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GPS-GSM Vehicle Tracking System

Anish Puranik
TE B TECH, Electronics and Telecommunication Engineering, MMCOE, Pune.

Abstract: ***This paper deals with GPS-GSM based vehicle tracking system. Tracking systems are installed to allow an individual or a third party user to know the exact location of the vehicle. Despite the reduction in vehicle thefts in today's world has decreased, industry observers caution that new and sophisticated means of stealing autos are constantly demised. A tracking system proves to be a simple yet an effective method for locating such vehicles. Not only thefts, a vehicle tracking system can help company owners with a fleet of vehicles, keep a tab on the driver without having to be actually present on the site. This can reduce vehicle abuse and ultimately results in significant cost-savings for individuals, fleet owners and the like. The GPS-GSM based tracking system intends to find the precise location of any vehicle and is interfaced using a single microcontroller and real time tracing of the vehicles location, which is then inquired using SMS. This system is easy to install, less costly and reliable as compared to a two-way GPS communication system where the communication is done both ways by GPS satellites.***
Keywords: GSM, MS, BTS, GPS, Trilateration, UART, RMC, microcontroller.

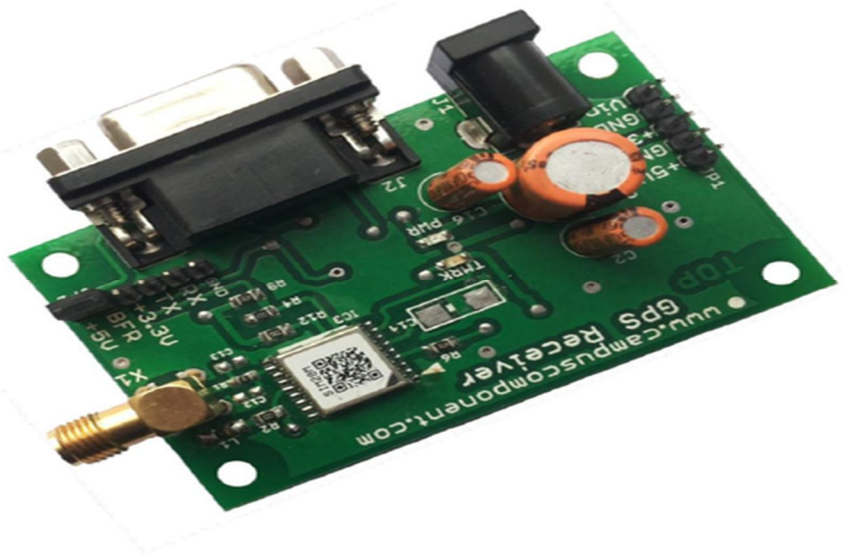
I. INTRODUCTION

A. GSM Communication

The Global System for Mobile Communication (GSM) is a standard developed by the European Telecommunications Standards Institute (ETSI), to describe the protocols for second-generation digital cellular networks used by mobile phones. GSM usually operates in a frequency spectrum around 900Mhz. *Components*-MS (Mobile Station) is a physical equipment, mostly, a handheld cellular phone. BTS (Base Transmitter Station) comprise the radio transmission and reception devices, and also manage the signal processing related to air interface.

B. GPS

GPS (Global Positioning System) is a navigation system that uses satellites and a receiver to synchronize location of any means of travel. It works through a technique called trilateration, which basically collects signals from satellites to output the location information. Since, we will be using microcontrollers for the tracking, the GPS module will continuously receive data from satellite and transmit it correspondingly to the UART of the microcontroller.



GPS Receiver

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C. UART

UART stands for Universal Asynchronous Receiver/Transmitter. Unlike I2C and SPI, UART is not a communication protocol, but a physical circuit in a microcontroller, or a stand alone IC. UARTs main purpose is to transmit and receive serial data.

D. GPS Module and GSM Modem

The GPS signal is applied to the antenna input of the module, and a complete serial data message with position, velocity and time is presented at serial interface. The data thus received, is in the format of RMC latitude and longitude positions. A GSM module is a hardware device that uses GSM communication to provide data remotely. It is mostly used to enable the communication between a microcontroller and a GSM Network. Moreover, GSM holds an advantage of possessing a harmonized spectrum, which means that even though different countries operate on different frequency bands, the users can transfer data seamlessly between networks and keep the same number. When a GSM modem is connected to a computer, it allows one to use the modem to communicate over the mobile network.

While most GSM modems are used to provide mobile internet connectivity, they can also be used for sending and receiving SMS and MMS.

E. Microcontroller

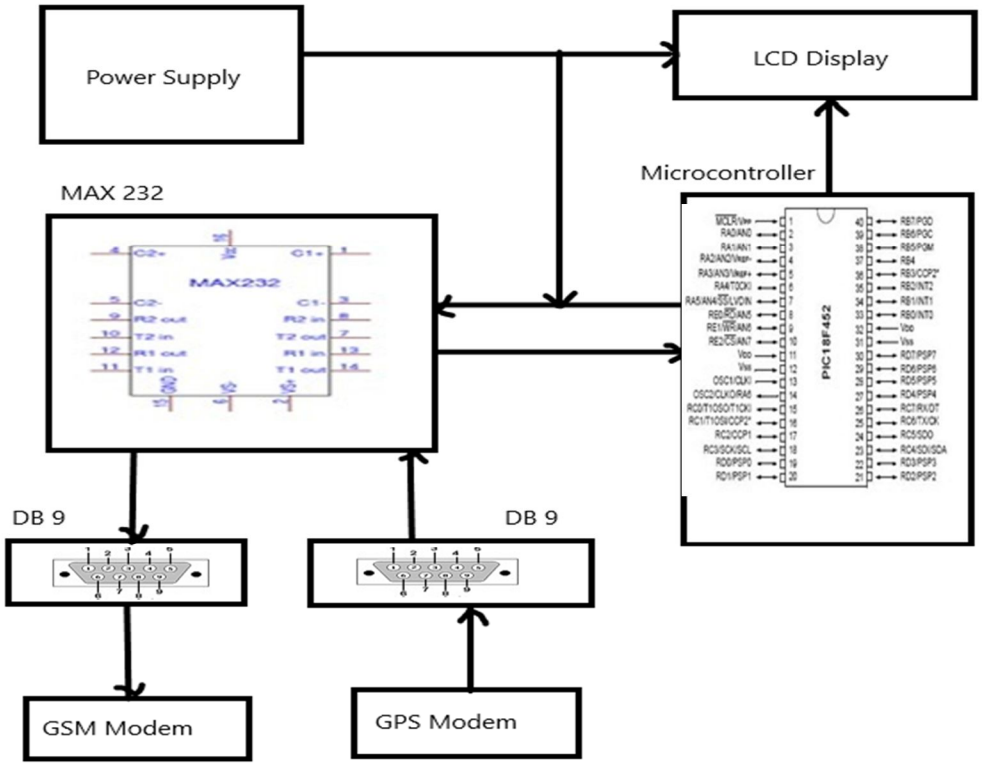
This is the heart of this tracking system. It acts as an interface between the GSM modem and the GPS module. It is a small computer on a single Integrated Circuit containing a processing core, data memory, analog-digital converter and programmable input/output peripherals. In our tracking system, the microcontroller is programmed to stimulate the GSM modem in message forwarding when a request is sent by the user. Microcontrollers are designed for embedded applications, in contrast to microprocessors used in personal computers or other general purpose applications consisting various discrete chips. Using a microcontroller is of great use mainly because of their form factor, low design cost and moreover, it adds intelligence to the system.

Microcontroller PIC18F452

II. METHODOLOGY/ WORKING

The purpose of this paper is to design an embedded system which is used for tracking of any vehicle by using GPS and GSM. Microcontroller PIC 18F452 can be used for interfacing various hardware peripherals. PIC 18F452 is serially interfaced with the GSM Modem and the GPS receiver. In this vehicle tracking system, the GSM modem is used for sending the vehicle information on the users mobile phone. This modem gets this required data from the Microcontroller PIC 18F52 through the MAX232, which is a 16-pin integrated dip package powered by 5V DC supply, Since, GSM and GPS module interfacing is not possible without Max232. We use this IC to serially interface the GSM modem and GPS receiver for serial communication with the microcontroller. MAX232 is a dual driver IC, meaning, it can send/receive signals from GPS-GSM module or the pic microcontroller.

The GPS module is only used for identifying the exact location of the vehicle. It gets information in the form of latitude and longitude and via the Geo Satellite and sends this data to the microcontroller via the MAX232. Lastly, to serially interface GPS modem, GSM modem and MAX232, we use a 9-pin connector, DB9.The working of this vehicle tracking system is fairly easy to understand. After the connections are done as per the block diagram given below, (Fig.1) activate the tracking system. Once the tracking system is online, we then add the owners or authorized mobile number to which we want to send the location of the vehicle to. The GPS module, which has the antenna, receives the data signals in the form of RMC latitude and longitude and further sends this data to the microcontroller. The microcontroller then sends the received data to the authorized mobile phone through the GSM modem. Thus, the owner can easily track the location of the vehicle without much of a hassle.



III. DISADVANTAGES

GPS-GSM tracking systems are fairly common these days. They are definitely a boon in so many ways in effective time management of travel services. But, as the saying goes, every coin has two sides. These tracking systems have their own drawbacks when it comes to utilizing their services.

A. Power Dependency

GPS-GSM vehicle trackers require a power source to function. Both battery powered and hardwired devices have their drawbacks. Battery powered devices must be kept charged at all time, avoiding liabilities or the possibility of being incapable of working during a case of emergency, if it runs out of power. Hardwired vehicle trackers draw power from the battery of the vehicle itself and can deplete it if the wires are not connected properly.

B. Jamming

in some cases, satellite malfunction or solar flares can temporarily disrupt the transmission of GPS signals. The only way to protect against this is to buy a telematics system that can detect and report the signal jamming.

IV. CONCLUSION

Of all the different options to protect the vehicle from thieves, including steer locks, car alarms, none of them offer the same advanced features as a vehicle tracking system. These small gadgets not only improve vehicle security but also reveal a huge amount of information- everything from driving habits to engine diagnostic reports, location. The use of GPS-GSM vehicle trackers will continue to see subtle improvements and tremendous growth, as they are a proven tool for recovery of stolen vehicles, tracing company owned vehicles and help protect people by promoting safer driving habits.

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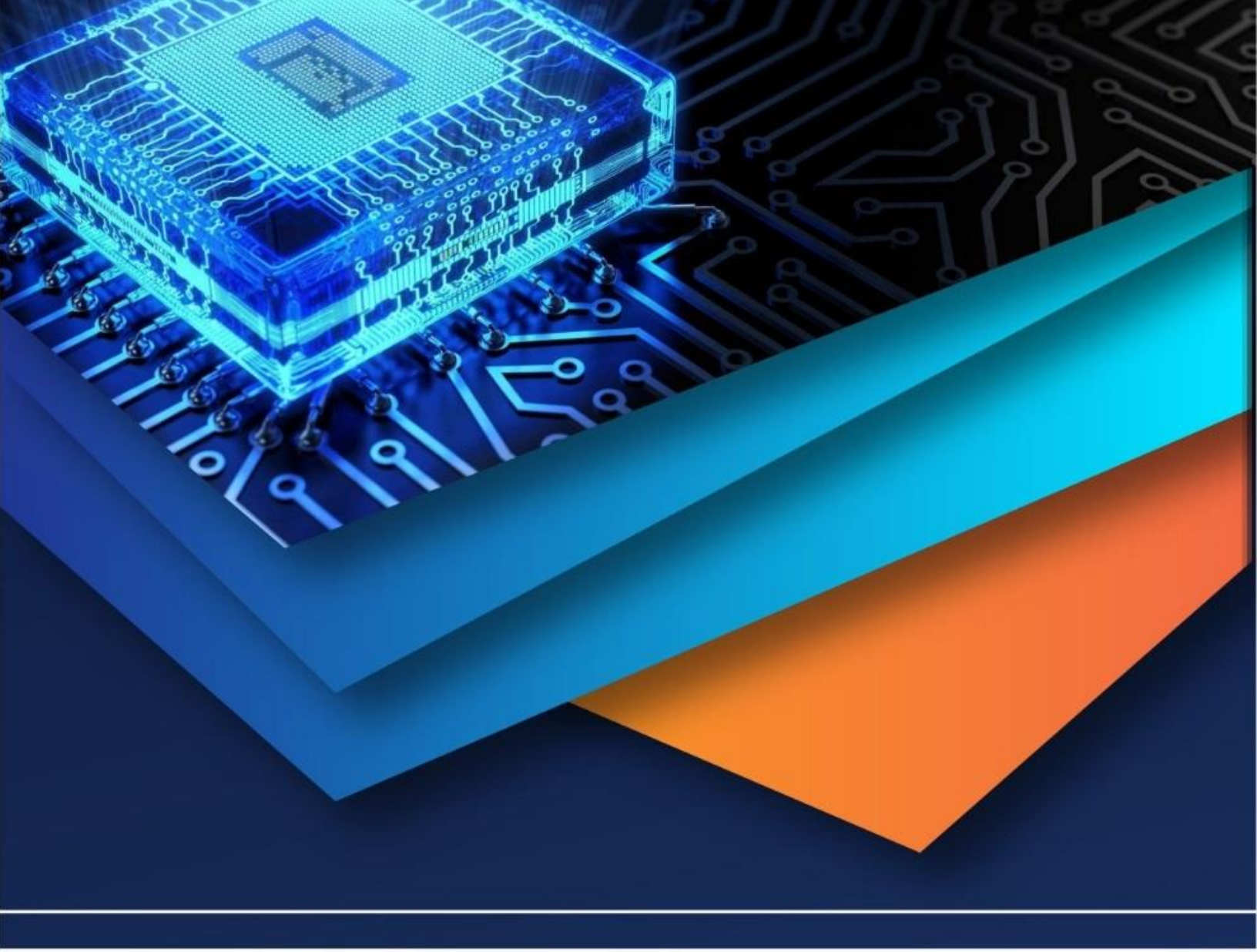

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