

Vehicular Anti-Theft Protection and Tracking System

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ABSTRACT

Vehicle Theft is a serious issue that is difficult to tackle in many countries across the globe. The aim of this paper is to provide a solution for detection of stolen vehicles and also track its location. Vehicular Anti-Theft Protection and Tracking System is a vehicle theft deterrent system designed to determine the location of a stolen vehicle and to disable the vehicle engine remotely through SMS. The system is designed with intent of allowing the user to interact with the vehicle via mobile phone. It deals particularly with the tracking and location reporting aspects of car security. The advantage of using this system is the accuracy in determining the position through GPS, which is a space based satellite navigation system. The 24 satellites that make up the GPS space segment help in achieving the accuracy

Keywords/ Index Term— Vehicle Theft Detection, Anti-Theft Protection System, Vehicle Location Tracking

1. INTRODUCTION

In 2010, there were 147,475 reported motor-vehicle thefts in India alone, and even automobiles with the best in-vehicle security systems can still be stolen by professional car-thieves. Most security features in cars today attempt to protect against theft, but there are relatively fewer technologies that facilitate vehicle recovery after theft. Therefore, the nature of this project is to create an automobile security/recovery system that can track the location of an automobile in the event that it is stolen. Law enforcement agencies would be able to easily recover a stolen automobile if they knew its location. This would further reduce the motor-vehicle thefts in India and around the world

2. EXISTING SYSTEM

Domestic and overseas vehicle anti-theft products are technologically classified into three categories: mechanical lock devices, car alarm system, and vehicle tracking/recovery systems, mainly aiming at preventing cars to be broken in and driven away. The most commonly used mechanical lock device is steering wheel lock, which is relatively cheap but

inconvenient to use and may be easily disarmed by skilled thieves. Car alarm devices are very popular these days. These car alarm systems do not cover large areas; the area is just less than 100m. Once the car is stolen, the owner and the police cannot track the position of it

3. PROPOSED SYSTEM

Vehicle anti-theft tracking system works using GPS and GSM technology. The system aims at providing the following functionalities

- Reporting the vehicle location to the owner through SMS whenever the vehicle engine is switched on.
- Stopping the vehicle engine when the owner sends a 'STOP' SMS using pre-registered number known to the system.
- On receipt of the 'STOP' SMS, the system should send a reply SMS with the vehicle location.

- The vehicle engine cannot be started again until a 'RESET' message is sent by the owner.

The automobile security/recovery system using GPS and GSM. The user interacts with the system through SMS. It utilizes GPS to find the location coordinates of the vehicle and reports it to the owner by sending an SMS via GSM.

The vehicle owner is provided with the option of sending a 'STOP' SMS in case of vehicle theft. On receipt of the 'STOP' SMS, the microcontroller in the GSM Antitheft Tracking System shuts OFF the engine and sends a message to the owner. This message passes on the information that contains the current location. The vehicle engine cannot be started until a RESET message is received by the system from the owner.

4. PROJECT MODULES

Whenever engine of the vehicle starts, an SMS will be sent to the owner containing details about the location of the vehicle. This SMS will help in determining the theft. If the owner doesn't know who has started the vehicle, he can send a 'STOP' message to halt the vehicle engine.

The entire project can therefore be viewed as three sections:

1. **On Engine Start**
 - Location Tracking using GPS
 - Data Transmission to Owner
2. **On Engine Stop**
 - Data Acquisition and Processing
 - Stopping the engine and location reporting
3. **On Engine Reset**
 - Data Acquisition and Processing
 - Resetting the system to initial stage.

5. SYSTEM ARCHITECTURE

The architecture diagram of vehicular anti-theft protection and tracking system based on GSM and GPS technology is shown in the Figure 1. It consists of power supply section, keyboard, GSM, GPS, microcontroller, MAX232 driver, relay driver and LCD. The GSM board has a valid SIM card with a sufficient recharge amount to make outgoing calls/SMS. The circuit is powered by +5V DC

The system includes a GPS modem which retrieves the location of a vehicle in terms of its longitude and latitude. This data is fed to the microcontroller which is interfaced with a GSM modem. Microcontroller retrieves the location details from the GPS and sends it to the owner in the form of an SMS over GSM modem. An LCD display is interfaced to the microcontroller to display the data received on the system before being sent via GSM. Microcontroller also receives the data i.e. 'STOP' message sent by the user through GSM, which is processed to direct the system to stop engine of the vehicle. The vehicle engine is shut down by cutting off the ignition

6. DESIGN APPROACH

6.1 On Engine Start

Whenever engine of the vehicle starts an SMS to the owner is sent informing him about the start and current location of the vehicle.

- **Location Tracking using GPS**

The location of the vehicle can be acquired using a GPS module which is interfaced to a microcontroller. GPS module transfers a string of data through serial communication. This string contains longitude and latitude positions together separated by a comma. The sent information is a Global positioning system fixed data (GGA) and string will start with \$GPGGA.

- **Data Transmission to Owner**

The data received from the GPS will be sent to the owner informing him about the start of the engine through a GSM module. Data transmission from microcontroller is done using serial communication and GSM modem uses AT Commands for sending and receiving data.

6.2 On Engine Stop

After receiving the message and confirming the theft of the vehicle a 'STOP' message will be sent by the owner to stop the engine of the vehicle and to trigger an alarm.

- **Data Acquisition and Processing**

The 'STOP' message sent by the owner will be received by microcontroller serially with the help of GSM modem which uses AT Commands for sending

and receiving these messages. The data received by the microcontroller will be processed to find its match

to 'STOP'.

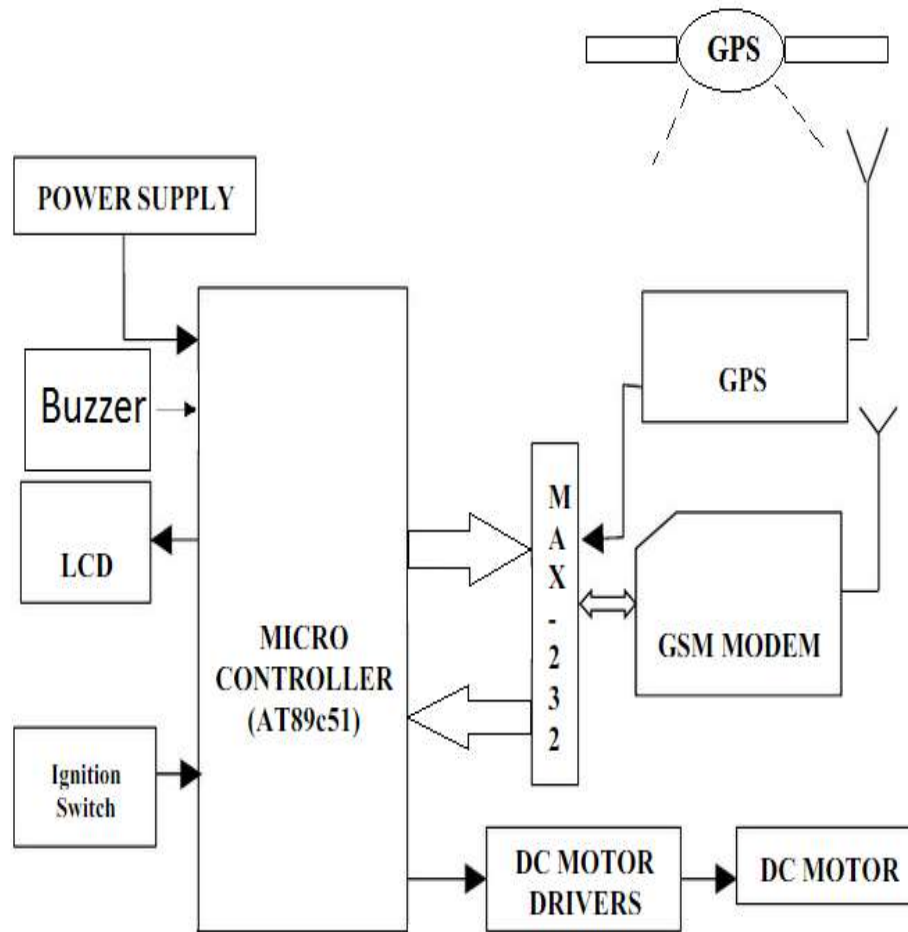


Figure-1: System Architecture

- Stopping the engine and Location reporting**

When it is confirmed that the message received is a 'STOP' message, microcontroller stops the engine and sets alarm to active state. The engine and buzzer are interfaced to P0_0 and P3_7 pins of the microcontroller respectively. On receipt of the message, the locations received from the GPS are sent to the owner.

and receiving these messages. The data received by the microcontroller will be processed to find its match to 'RESET'.

- Resetting the engine to its initial state**

When it is confirmed that the message received is a 'RESET' message, microcontroller will turn off the alarm and the engine of the vehicle will be set active.

6.3 On Engine Reset

The engine after it has been stopped cannot be started again until a 'RESET' message is received by the owner.

- Data Acquisition and Processing**

The 'RESET' message sent by the owner will be received by microcontroller serially with the help of GSM modem which uses AT Commands for sending

7. CONNECTIONS

TABLE-I

Pin	Connection
8	This pin is connected to Buzzer(alarm)
1	This pin is connected to Switch
39	This pin is connected to DC Motor
21-28	Data Pins for LCD(D0-D7)
12	RS of LCD

13	RW of LCD
14	E pin of LCD
10	T2IN pin of MAX232
11	R2OUT pin of MAX232

Table-1: Microcontroller Connections

TABLE-II

Pin	Connection
1	VSS(GND)
2	VDD, Power supply for logic(+5V)
3	VEE, Power supply for LCD driver
4	RS, this pin is connected to P3.2 of the microcontroller
5	RW, this pin is connected to P3.3 of the microcontroller
6	E, this pin is connected to P3.4 of the microcontroller
7-14	(D0-D7) these pins are connected to port 2(P2) of the microcontroller

Table-2: LCD Connections

TABLE-III

Pin	Connection
8	R2IN pin
7	T2OUT pin
13	R1IN pin
14	T1OUT pin
9	TXD pin of microcontroller(P3.0)
10	RXD pin of microcontroller(P3.1)

Table-3: MAX232 Connections

8. PROJECT DEMONSTRATION

The most important specification that the system offers is its ability to allow tracking of vehicle in case of theft. Therefore the primary project demonstration will pit the Vehicular Anti-Theft Protection and Tracking System against two cases, in the first case, owner himself or someone known to the owner starts the vehicle and in the second case, someone else who is not known to the owner starts the vehicle.

A DC motor emulating a vehicle engine is turned on by pressing a switch. As soon as motor starts, a message is sent to the owner informing him about the start of the vehicle and the locations. Identification of the theft depends on the owner who receives this message as it is up to his judgement to take the final call. If someone known to him has started the vehicle, he

will ignore the message otherwise he will send a 'STOP' message. When system receives this 'STOP' message, a buzzer used for alarming the thief will be turned on, locations will be sent to the owner and DC motor will stop. The DC motor after it has been stopped cannot be started again until the system receives a 'RESET' message from the owner. A 'RESET' message from the owner will bring the system to the start stage of the demonstration. The constraint for using this system is that whenever engine of the vehicle is started, Owner receives a message, so the amount of messages received may turn the owner hostile.



Figure-2: Vehicular Anti-Theft Protection and Tracking System



Figure-3: System is switched ON

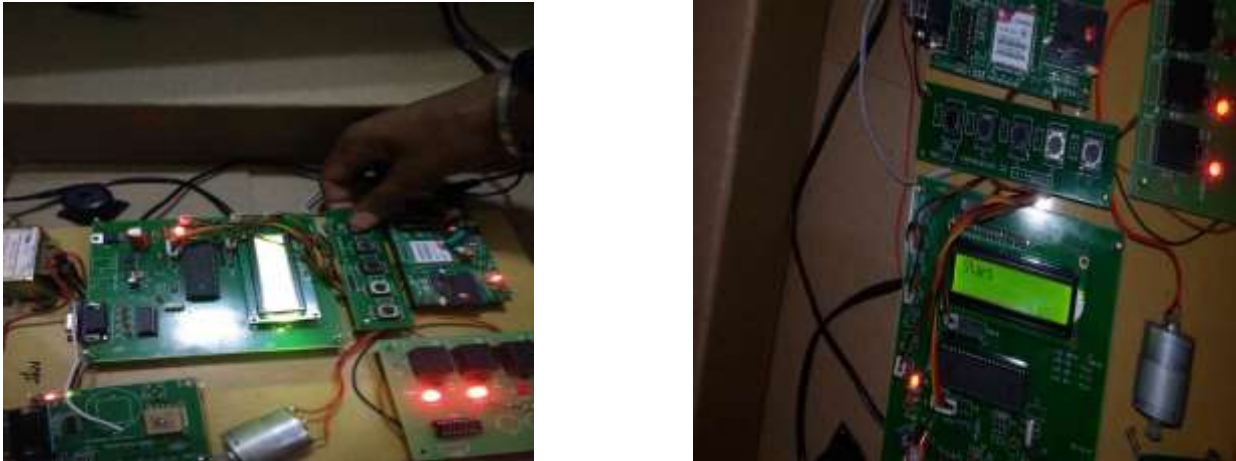


Figure-4: DC Motor is Switched ON and locations are sent

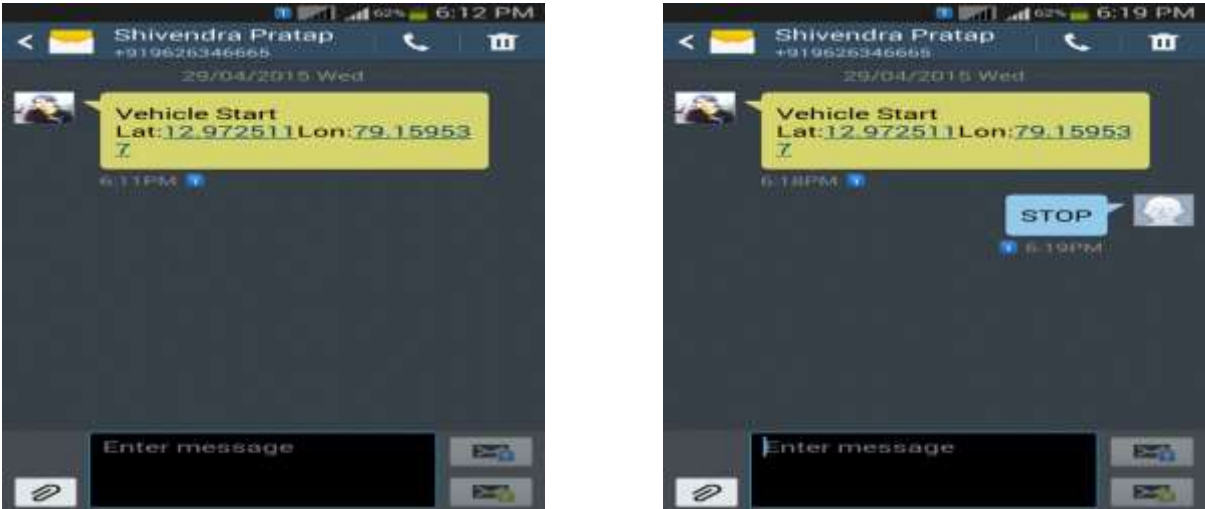


Figure-5: Locations are received and 'STOP' message is sent



Figure-6: DC Motor stops as 'STOP' message is received



Figure-7: 'RESET' message is sent to bring system back to its initial state

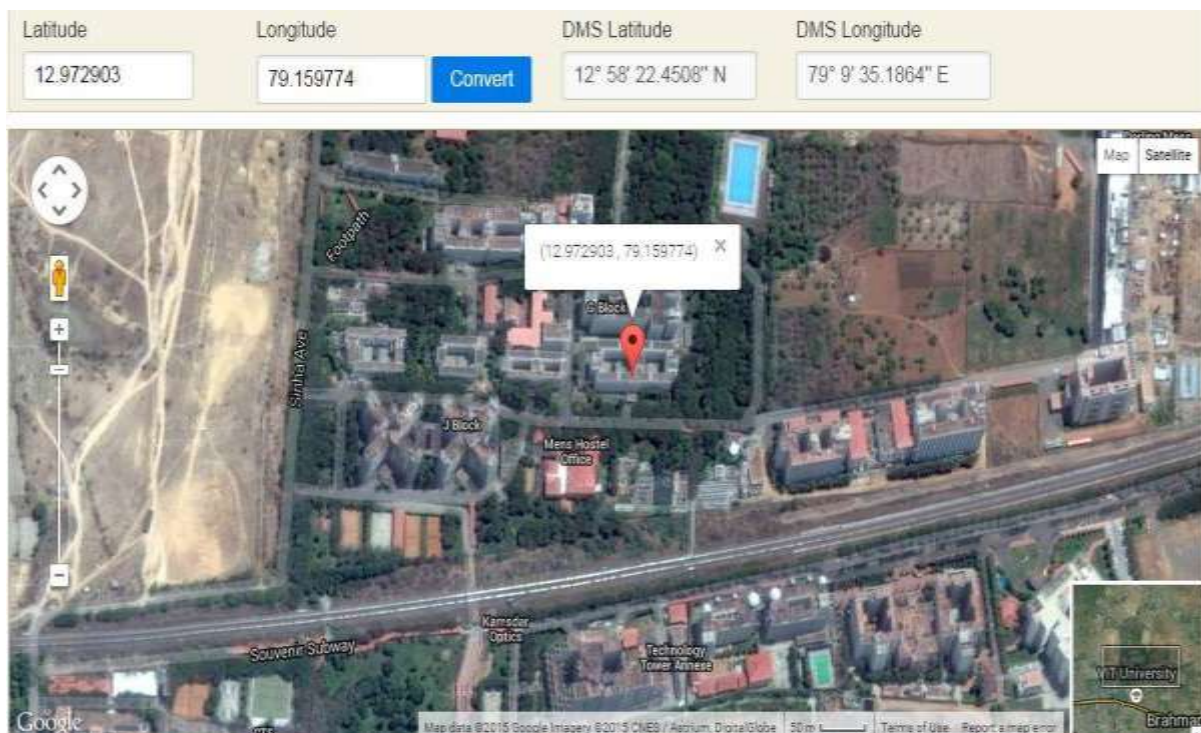


Figure-8: Location Tracking

9. CONSTRAINTS, ALTERNATIVES AND TRADEOFFS

9.1 Design constraints

Power Source: System is completely reliant on car battery. The System will not respond to situations when GSM and/or GPS signals are weak. Such situations include:

- The vehicle is present inside an underground garage.

- The vehicle is present at location having adverse weather conditions.

9.2 Significant trade-offs

GPS versus A-GPS (Assisted Global Positioning System):

A-GPS and GPS are different navigational aids that use information from satellites to determine their exact location on Earth. A GPS (Global Positioning System) device communicates with 4 or more satellites to determine its exact

location coordinates (latitude and longitude) anywhere on Earth. As long as the device has a clear line of sight to the satellites, it can work in adverse weather conditions. A-GPS works on the same principles as a GPS, the difference is that, it gets the information from the satellites by using network resources e.g. mobile network, also called assistant servers. A-GPS devices determine location coordinates faster as compared to GPS devices because they have better connectivity with cell sites than directly with satellites. But it has a major drawback in terms of accuracy since location determined via A-GPS is slightly less accurate than GPS. GPS finds its use in a variety of devices like cars, planes, ships/boats whereas A-GPS is restricted to mobile phones and also the operating costs for GPS devices is less as compared to A-GPS devices.

10. CONCLUSION

The system can be used as a location detector and a possible guarding tool against vehicle theft. The accuracy of locations from GPS proves that the error is within tolerance to find the vehicle when theft happens. However, it can be further developed into a more accurate system with better GPS module like AGPS and with Cell Tower Triangulation systems programmed in the controller so that if the signal is lost an assisting system or program can pin point the coordinates without the signal of satellite. To reduce the battery consumption of the system, we can connect it to the vehicle alternator.

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