Security System for Automobiles

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***Abstract*: This paper is an action to build an anti-theft system using GPS and GSM to get the live locations of the vehicle. The system contains GSM, GPS, ultrasonic sensor, Arduino micro-controller, stepper motor, LCD and switches. Vehicle theft monitoring system sends location information of the vehicle to the user using GSM and GPS. The message would contain the latitude and longitude information about the stolen vehicle. The micro-controller i.e. Arduino collects these coordinates from GPS module and sends it to the user via GSM modem. It also receives the messages and takes necessary actions according to the code. The problem of towing the vehicle is tackled with the help of ultrasonic sensor. Based on the value of sensor and the ground clearance of the vehicle a message will be sent to the user containing co-ordinates of the vehicle.**

***Keywords*: Arduino, GSM, GPS, Towing.**

1. INTRODUCTION

Identification of the vehicle location has nowadays become easier by the development of satellite communication technology. This technology has been brought to the day to day life of a common person through these vehicle tracking systems. Nowadays, all the developed countries are having the common sights of GPS being used in cars, police vehicles and ambulances. The tracking of the vehicle is being supported by all the existing technology. The important among them is the system which is based on GPS and GSM. It is required due to the wide usage of many people.

In market, various vehicle security systems are available but due to advanced technology these security systems can be tampered easily. They are not capable of providing real time analysis of the scenario. Alarms which have been used can be easily disabled. So real time analysis is mandatory for advanced security purpose.

This system will provide us the feature of determination of location of vehicles when there is an unauthorized access to the vehicle. There is also a system that gives us the intimation regarding towing of the vehicle.

2. RELATED WORK

Vehicle theft detection is used to detect the theft of the vehicle using GSM and GPS technologies. A highly expensive tracking systems are not generally implemented in all vehicles, also existing theft detection systems makes use of keypads, relays etc., which has a lot of disadvantages and are expensive. The objective of this paper is to design a simple and yet robust security system that can be implemented in all vehicles as a standard and also to solve the problem of theft by towing the vehicle.

3. REQUIREMENTS

Hardware Requirements

- Arduino Uno
- L293D Motor driver
- 16 × 2 LCD
- Sim300 GSM Modem
- G7020 GPS module
- Switches
- Stepper motor
- Ultrasonic sensor

Software Requirements

- Arduino IDE
- Embedded C

4. LITERATURE SURVEY

Use of Limit switch for intruder detection by sensing the opening of the door, PIR sensor to detect the presence of intruder. Based on these information messages are sent using GSM and GPS [1].

Use of piezoelectric sensor that are used in air bag to detect pressures and vibrations and based on these sensor values GPS is used to get the location and these are sent to the police department using GSM [2].

Use of keypad to enter the correct password to gain access to the vehicle. Different OTP would be sent to the user every time. When invalid password is entered 3 times a message is sent to the user with the co-ordinates of the vehicle and a buzzer would turn ON. Based on the reply the engine would be turned OFF and location information can be obtained by sending request for the same [3].

Continuously determine the location of the vehicle when the controller is in active mode and the controller will be in sleep mode if the vehicle is being used by the user. Any interruptions to the IR door sensor is used to detect the theft and is managed by sending messages from authorized user which would block the engine and doors can be opened from messages itself [4].

5. PROPOSED BLOCK DIAGRAM

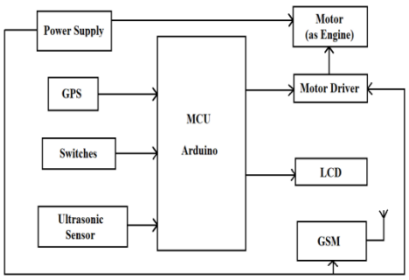

Figure 1: Proposed block diagram

The micro-controller Arduino Uno is used to control the process as a whole along with GPS module and GSM modem. The coordinates of the vehicle are detected by using GPS module. The process of sending those coordinates via SMS to the user is achieved with the help of GSM modem. A 16×2 LCD is used to display the coordinates along with the messages. Here motor is assumed to be the engine of the vehicle. An ultrasonic sensor is used which would continuously determine the distance between the vehicle and the ground. Switches are used for enabling different modes of operation in the automobile.

6. WORKING

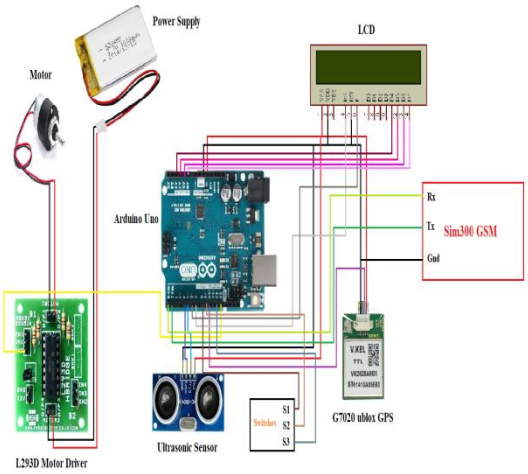

Figure 2: Circuit Diagram

After all the initialization, in our project we have provided three switches. S1 would control the MOTOR, S2 for USER MODE and S3 for THEFT MODE. When S2 i.e. user mode is turned ON, it means that the user of the vehicle would be using the

vehicle and in this stage making S1 HIGH would turn the motor ON and similarly making it LOW would turn the Motor OFF. When the user parks his vehicle he should turn the THEFT MODE ON. In this mode, if S1 is turned ON a message would be sent to the user and further any action to any of the switches would be ineffective.

The message sent by the GSM modem would contain the coordinates of the vehicle. We have coded the micro-controller in such a way that if the user reply with the message 'Engine OFF' then the motor will turn OFF any further action to turn the engine ON would go in vain. If the user sends a 'Location' message live location of the vehicle would be sent to the user. This request can be made any number of times. Maximum ground clearance that is currently available is 30cm, if the ultrasonic sensor detects a distance greater than 31cm a message would be sent stating towing alert. The message would contain the coordinates of the vehicle.

7. WIRELESS COMMUNICATION MODULES

- **Arduino UNO**

An Atmega328 based micro-controller. It comprises a total of 14 digital I/O pins in which 6 of them can be used as PWM pins. It consists of 6 analog pins. It has a button for reset. It also consists of a power jack, a crystal oscillator and an USB connection. With the help of USB cable, uploading the programs can be done by connecting it to the computer. A battery or an AC to DC adapter can be used for powering it.

- **GPS**

GPS is a system for navigation which consists of a 24 satellites network present in the orbit. The real time tracking data is sent by the GPS module in NMEA format. NMEA format consists of several sentences, in which we need only one sentence. Out of different formats $GPGGA is used here. This GPGGA is nothing but the fix data present in GPS. We can get the co-ordinates present in the $GPGGA string by getting the count of the commas present in it. Latitude is present immediately after two commas and longitude is present just after four commas. It has an update rate of 5 Hz. Frequency of GPS is 1575.42MHz.

- **GSM**

GSM modem operates on subscribers mobile number with the help of SIM card. It uses TDMA and is a triband modem that works on 900MHz, 1800MHz and 1900MHz. It communicates with the micro-controller by sending OK signals to the AT

commands sent by the controller. It supports text and PDU modes. Text mode sends message in human understandable form and PDU mode sends messages in hexadecimal format. In this project text mode of GSM is used.

- **ULTRASONIC SENSOR**

Vehicle's ground clearance is measured here by using an ultrasonic sensor. It measures the time taken by the sound waves to hit a target and return back. Trigger pin send out the signal and are received by the echo pin. The sensor operates at 40KHz and signals are sent with pulse duration of 10us with maximum distance that can be measured is 400cm. The distance is calculated with the help of the following formula

Distance = (time * 0.034) / 2

where speed of sound = 0.034 cm/us.

8. RESULTS

Whenever there is a theft of vehicle or the vehicle is being towed, a message will be sent to the user.

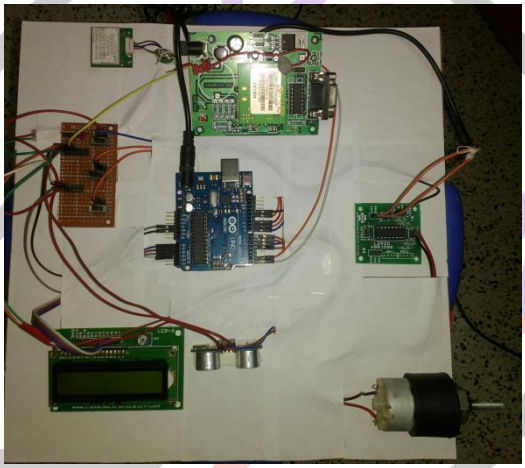

Figure 3: Theft detection system

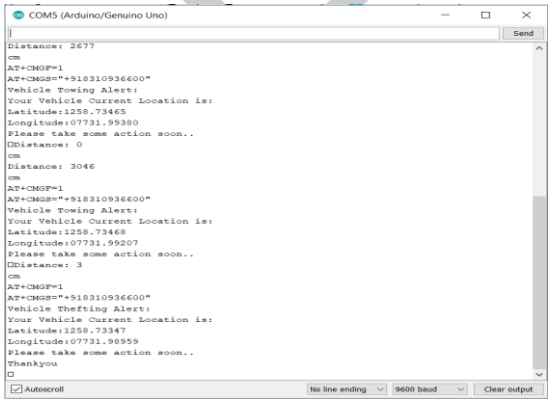

Figure 4: Output on serial monitor

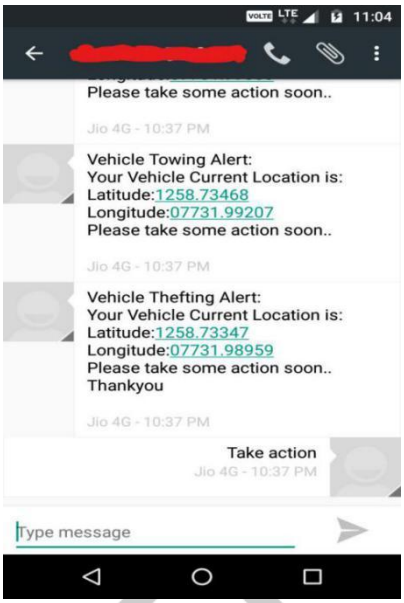

Figure 5: SMS output for towing and theft

Figure 6: Output of GPS on LCD

9. CONCLUSION AND FUTURE SCOPE

Vehicle tracking both in case of personal and business purpose improves safety and security of the vehicle. Vehicle theft detection system jams the engine control unit of the vehicle providing better security in comparison with present security devices. So in future it plays a very important role in the day to day life of the people. Main motto of the project is to incorporate features of GSM, GPS and Ultrasonic sensor to prevent theft of the vehicle and detect towing of the vehicle.

- We can reduce the size of the kit by using GPS and GSM on the same module.
- With the help of IR sensors intruders can be detected.
- Bio metrics and other such safety features can be added to secure the access to switches.
- With the help of high sensitivity sensor, we can detect the accident and send the location to emergency services such as ambulances, fire department etc. We can use our kit to assist the traffic control by installing kits in all the vehicles.

10. REFERENCES

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