

Microcontroller Based Anti-theft Vehicle system

Mahesh Pawaskar^{1*}, Manisha Samant², Adesh Hardas³

^{1,2,3}Department of Electronics & Telecommunication Engineering, APSIT, Thane, India

*Corresponding Author: mcpawaskar@apsit.edu.in, Tel.: +91-9730579463

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Abstract— Every vehicle owner wants maximum protection of his vehicle; otherwise thief can easily steal the vehicle. Modern vehicles are becoming smarter by the incorporation of higher computing power, connectivity solutions and advances in communication. This paper introduces design of theft prevention system. Three stages are proposed to protect the vehicle from theft. 1. when the user accesses the vehicle by the vehicle key and entered the wrong password, the power remain disable. 2. If engine is cracked by any other means like bypassing the key switch, the second level comes by sending “ALERT” message to the owner of the vehicle. 3. In case, owner identifies that vehicle is stolen by other way, he has to send “STOP” message to predefined number, so that ignition of vehicles engine will be turned off and brakes will be applied to the vehicle automatically, which is third security. Once that vehicle engine is turned OFF, after every five minutes microcontroller reads geographical location from GPS and sends one URL to owner through GSM module. Owner can open this URL and identify exact location of vehicle on Google Map.

Keywords— *GPS, GSM, matrix Keypad, microcontroller, SMS*

I. INTRODUCTION

In these days, vehicle thefts are increasing at an alarming rate all over the world. So to get rid of this problem, owner can install the theft prevention system described below. The main objective of this system is to protect the vehicle from any unauthorized access, through entering a protected password, disabling the power, applying brakes and intimate the position of the same vehicle to owner. Here, we make an attempt to develop microcontroller based system which is mainly uses GPS and GSM technologies. The system is low cost vehicle theft control embedded system.

The Global System for Mobile communications (GSM) is the most popular and accepted standard for mobile phones in the world established in 1982 and it operates in 900 MHz frequency. The Global Positioning System (GPS) is a space-based satellite route framework that gives area and time data in all climate conditions, anyplace on or close to the Earth where there is an unrestricted observable pathway to four or more GPS satellites. A GPS receiver calculates its position by precisely timing the signals sent by GPS satellites high above the Earth.

Three stages are proposed to protect the vehicle from theft. Firstly user has to enter known password through keypad. If password is matched with stored password then power is turned ON and user can get further access. If the power shifted by others, the second level comes by sending “ALERT” message to the owner’s cell phone. In this way

owner get information that correct password is entered and now vehicle is being turned ON, which is second security. Suppose owner has come to know that vehicle is stolen by any other way, user has to send “STOP” message to predefined GSM number. Once Instrument receives and reads “STOP” message, it is going through three steps. 1.It cuts the current supply to the ignition system in case of petro engine to turn OFF the engine of vehicle so that vehicle will get stop within 10 seconds. 2. It turns ON the motor to pull the brake paddle and apply the brakes. 3. It keeps triggering GPS module after regular interval. GPS modules provide timing and precise location information to microcontroller unit. Micro-controller read this information and creates a URL. This URL will be sent to the owner cell phone through GSM. Owner can open this URL and identify exact location of vehicle on Google Map.

Rest of the paper is organized as follows, Section I contains the introduction of anti-theft vehicle system. Section II contains the related work of microcontroller, GSM, GPS and vehicle security system. Section III contains methodology to implement in proposed work. Section IV contain experimental process and setup and lastly Section V gives conclusion and future scope.

II. RELATED WORK

Montaser, N.R., & Mohammad, A.A. (2012) explain an efficient automotive security system has been implemented for anti-theft using an embedded system occupied with GPS and GSM. In this work, the client

communicates through this system with vehicles and the vehicles current locations and status are determined using Google Earth. The position of targeted vehicles is tracked by the user on Google Earth. By using GPS locator, the target current location is determined and sent, alongside with various parameters received by vehicles data port, via SMS through GSM networks [1].

Sot, S. (2012) has proposed the use of MMS Based Vehicle Security System for solving issue. This system integrated monitoring and tracking system. SMS and MMS are sent to the owner to initiate fast response most especially when the vehicle is close. Whenever intrusion is detected, the SMS and the picture of the intruder are first sent to main user via local GSM/GPRS service provider to user (and/or) police mail ID. The time taken to receive the SMS and MMS by the owner and police are suitable to take action against intruder [2].

Kiruthiga, N., &Latha, L. (2014) studied the use of Biometric Approach for Vehicle Security System Using Finger print Recognition. In all the areas, an embedded computing technology is used. A competent automotive security system has been implemented using embedded system along with Global System for Mobile (GSM) and Fingerprint Recognition. The survey mainly raised emphasizes on major approaches for automatic person identification, such as fingerprint recognition and various existing vehicle security system. The security system can be implemented using Microcontroller [3].

Iman M. Almomani ;Nour Y. Alkhalil ; Enas M. Ahmad Rania M. Jodeh proposed "GPS vehicle tracking system". This system is useful for fleet operators in monitoring driving behavior of employees or parents monitoring their teen drivers. This system can be used in theft prevention as a retrieval device in addition of working as a security system combined with vehicle alarms. The system's tracking services includes acquiring the location and ground speed of a given vehicle in the current moment or on any previous date. It also monitors the vehicle by setting speed and geographical limits and therefore receiving SMS alerts when the vehicle exceeds these pre-defined limits. Tracking vehicles in system uses a wide range of new technologies and communication networks including General Packet Radio Service (GPRS), Global System for Mobile Communication (GSM), the Internet or the World Wide Web and Global Positioning System (GPS) [4].

III. METHODOLOGY

System is mainly divided in two parts, i.e. electronic part and mechanical part. Electronic part includes microcontroller 8051, GPS, GSM, matrix keypad, EEPROM, 16x2 LCD, relay driver and relay. Block diagram of proposed system is given below.

Microcontroller is control unit which controlling all remaining units. In this project 8 bit, low power Philips microcontroller 89V51RD2 is used. 4x4 matrix keypad is

provided to input password. The entered password is processed by the control circuit, which compares the entered data with those stored in EEPROM memory. Correct password enables ignition system through relay. EEPROM memory store information even power is turned off. Here EEPROM is used to stored password. In this project AT24C01A is used. The AT24C01A provides 1024 bits of serial electrically erasable and programmable read-only memory (EEPROM) organized as 128 words of 8 bits each. Memory is accessed via a Two-wire serial interface.

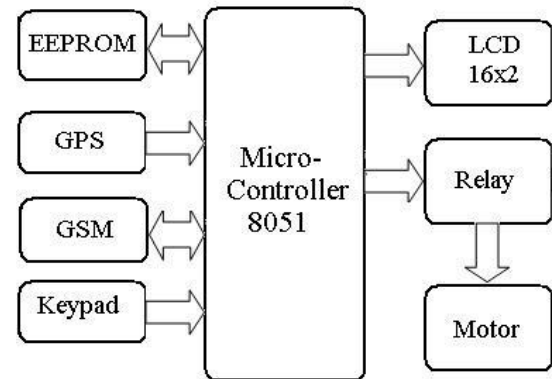


Figure 1: Block diagram of proposed system

If vehicle is turned ON by other means like bypassing the ignition switch, ALERT message will be sent to owner cell phone. Owner would know that whether unauthorized person is using his vehicle. In case owner has identified that his vehicle is stolen then he has to send STOP message to GSM module. Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. The working of GSM modem is based on commands, the commands always start with AT (which means Attentions) and finish with a <CR> character. For example, the dialing command is ATD<number>; ATD9730xxxxxx; here the dialing command ends with semicolon. The GSM modem is serially interfaced with the controller with the help of UART.

Sr. No.	Command	Description
1	AT+CMGF=1	Select text mode SMS format
2	AT+CMGS="9730xxxxxx">This is a test	Send a SMS to Specified number
3	AT+CMGR=<Index>	Read SMS

Table 1: GSM Command and their description

In this project SIM300 GSM module is used. Some useful commands of GSM are listed in table 1.1. The AT commands are given to the GSM modem with the help controller. GSM module receives STOP message from owner and intimate to microcontroller unit.. Microcontroller activates a relay driver to trip the relay that disconnects the ignition of the automobile resulting in stopping the vehicle followed by applying brakes.

As soon as the ignition supply gets cut off, the application of brake after 5 seconds will occur. This will be possible through actuating programmable relay which supplies current to the motor after 5 seconds which will pull the brake pedal through pulley and cable in 3 seconds. The motor will be in running condition for 5 seconds after which it will also stop. This two stage procedure will ultimately stop the vehicle by disconnecting fuel supply at ignition system and vehicle will not be able to move due to application of brake.



Figure 2: Electronic setup of proposed system

The theft prevention system is installed in Maruti Omni Vehicle of 2004 model. As Omni vehicle is more specious and reliable to work, it is preferred to use and hence gives proper output. The brake system in this model is Drum Brake system and the Fuel ignition system is MPFI. Force require to push the brake pedal in this vehicle is little more compared to disc brake system. But the motor used to pull the brake pedal is more effective that it can easily make the brake pedal to its fully pressed condition. The installation of motor is behind the brake pedal and supply to fuel ignition is directly connect at its place.

Microcontroller trigger GPS module to get current geographical position. GPS receiver is used for this research work to detect the vehicle location and provide information to responsible person through GSM technology. The Global Positioning System (GPS) is a satellite-based navigation system consists of a network of 24 satellites located into orbit.



Figure 3: Position of Electric Motor for application of brake

The system provides essential information to military, civil and commercial users around the world and which is freely accessible to anyone with a GPS receiver. With four or more satellites in sight, the receiver can determine the user's 3D position (latitude, longitude and altitude). GPS receiver calculates location using Triangulation method. 66 Channel GPS receiver interfaced via NMEA protocol. Information of GPS is read by microcontroller. Microcontroller has to extract latitude, longitude and altitude from received data. In this project \$GPRMC command is monitor to extract these information. We found 19.268112 as latitude and 72.967011 as longitude for our location. Microcontroller creates a URL to show current location of vehicle on Google.map.

URL has to be formed like <http://maps.google.com/?q=<lat>,<lng>>. This URL is sent to owner to identify current geographical position of his vehicle.

IV. EXPERIMENTAL PROCESS & RESULT

- Execution starts with keypad. Correct password is entered to initiate the process.
- Authorized person receives ALERT message on his phone.
- Authorized person sends "STOP" message to the GSM module.
- Electric supply to Ignition system is cut off at the first stage through the relay
- After 5 seconds, the second relay actuates with supply of current and allows the motor to start for 5 seconds. This will pull the brake pedal from normal position to fully pressed condition. With these two steps, cutting current supply to the ignition system and application of brake can stop the vehicle in safe condition without damage.

V. CONCLUSION AND FUTURE SCOPE

The system developed can be used to protect the vehicle from the theft without any damage to the vehicle. The system is user friendly that can be controlled with help of mobile of the vehicle owner from remote location also. The above mentioned system is for the petrol vehicles. It can be used for diesel vehicles with few modifications.

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Authors Profile

Mr. Mahesh C Pawaskar¹ pursued Bachelor of Engineering and Master of Engineering (Electronics) from Mumbai University, India. He is currently pursuing PhD from Career Point University, Kota, India. He is working as an Assistant Professor in Department of Electronics & Telecommunication Engineering at A. P. Shah Institute of Technology, Thane, Maharashtra-India. He has 12 years of teaching experience. He is member of ISTE. His area of interest is Embedded system and Digital image & Video Processing.



Mrs. Manisha M. Samant pursued Bachelor of Engineering from Rajarambapu Institute of Technology, Rajaramnagar, Islampur in Electronics & Telecommunication Engineering & Master of engineering from Ramrao Adik Institute of Technology, Navi Mumbai in Electronics Engineering. Currently she is working as assistant professor in A. P. Shah Institute of Technology, Thane, Maharashtra-India. She has 13 years of teaching experience. She is member of ISTE. His area of interest is Embedded system and Basics of Electronics.



Mr. Adesh C. Hardas pursued his Bachelor of Engineering in Electronics and Master of Engineering in Electronics & Telecommunication Engineering from Vidyalankar Institute of Technology, Mumbai. Currently he is working as assistant professor in A. P. Shah Institute of Technology, Thane, Maharashtra-India. He has 10 years of industry and 15 years of teaching experience. His area of research is Digital Signal Processing.

