the most inexpensive form of the system that can help identify vehicle theft. It is an enclosed system that uses a GPS receiver along with a GSM modem monitoring the movement of vehicle and briefs the status. GSM modem shows the location with respect to longitude and latitudes.*
Keywords: *GPS, GSM, Maps, Microcontroller, Vehicle Tracking.*

I. Introduction

Survival in today's urban world cannot be imagined with proper means of transportation. Transportation is not only crucial but has also become a necessity in one's life. One such means of transportation is the use of vehicles such as buses, cars etc. Owning a vehicle today is not merely a symbol of luxury but has become a necessity. However, considering vehicles, any catastrophic situation can take place.

Therefore there is always an urgent need to arrange appropriate measures to increase the safety, security as well as monitor the vehicles to avoid any mishap. It would help us in the situations such as:

* Locating a stolen vehicle.
* Allowing an agency to detect the location of its vehicles.
* Useful for finding the shortest path to a particular destination.

One such measure is the use of vehicle tracking system using the GPS (Global Position System).Such a tracking system includes a mechanized device that is equipped in a vehicle. Using software present at an operational base, it helps track the location of the vehicle. This base station is used for monitoring purpose. It is accompanied by maps such as Google maps, Here maps, Bing maps etc for the representation of the location. The system is linked to Global Positioning Satellites which helps to acquire the time as well as the position. The electronic device placed on the vehicles consists of GPS receivers and a GSM modem.

Developed by the American Military, GPS is a global system which uses satellites to show the locations as well as the timings, anywhere over the earth. It usually requires at least 4 satellites to be on the visible horizon. It is easily accessible with a GPS receiver.

GSM which was developed by the ETSI with the aim to back the mobile communication,has now become worldwide accepted standard. Dispatching and gathering of the data in a GSM supported modem are perfected using the radio signals.

II. Related Works

According to Prof. BaburaoKodavati (Asst. Prof in ECE Dept), in his paper titled 'GSM AND GPS BASED VEHICLE LOCATION AND TRACKING SYSTEM' has concluded by saying that vehicle tracking system is necessary to prevent any vehicle theft and also allows to remotely control a vehicle only by a text message.

According to Mr. NileshManganakar (BE-IT), in his paper titled 'REAL TIME TRACKING OF COMPLETE TRANSPORT SYSTEM USING GPS' has concluded by saying that GPS tracking system is useful for a user to track the current position of vehicle thus reducing waiting time for travelling.

According to Mr. PankajVerma, in his paper titled 'DESIGN AND DEVELOPMENT OF GPS-GSM BASED TRACKING SYSTEM WITH GOOGLE MAP BASED MONITORING' has concluded by saying that it is useful for making vehicles more secure by use of GPS and GSM technologies and can also be useful for tracking animals in jungles, various department services such as fire etc.

According to Mr. KunalMaurya, in his paper titled 'REAL TIME VEHICLE TRACKING SYSTEM USING GSM AND GPS TECHNOLOGY- AN ANTI-THEFT TRACKING SYSTEM' has concluded by stating that besides being useful in animal tracking and asset tracking, the proposed system in future can be assimilated with other related devices such as senors thus resulting in a smart tracking system.

III. Models

3.1 GPS Technology

This is a navigation technology providing accurate location and information. Preserved by the U.S, GPS is a space-based satellite system, granting contact to anyone owning a GPS supported receiver. Started in 1973 was designed for military purpose but later was allowed for commercial use. The system consists of 24 satellites of United States. A GPS receiver calculates the radio signals that are rhythmically sent fromthe satellites. It measures the signal from at minimum 3 satellites to find the longitude and latitude using various techniques.

Fig 1: GPS Receiver*[Source: Google Images]*

3.2 GSM Technology

This GSM technology was established in 1982 to develop a common mobile telephone standard. Although it resembles the traditional modem, but differs in the way it transmits and receives data. A dial-up modem uses telephone lines whereas a GSM modem makes use of radio waves. A GSM modem uses commands with each command beginning with AT i.e. Attention followed by a character. For example Dialling command would be – ATD123123234. A GSM modem obtains a SIM (Subscriber Identity Module) and making use of circuit switching establishes a communication between two devices. Once connected constant streaming of data takes place.
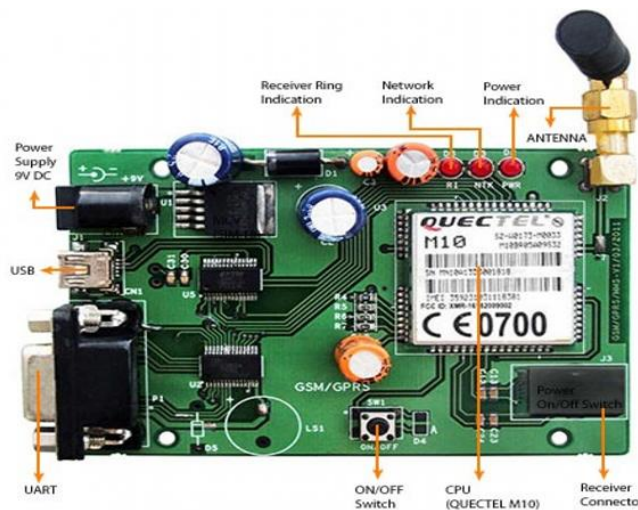

Fig 2: GSM Modem*[Source: Google Images]*

3.3 Maps

There is much free software such as Google map, Here maps, Bing map that provides maps using satellite imaging which make use of plug-ins to show objects such as 3D objects, pin objects indicating the point of interest or a line object to show tracks.

3.4 Microcontroller

It is responsible for acting as an interface between GSM module and GSM receiver. Microcontrollers are small chips which simplify the functioning. Low-cost design and adding intelligence to the system makes microcontroller chips highly reliable. It is programmed to energize the modem when requested in terms of message forwarding.

IV. System Design

This paper proposes a planted system that helps to track and determine the position of each automobile adopting the GPS technology as well as the GSM technology. The displacement and the grade of any vehicle can be monitored using the encapsulated system on command. The interaction between a GSM modem and a GPS receiver is facilitated using a microcontroller.

The modem sends the Longitude and Latitude position of any vector from an unknown place. When the user demands or requests, the system accordingly delivers a reply to the device indicating the location of a vehicle with respect to the latitude and longitude values.

Microcontroller's internal memory i.e. ROM (Read-Only Memory) consists of the code. Processing of the instruction is done using instruction set and acts as an ally between GSM and GPS. GPS only transmits data whereas GSM imparts as well as receive data.

The microcontroller is linked to the GPS pins and a serial connection is established between the GSM pins and microcontroller. The data is received by the GPS receiver from numerous satellites i.e. processing of data containing GPS results from diverse satellites is done by the microcontroller which is then acquired by the GSM modem.

The receiver sends the data to microcontroller which is then processed by the microcontroller and catches only latitude and longitude numerical values blocking information such as interval, elevation, alias of satellite, verification etcetra. On the user end the GSM enabled device acts like an SMS receiver and acting as a SMS sender is a GSM modem connected serially to the microcontroller. In terms of power, GSM uses 12 volts whereas microcontroller circuitry and GPS use 5 volts which are provided by a 12 volts /3.2 Ampere battery.
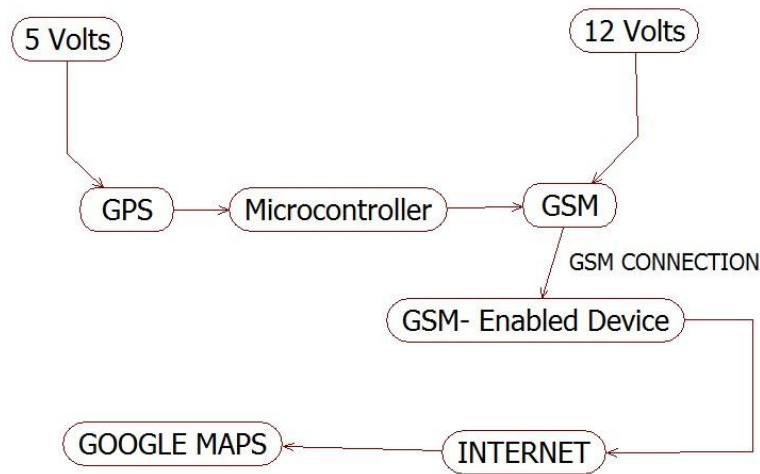
Fig 3: Block Diagram illustrating the concept
[Source: References-[4]]

V. Results

The coding is achieved using C programming language. NMEA (National Marine Electronics Association) protocol forms the basis of the data gathered from the satellites. Decoding the NMEA protocol is an important function of this software. The NMEA code consists of a combination of information. These messages follow an ASCII character set. The data sent to the GPS receiver is in ASCII comma form i.e. delimited message strings. It uses $ sign at beginning of every broadcast and the locations are in the pattern of ddmm.mmmm (degree minutes and decimal minutes).The system flow chart can be shown in the *fig* given below:
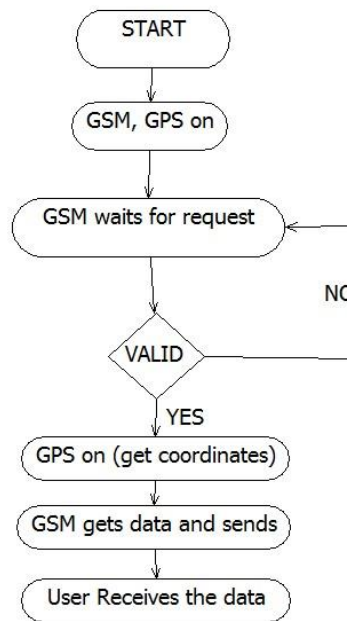
Fig 4: Flow Chart of the system
[Source: References-[3]]

VI. Conclusion

This paper offers an anti-theft system that makes a vehicle more immune by the help of GPS. It allows a vehicle to be tracked using the proposed system in it. This system can also serve for animal tracking, resource tracking as well as robbed automobile. These systems are usually used by fleet operators which help them in simulations, defining their routes and also dispatching. Another application of this system can be monitoring driving behaviour. It can also be beneficial in delivery services and also cops and fire department.

References

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