GPS-GSM Predicated Vehicle Tracking and Monitoring System using a Mobile App based on Google Map

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Abstract: *Vehicle tracking is one of the important application of IoT which comprises of a GPS and GSM modules that tracks the location of the vehicle and points the location of the vehicle on a Google map and helps the user to navigate. The system is developed keeping in mind, the trouble of finding one's vehicle when lost. The main objective is to implement real time vehicle monitoring to continuously tracking of a vehicle's position and to give the security. The systems keep in touch with the owner through GSM modem. An ignition key is used for theft detection. GPS module is protected by using RFID technology.*

Keywords: Arduino, *GPS Module, GSM Modem, IoT, RFID*

1. INTRODUCTION

The essential part of the system is tracking and monitoring the lost vehicle. This system is designed to develop Anti-theft system. A GPS based vehicle tracking system is proposed to find the location of the lost vehicle and to notify the location to the automobile owner through the GSM modem. RFID technology is used to protect the GPS module before it gets unaltered. The location of the vehicle can be known by sending a Short message alerts to user and also whenever vehicle is met with theft the user will get to know the status and the user can control the vehicle by using mobile app.

The process of working consists of two sections. They are vehicle section and monitor section. In the vehicle section, the equipment is placed inside a vehicle which is not visible to others. Here we have GPS (Global Positioning System) module by which we can get the graphical location of the vehicle using satellite signals and these location values are displayed on the LCD (Liquid Crystal Display). Three satellite signals are necessary to locate the receiver in 3D space and fourth satellite is used for time accuracy. GSM is used to monitor the vehicle by receiving messages by the automobile user. RFID technology is used to protect the GPRS and GPS module when the vehicle is lost. By this way user will get to know the exact location of the vehicle and will be also intimated in tracking conditions.

The system consists of three technologies GPS, GSM and RFID Technologies. RFID Technology consists of two sections, one is RFID tags which are used to trace the object and the other is RFID reader used to generate the signals from the satellite and convert them into geographical locations .Global Positioning System is used for tracking the locations of the automobile vehicle by calculating the longitudinal and latitudinal values. Global System for Mobile Communication is used to transfer the information from the interfacing device microcontroller to the automobile owner by sending short messages.

2. RELATED WORK

There are many other technologies which are used for tracking the lost vehicle. Few of the vehicle anti-theft systems are like password security systems, RFID systems, face detection systems etc. All the above systems are used to know the information about the vehicle when lost.

All of these technologies are used to find the location of the lost vehicle and for controlling the vehicle when lost. They can only monitor the vehicle remotely but controlling cannot be done by these technologies. To overcome these problems a system is designed which is used to track the location of the vehicle which is lost and for controlling the vehicle remotely by using GPS, GSM for tracking and mobile app for controlling.

3. PROPOSED SYSTEM

The commonly used vehicle tracking system works with the radio signals. After a vehicle has stolen the owner can report it to the police officer to get the vehicle back. The locations are reported to the police officer. This process is time consuming and expensive. Thief can remove the GPS modem from the vehicle so that location cannot find. To overcome these limitations of existing system, we propose this anti-theft system by providing security to the GPS module.

The proposed system consists of GPS module for tracking the locations of the vehicle by generating the signals [3]. The locations are shared to the automobile owner by sending the messages through GSM modem. The locations are transferred from GPS receiver to the GSM modem through the Microcontroller. The microcontroller used in this system is Atmega which is of AVR family.

The system includes RFID module to protect the GPS module before it gets damaged [9] .GPS continuously tracks the location of the vehicle and vehicle's engine can be controlled either by sending messages or through the mobile app [10]. Once the vehicle's engine is turned off or stopped through the mobile app the vehicle will stop permanently until and unless it is switched on by the owner through the mobile app by sending the message. When the ignition key is in ON condition the automobile owner gets the message along with the location and buzzer will be in ON condition. Vehicle tracking and monitoring system is as shown in figure1.
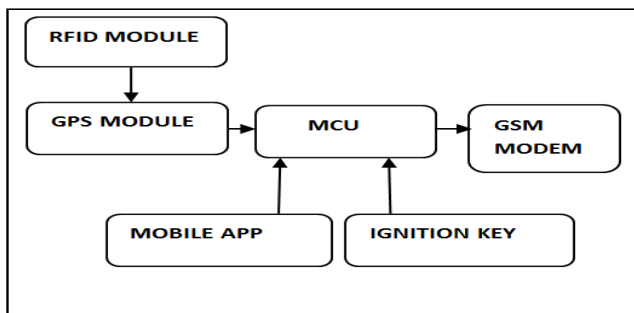

Figure 1: Vehicle tracking and monitoring system

3.1 Interfaces:

3.1.1 MCU

One of the most popular and generally used microcontrollers is ATMEGA328. A microcontroller is a circuit board which has a chip on it, can be programmed to do many things such as reading data from the sensors, actuators etc. Arduino Uno board is manufactured by an ITALY company by the name Arduino. The largest chip on the Arduino board is ATMEGA328, which is a 8bit AVR RISC based controller with 32KB flash memory, 2KB SRAM. This controller operates at a voltage of 5v and with clock frequency of 16MHz.

It contains ICSP (In Circuit Serial Programmer) connector which is used to connect an external hardware devices. The unique thing about the Arduino board is it has the preloaded software known as bootloader program that allows to use more simple programming language to program the modules. It has a polyfuse which is used to protect the UART ports from overcurrent or shorts.

3.1.2 GSM Module:

GSM (Global System for Mobile Communication) is a communication module which was developed at bell laboratories in 1970. It is a digital cellular technology which was used for providing data and voice oriented services by using time division multiple access technique for communication purpose. It has a capacity to carry 64kbps to 120Mbps of data rates.

GSM modem is a device which can be either a mobile phone or any modem which is used for communication between two different devices over any network. It works with a frequency of 1800 KHz and operating voltage is 5v. After initializing the GSM modem some attenuation commands are used to set the modem into text mode and for storing the messages. It will allow communication from anywhere, anytime and with anyone.

3.1.3 GPS Module:

GPS (Global positioning system) was developed by the United States development of defense. This is used for tracking the geographical locations of any object. The GPS modem generates the signals from the satellites and converts them into the digital signals and sends them to the GPS receiver. Many satellites are placed around the point in different directions.

To find the location of the object three different satellites are considered to find the position in three dimensions – east, north and altitude by calculating the distance from each satellite. The distance is calculated by finding the difference between the time at which signal transmitted and the time at which signal received. The calculated longitudinal and latitude values are then sent to the microcontroller to display it on the LCD.

3.1.4 RFID Technology:

RFID (Radio Frequency Identification) Is used to provide security for GPS modem from an unauthorized user. It consists of two parts one is RFID tags and the other is RFID receiver. RFID tags are made up of magnetic material which is used to sense the signals. Generally barcodes identify the objects with line-of sight butt RFID identifies the objects without line-of sight. RFID Reader is placed inside a vehicle and tags are given to the owner. The automobile owner's information is stored in the tags and only the authorized users can use it.

There are two types of RFID. They are active RFID and passive RFID. Depending upon the application and distance to be covered those are selected. Generally for shorter distances passive RFID is selected which is less

expensive and for longer distances active RFID is chosen which a bit expensive.


4. METHODOLOGY:

GPS, GSM and RFID modems are placed inside the vehicle to track the location and to send that information to the owner by sending the messages through GSM modem. GPS is protected by using RFID technology. When the vehicle is driven by the owner in normal conditions just the locations are displaced on the LCD.

If the vehicle is driven by an unauthorized person by using ignition key the locations are sent to the owner who can then control the vehicle by using a mobile App.

The vehicle is stopped permanently so that the unauthorized cannot go ahead normally. The layered approach of the vehicle tracking and monitoring system is shown below Figure.
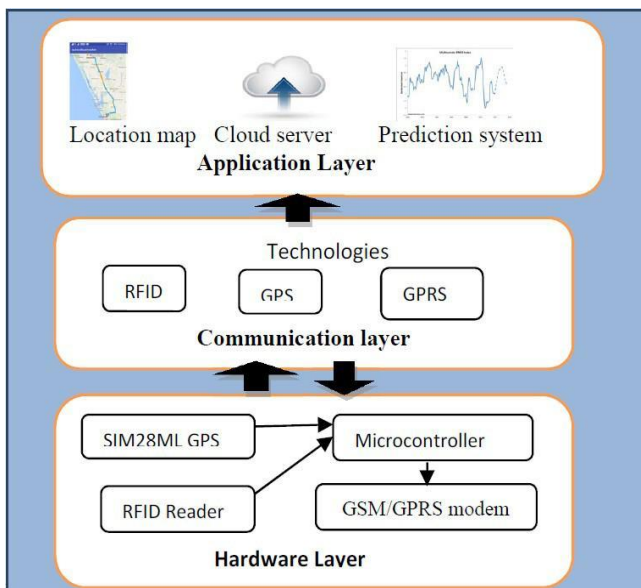
The flow chart of the vehicle tracking system and monitoring system is as shown in below fig.
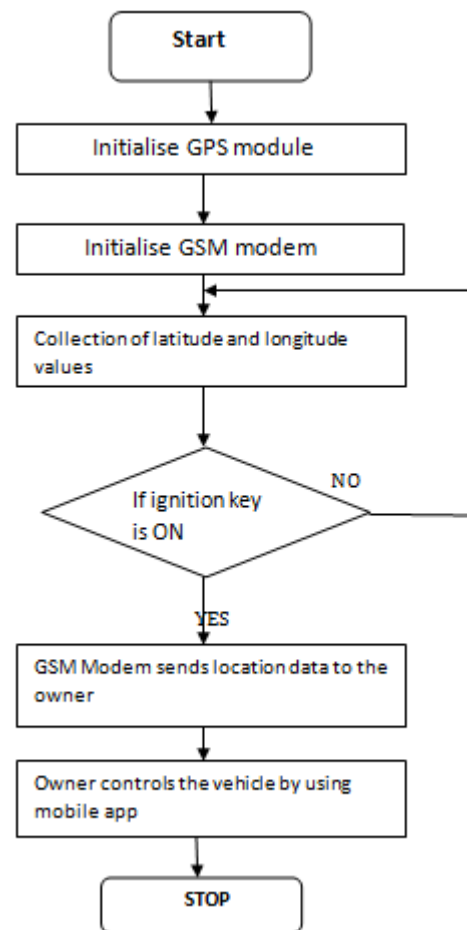
5. CONCLUSION

The very essential part in today's everyone life is security. The article GPS-GSM predicated vehicle tracking and monitoring system using mobile App based on Google Map is proposed to track and monitor the vehicle using GSM and GPS modules. Ignition key is used as the anti-theft system to find the vehicle when it is stolen and the data can be received through messages by using GSM modem by the owner. Security for the GPS is provided by using RFID technology.

6. REFERENCES

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