GPS and GSM Based Engine Locking System Using Smart Password

A. Omanakuttan[1*], D. Sreedhar[2], A. Manoj[3], A. Achankunju[4], CM. Cherian[5]

[1*]Dept. of Computer Science, St. Thomas College of Engineering Kozhuvallor (Kerala University), Chengannur, India
[2]Dept. of Computer Science, St. Thomas College of Engineering Kozhuvallor (Kerala University), Chengannur, India
[3]Dept. of Computer Science, St. Thomas College of Engineering Kozhuvallor (Kerala University), Chengannur, India
[4]Dept. of Computer Science, St. Thomas College of Engineering Kozhuvallor (Kerala University), Chengannur, India
[5]Dept. of Computer Science, St. Thomas College of Engineering Kozhuvallor (Kerala University), Chengannur, India

[*]*Corresponding Author: aswathymol84@gmail.com*

Abstract— The smart engine locking system is an embedded system based intrusion detection system designed and implemented to prevent unauthorized access of vehicles while parking in insecure places. The proposed system incorporates a micro controller along with GSM and GPS modules. This instrument is installed in the engine of the vehicle whose current position is to be recorded and locked the engine in real time. Main objective of this instrument is to protect the vehicle from any unauthorized access by providing two locking status, theft mode and user mode. These two modes are controlled by Arduino UNO and GPS technology is used for finding current location of the vehicle. A GSM modem is also connected to the micro controller for sending message to the owner's mobile if the vehicle is in theft mode. This system puts into the user mode if vehicle is handled by the owner or authorized persons, otherwise goes to theft mode. The most important concept in this design is introducing the mobile communications into the embedded system using GSM module. The entire design is on a single board.

I. INTRODUCTION

In modern life one of the serious problems facing by people is automobile thefts, which are increasing in huge amount. Many criminal offenses can also be done with this theft vehicle. So to reduce any unauthorized access and miss use of theft vehicles, we introduce a technology like GSM and GPS. We try to develop an instrument based on Arduino Uno which incorporated GSM and GPS technology. The instrument is simple and low cost automobile theft control embedded system.

The Arduino Uno is a microcontroller board based on the ATmega328. "Uno" means one in Italian and was chosen to map the release of Arduino Software (IDE) 1.0.The Global system for mobile communication (GSM/GPRS) modem-RS232 is built with dual band GSM and GPRS engine – SIM900A works on frequencies 900/1800MHz. Global Positioning System (GPS) is a space –based radio navigation system. Also we used vibration sensor to sense the vibration of the engine while it starts.

The paper is organized in the following sequence. A small literature survey on the theft control system is given in section 2. Section 3 describes the development of the block diagram and its components for the design & development of the theft control system. The working of the system is presented with flowchart in section 4. This is followed by the results, conclusions & the references.

II. RELATED WORK

The remote monitoring system based on SMS and GSM was implemented in [1]. Here, the network is used as a medium for transmitting the remote signal. This consists of two parts: the monitoring centre and the remote monitoring station. The monitoring centres consist of a computer and communication module of GSM. The software-monitoring centre and the remote monitoring station were implemented with the help of VB. The result of this demonstration shows that the system can watch and control the remote communication between the monitoring centre and the remote monitoring station [4,5,6,7].

In [2], the hardware and software of the GPS and GSM network were developed. The proposed GPS/GSM based System has the two parts, first is a mobile unit and another is controlling station. The mobile unit and control stations are working successfully with the system processes, interfaces, connections, data transmission and reception of data. These results are compatible with GPS technologies.

In vehicle tracking system [3] is a device, which is installed in a vehicle to enable the owner or a third party to track the

vehicle. In this paper, the design works on the basis of GPS and GSM technology. This system is based on embedded system. Tracking and positioning of any vehicle is detected by using Global Positioning System (GPS) and Global system for mobile communication (GSM). The status of the moving vehicle is uploaded frequently on demand.

In Face Detection System [4], the face of the driver is detected, and it compares with the predefined face. When the owner is sleeping during the night time and someone theft the car, then the System obtains the images of the thief by one tiny web camera, which is hidden somewhere in the car. Then the System compared the obtained images with the stored images. If the images don't match, then the information will be sends to the owner through MMS. The owners get the images of the thief in mobile phone and can trace the place through GPS. The place of the car and its speed is also displayed to the owner through SMS. The owner can recognize the thief. This system applied in our day-to-day life.

Kai-Tai Song and Chih-Chieh Yang [5] have designed and built on a real-time visual tracking system for vehicle safety applications. In this paper built a novel feature-based vehicle-tracking algorithm, automatically detect and track several moving objects, like cars and motorcycles, ahead of the tracking vehicle [8]. The system can segment features of moving objects from moving background and offer a collision word of warning on real-time with the concept of focus of expansion (FOE) and view analysis. CMOS image sensor and NMOS embedded processor architecture is used in proposed algorithm. The constructed stand-alone visual tracking system is validated in real road tests.

In [6,9,10,11] the proposed tracking system is based on cloud computing infrastructure. The sensors are used to monitor the fuel level, driver conditions, and speed of the vehicle. All the data transferred to cloud server-using GSM enabled device. All the vehicles equipped with GPS antenna to locate the place. To avoid the drunk and drive, the alcohol sensor installed to monitor the driver status. The proposed technology significantly avoids the accident in highways.

III. DESIGN OF EMBEDDED SYSTEM BLOCKS

The block diagram of the designed system shown in the figure 1 has a microcontroller, GSM modem, GPS module, relay driver, Power Supply blocks which are interact with each other as follows. When power supply switched on it will give 5V to the microcontroller and all other components in the instrument. If the vehicle is stolen, then the owner will get a message from the GSM mobile and the user can request to stop the engine by disconnecting connection from the 5V relay.
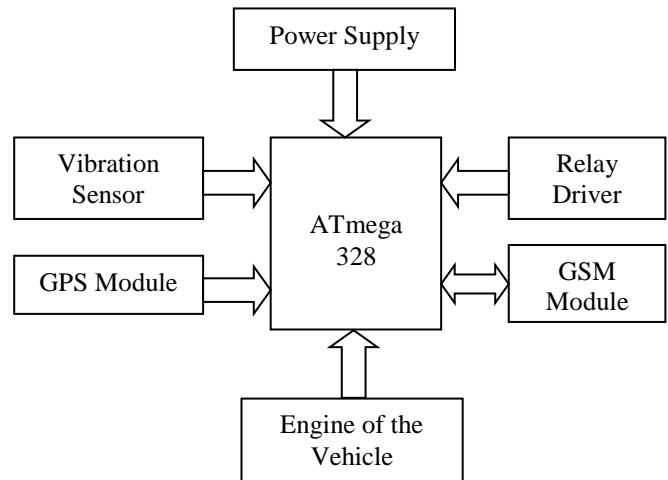

Figure 1: Block diagram of designed system

3.1 Microcontroller

Microcontroller is the heart of the designed unit, which handles all the signals. All other blocks are interfaced to it. The most common version of Arduino is the Arduino Uno. The Arduino Uno is a microcontroller board based on the ATmega328.TheATmega328 is a single-chip microcontroller created by Atmel in the mega AVR family. It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. The device has throughput approaching 1 MIPS per MHz.

Table 1: Arduino Specification

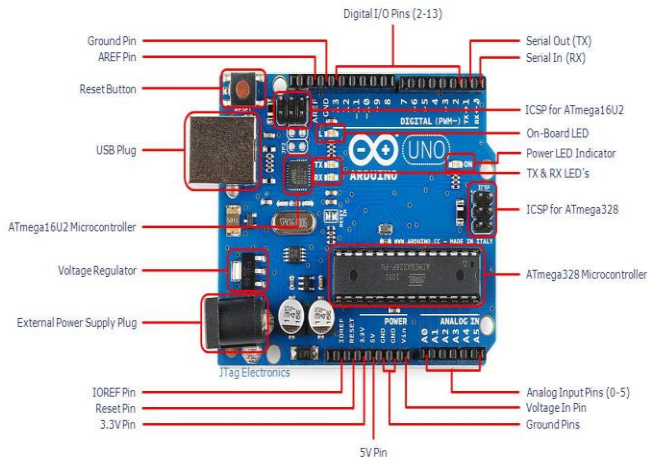| Microcontroller	ATmega328
Operating Voltage	5V
Input Voltage(recommended)	7-12V
Input Voltage(limits)	6-20V
Digital I/O pins	14
Analog input pin	6
DC current per I/O pin	40mA
DC current for 3.3V pin	50mA
Flash Memory	32KB of which 0. 5KB used for boot loader

Figure 2: Arduino UNO Board

3.2 GSM Module

GSM/GPRS Modem-RS232 is built with Dual Band GSM/GPRS engine- SIM900A, works on frequencies 900/ 1800 MHz .The Modem is coming with RS232 interface, which allows you connect PC as well as microcontroller with RS232 Chip (MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface. The onboard Regulated Power supply allows you to connect wide range unregulated power supply. Using this modem, you can make audio calls, SMS, Read SMS, only a subset of the AT-Command set needs to be implemented.

Table 2: Pin Specification

PIN	RESUME	DETAILS
1	GND	Power supply ground
2	Tx	Transmitter
3	Rx	Receiver
4	Line r & Line l	Line input
5	Spk p & spk n	Speaker positive & negative
6	Mic p & Mic n	Mic positive & negative
7	DTR	Data terminal ready
8	CTS	Clear to send
9	RTS	Request to send

3.3 GPS Module

The **GPS** (**Global Positioning System**) is a condition of 30 well-spaced satellites. It orbits the Earth and makes it possible for people with ground receivers to pinpoint their satellite location. A GPS receiver must be locked on the signal of at least three satellites to estimate 2D position (latitude and longitude) and track movement. It depicts the use of GPS module/receiver to find latitude and longitude of its position. The data obtained from GPS receiver is processed by microcontroller to find its latitude and longitude values.GPS module consists of 28 pins. With Live Tracking we get Live Alerts via SMS or Email, which are generated at highest priority because Safety of the Vehicle is our Primary aim.

Figure 3: GPS Module

3.4 Vibration Sensor

Vibration sensor is capable of measuring vibration of the engine when it starts. If the vehicle met an accident, the sensor will send voltage equivalent to the intensity of hit, to the microcontroller at once. Then microcontroller sends a notification to the owner/contact list as SMS, if the sensed signal voltage is greater than or equal to some stored threshold value. So this will be helpful to report any accidents occurring at night. Thus we use this sensor for security of rider. There are two threshold values one to detect intrusion and another to detect accidents. In the security system piezoelectric sensor is used. It is generated by pressure on certain crystals which will develop a potential difference or voltage on the crystal face. If the crystal oscillates, an AC voltage is formed. The sensor is modelled as a charge supply with a shunt capacitor and resistor, or as a voltage source with series capacitor and resistor.

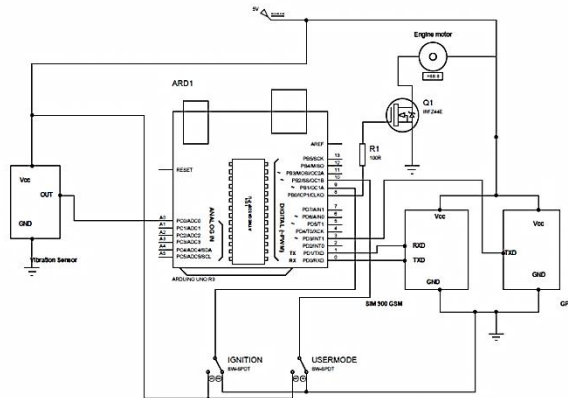*Figure 4: Vibration Sensor*

IV.   PROPOSED SYSTEM

Figure 5: Circuit Diagram of GSM and GPS Based Engine Locking System Using Smart Password
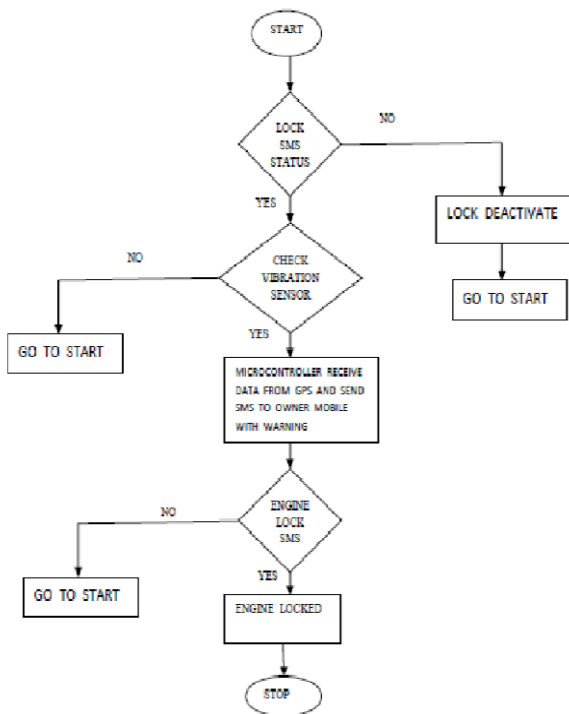

Figure 6: Flow chart of the system

The embedded system is installed in the engine of the vehicle along with GSM and GPS module. The instrument allows to active the 5V and then ignition of the engine will start, hence start the vehicle. The instrument has two modes of operation ,one is user mode and second one is theft mode .When engine will start ,then the instrument will check the lock status, if it is the owner engine will start as user mode and no SMS will be send to owner but if it is somebody else ,theft mode comes into practice and it gives as SMS notification to the concerned party as programmed that is the vibration sensor in the instrument will sense the value of the vibration

of the engine .If the engine will vibrate more than 10 sec ,then the sensing value is given to the microcontroller. If the value is greater than the threshold value then sending a message "Engine Started" through GSM mobile to owner's mobile for the further action for prevention of the vehicle theft.

After receiving this message the owner can send password '#' for getting the current location of the vehicle, then the longitude and latitude will be received by the owner. If the owner will send password '*' ,then the owner can lock the engine of the vehicle through this password and receiving a message "Engine Locked" and "current location" is also include as part of the message. The flow chart being shown in the figure no: 6

V.   RESULTS AND DISCUSSION

In this paper, we proposed design of unique engine locking system to control seizing of vehicles using GSM and GPS technology based embedded system. The instrument has simple design, low cost, compact and reliable. This instrument can change by setting lock status field. If the vehicle accessed by unauthorized person, then owner get SMS and lock the system using the password. The delay incurred for engine locking is 2-5 minutes.
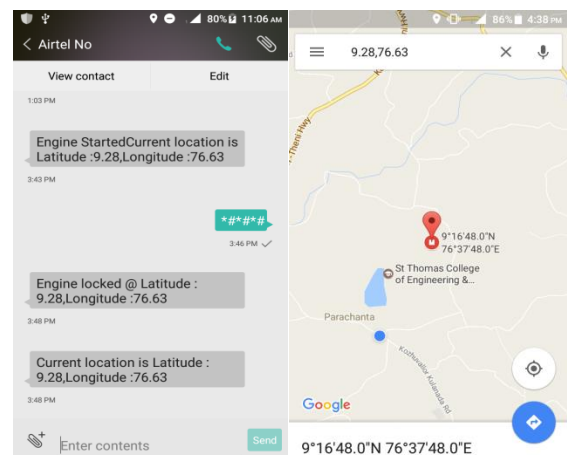

Figure 7: Message send to owner's mobile and location of vehicle

VI.   CONCLUSION

Day by day the vehicles increasing so as theft, on the basis of this we can be generate the proposed system that is helpful. When accidents occur during the night time, the incident can report immediately as SMS to the owner's contact list so that the injured persons can be hospitalized as soon as possible. As future improvement we can add extra features to the proposed system by using hidden cameras in the front and back side of the vehicle so that the details like number of the vehicle is

given as SMS to owner's mobile so that we can take the details for further investigate, on procedure.

REFERENCES

[1] Chen Peijiang, Jiang Xuehua, *"Design and Implementation of Remote monitoring system based on GSM"*, IEEE Computational Intelligence and Industrial Application, Vol.42, Issue.2 , pp.167-175, 2008.

[2] MJ. Asaad, Ibraheem Talib, *"Experimentally Evaluation of GPS/GSM Based System Design"*, Journal of Electronic Systems, Vol. 2, Issue 2, pp.1-8 , 2012.

[3] Kunal Maurya , Mandeep Singh, Neelu Jain, *"Real Time Vehicle Tracking System using GSM and GPS Technology- An Anti-theft Tracking System"*, International Journal of Electronics and Computer Science Engineering, Vol.1,Issue 3, pp.1103-1107, 2012.

[4] Vikram Kulkarni, Viswaprakash Babu, *"Embedded Smart Car Security System on Face Detection"*, IJCCT, Vol.3, Issue.1, pp..86-93, 2013 .

[5] Kai-Tai Song, Chih-Chieh Yang, *"Front Vehicle Tracking Using Scene Analysis"*, Proceedings of the IEEE International Conference on Mechatronics & Automation Niagara Falls, Canada, pp.1323-1328, 2005.

[6] Albert Alexe, R. Ezhilarasie, *"Cloud Computing Based Vehicle Tracking Information Systems"*, IJCST, Vol. 2, Issue 1, pp.49-52, 2011.

[7] V. Deepika, M. Suneel, M. Chiranjeevi, T. Satya Vijay Swamy, *"Vehicle Engine Locking System Using, Embedded Based GSM Technology"*, International Journal of Advances In Computer Science and Cloud Computing, Vol.1, Issue 1, pp.53-56, 2013.

[8] Hammad Afzal , VD. Maheta "*Low Cost Smart Phone Controlled Car Security System"* IEEE International Conference on Industrial technology, Korea, pp.670-675,2014.

[9] R. Ramani, S. Valarmathy, N. SuthanthiraVanitha, S. Selvaraju, M. Thiruppathi, R. Thangam, *"Vehicle Tracking and Locking System Based on GSM and GPS"*, IJISA, vol.5, Issue.9, pp.86-93,2013.

[10] NV. Alex, Filma Mathew, Sini Jacob,Vaneza Benny, M. Bineesh, "*Car Security - Vehicle Theft Identity and Control System*" International Journal of Computer Sciences and Engineering ,Vol.3, Issue.3 , pp.121-124, 2015.

[11] JK. Pany, RND Choudhury, "*Embedded Automobile Engine Locking System, Using GSM Technology*", International Journal of Instrumentation, Control and Automation, Vol.1, Issue-2, pp.49-53, 2011.

Authors Profile

Aswathy Omanakuttan is currently pursuing Bachelor of Engineering in Computer Science from St Thomas College of Engineering & Technology, Kozhuvalloor, Chengannur, India.

Ms Deepa Sreedhar has received Master of Engineering degree in Computer Science. She is currently working as assistant professor in Computer Science department at St Thomas College of Engineering & Technology, Kozhuvalloor, Chengannur, India.

Ms Akhila Manoj is currently pursuing Bachelor of Engineering in Computer Science from St Thomas College of Engineering &Technology, Kozhuvalloor, Chengannur, India.

Ms Ajeena Achankunju is currently pursuing Bachelor of Engineering in Computer Science from St Thomas College of Engineering & Technology, Kozhuvalloor, Chengannur, India.

Ms Chinju Mariyam Cherian is currently pursuing Bachelor of Engineering in Computer Science from St Thomas College of Engineering & Technology, Kozhuvalloor Chengannur, India.