# Advanced Vehicle Security System Using GSM, GPS And Image Processing

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***Abstract-*** *The rapid development of electronics provides the secured environment to the human in present day of life. Using this development in the field of electronics "Advanced Vehicle Security System using GSM, GPS and Image Processing" is designed to reduce the risk involved in losing the vehicles and providing accident notification which will reduce the rate of death. Since theft of vehicles is happening on parking and it became difficult to catch the thief within proper time. In order to overcome this problem, we are implementing a project this can also provide the security for the costliest vehicles using Vehicle tracking, locking and image capturing system which is installed in the vehicle. Vehicle tracking system tracks the place of vehicle where it is present currently, locking system lock the engine motor and capturing system captures the image and compares it with the predefined images. The place of the vehicle identified using Global Positioning system (GPS) and Global System for Mobile communication (GSM). These systems constantly watch a moving Vehicle and report the status of vehicle on demand. When the theft identified, the responsible person sends SMS to the microcontroller through GSM, then microcontroller issue the control signals to stop the engine motor and to lock the door. Authorized person need to send the password to controller to restart the vehicle. This is more secured, reliable and low cost.*

***Keywords***- Vehicle Tracking, Locking, Microcontroller, GPS, GSM.

## I. INTRODUCTION

In the last few decades, India has progressed at such an enormous rate that many companies have strongly established themselves here. These companies bring a huge amount of workforce with them. Arranging transportation to such a huge mass is a cumbersome task involving many intricacies. Generally, this transport is arranged through the local transport vendors on a yearly contract basis, recently happen mishaps such as burglary, rape cases etc. The development of satellite communication technology is easy to identify the vehicle locations. Vehicle tracking systems have brought this technology to the day-to-day life of the common person. Today GPS used in cars, ambulances, fleets and police vehicles are common sights on the roads of developed countries. All the existing technology support tracking the vehicle place and status.

The GPS/GSM Based System is one of the most important systems, which integrate both GSM and GPS technologies. It is necessary due to the many of applications of both GSM and GPS systems and the wide usage of them by millions of people throughout the world. This system designed for users in land construction and transport business, provides real-time information such as location, speed and expected arrival time of the user is moving vehicles in a concise and easy-to-read format.

Currently GPS vehicle tracking ensures their safety as travelling. This vehicle tracking system found in client's vehicles as a theft prevention and rescue device. Vehicle owner follow the signal emitted by the tracking system to locate a robbed vehicle. After switch of the engine, motor cannot restart without permission of password. This system installed for the four wheelers, Vehicle tracking usually used in navy operators for navy management functions, routing, send off, on board information and security. The applications include monitoring driving performance of a parent with a teen driver. Vehicle tracking systems accepted in consumer vehicles as a theft prevention and retrieval device. If the theft identified, the system sends the SMS to the vehicle owner. After that vehicle owner sends the SMS to the controller, issue the necessary signals to stop the motor.

## II. RELATED WORKS

As mentioned in [1] GPS-based Vehicle Tracking System offering system-on-chip (SOC) which is replacement of current microcontroller-based implementation. The proposed SOC is built on a field programmable gate array (FPGA) promising a cheaper design, a more cohesive architecture, a faster processing time and an enhanced system interaction.

In paper [2], it is mentioned that, the Performance of Hybrid GPS/GSM Mobile Terminal Tracking overcomes some existing situations where GPS signal is not available,

e.g., when the MT is used indoors or when the MT is located close to high buildings. It uses Global System for Mobile Communication (GSM), measurements such as the received signal strength (RSS), timing advance (TA), angle of arrival (AoA) or enhanced observed time difference (E-OTD) exist that give information on the MT location. Although these measurements cannot provide the same accuracy as GPS measurements.

As per the reference paper [3] the use of GSM and GPS technologies allows the system to track object and provides the most up-to-date information about ongoing trips. If a password like SMS is sent by the owner, it automatically stops the vehicle or we can use it for different other work, it can provide real time control. This system finds its application in real time traffic surveillance. It could be used as a valuable tool for real time traveler. The current system can be able to provide monitoring process from anywhere. The purpose of this system is to design and integrate anew system which is integrated with GPS- GSM to provide following feature: a) Location information, b) Real time tracking using SMS, c) track bus driver activity d) Communication is instantaneous therefore we can receive running report quickly.

As per contents in paper [4] limitations of vehicle tracking system because of dependency on GSM service provider can be overcome to some extent by addition of DGPS and Mobile Wi-Max. With differential GPS, the accuracy of the position will be improved within 2 to 3 meters practically. With addition of Mobile Wi-Max technology we can get high bandwidth (data rates from 3 Mbps to 50Mbps) through which we may be able to send the live videos from inside and outside the vehicle. The data update rate for position may by every one second or even less. Quick information to control room, in case of break down/accident is possible. Effective control over the drivers, check on over-speeding can be achieved. As the system is fully automatic, automation of fleet operations minimizes human intervention which results in better services. This system also prevents the alteration in the license plate of the vehicle.

As per the survey paper [5] GSM board is used for SMS, MMS and voice link over mobile networks and it uses most popular SIM300 GSM module. To communicate with microcontroller or pc the GSM module has a RS232 serial interface using MAX232 IC. The SIM300 is designed with power saving technique, the current consumption to as low as 2.5mA in SLEEP mode. The SIM300 is integrated with the TCP/IP protocol, Extended TCP/IP AT commands are developed for customers to use the TCP/IP protocol easily, which is very useful for those data transfer applications. 12V 1A adapter is used as power supply for GSM module. GSM board is provided with SIM holder at the backside of the board.

As per the reference paper [6] in this project, GPS is used to find the position of the vehicle and GSM used to send the message to the specified person whose number is stored in the micro controlled. At once if the vehicle seems to be theft, the owner has to just send SMS to that vehicle means vehicle will be stop all the door will be locked then theft will be locked in the car. It uses pic-microcontroller that sends SMS to the vehicle owner using GPS-GSM technology when the vehicle seems to be theft.

As per the reference paper [7] a GPS tracking unit is a device that uses the Global Positioning System to determine the precise location of a vehicle, person, or other asset to which it is attached and to record the position of the asset at regular intervals. The recorded location data can be stored within the tracking unit, or it may be transmitted to a central location data base, or internet-connected computer, using a cellular (GPRS or SMS), radio, or satellite modem embedded in the unit. This allows the asset's location to be displayed against a map backdrop either in real time or when analyzing the track later, using GPS tracking software

As per the contents of the paper [8] microcontroller AT89C52 has 8K bytes of In-System programmable flash memory, eight interrupt sources, low power idle and power down modes, three 16-bit timer/counter, 32 programmable I/O lines, fast programming time. It is low power, high performance CMOS 8-bit microcontroller and it is manufactured using Atmel’s high density non-volatile memory technology and is compatible with industry standard 80C51 instruction set and pin out. It allows program memory to be reprogrammed in-system. It provides a highly flexible and cost-effective solution to many applications.

## III. PROPOSED WORK

In this proposed work, a novel method of vehicle tracking and locking system used to track the theft vehicle by using GPS and GSM technology. This system puts into sleeping mode while the vehicle handled by the owner or authorized person otherwise goes to active mode, the mode of operation changed by in person or remotely. When the unauthorized person enters the car and put the key in the ignition system, the system sends SMS to the owner. After receiving the SMS the owner is supposed to give the miscall to the GSM in order to stop the ignition system.

*A. System Overview:*

In this section, the overview of the proposed work is described. The block diagram of the advanced vehicle security system using GSM, GPS and Image processing is shown in Fig. 1.

When the person enters the car and inserts the key the face detection system captures the image by one tiny web camera which is hidden easily somewhere in the car. Face detection system using MATLAB edge detection algorithm compares the input testing image with database images. If the image does not match with database images then information such as 'vehicle theft' will be sent to the owner mobile using GSM which is interfaced with microcontroller. When the

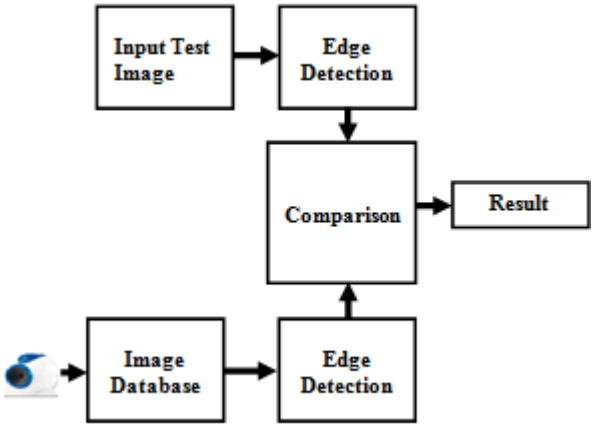


**Fig. 1** System overview.

owner gets the SMS as 'Vehicle theft' he needs to give a missed call to the GSM which is interfaced with microcontroller to stop the ignition system. The owner can also trace the location of vehicle through GPS which is also interfaced to the microcontroller. The location of the vehicle interns of latitude and longitude is send to the owner. To restart the ignition the authorized person needs to give another miscall to the GSM.

*B. Microcontroller*

In the proposed work, microcontroller MCS-51 is used. It consists of the following features:

Compatible with MCS-51®Products

a. a. 4K Bytes of In-System Programmable (ISP) Flash Memory– Endurance: 1000 Write/Erase Cycles
b. 32 Programmable I/O Lines
c. Two 16-bit Timer/Counters
d. Six Interrupt Sources
e. Full Duplex UART Serial Channel.

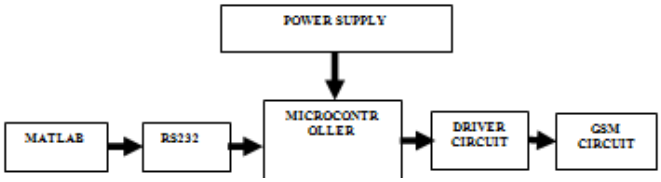


**Fig. 2** Transmitter block diagram.


**Fig. 3** Receiver block diagram.

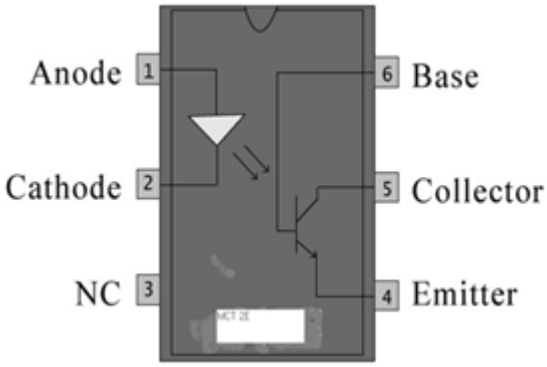


**Fig. 4** Opto-coupler.

*C. Opto-coupler*

MCT2E is an optocoupler integrated circuit in which light emitting diode drives a phototransistor. They are also known as opto-isolators since they separate two circuits optically. These are used to couple two circuits without any ohmic contact. They allow one of the circuits to switch another one while they are completely separate. The first circuit is connected to LED while the other circuit with the phototransistor. The isolation ensures that no damage occurs in either of the circuits while the other one has a fault. An optocoupler is analogous to a relay which isolates two circuits magnetically. They differ with relays in the sense that they are smaller in size and allow fast operation. MCT2E's are commonly used in interfacing an electronic circuit with the parallel port of a computer.

*D. MATLAB*

MATLAB is a high-performance language for technical computing created by The MathWorks in 1984. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation. Typical uses include:

a. Program Math and computation
b. Algorithm development
c. Data acquisition
d. Modeling, simulation and prototyping
e. Data analysis, exploration, and visualization
f. Scientific and engineering graphics
g. Application development, including graphical user interface building

*E. GSM*

GSM features are as follows:

a. Designed for global market, SIM300 is a Tri-band GSM/GPRS engine
b. Works on frequencies EGSM 900 MHz, DCS 1800 MHz and PCS 1900 MHz.

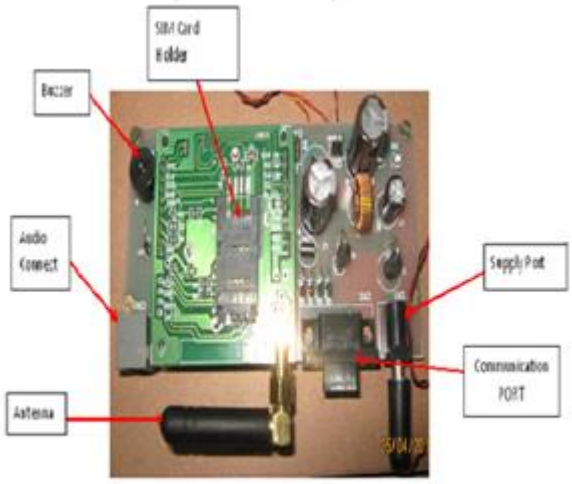


**Fig. 5** GSM Module.

c. SIM300 features GPRS multi-slot class 10/ class 8 (optional) and supports the GPRS coding schemes
d. CS-1, CS-2, CS-3 and CS-4 with a tiny configuration of 40mm x 33mm x 2.85mm
e. SIM300 can fit almost all the space requirements in your applications,
f. such as smart phone, PDA phone and other mobile devices.
g. Supports features like Voice, Data/Fax, SMS, GPRS and integrated TCP/IP stack.

## IV. HARDWARE ASSEMBLING & TESTING

As a first step, we made a single side PCB layout for the given circuit diagram. After that, the following process was followed to complete the current work:

a. Assemble all the components on the PCB based on circuit diagram. TX and RX pins of the GSM modem to pins 13 and 14 of MAX 232 and insert a valid SIM in the GSM modem.
b. Connect the GPS module according to circuit diagram.
c. Our work was implemented and tested successfully.
d. The system was found to very useful and secure for car owners.

## V. RESULTS AND DISCUSSIONS

The proposed work has been simulated using prototype model. The results are shown in Fig. 6, Fig. 7 and Fig. 8. As we can infer from the graphs that, as the efficiency increases, the complexity also varies linearly. Similarly, as the speed increases the complexity also increases linearly. From Fig. 8, as the cost increases the maintenance also increases linearly.

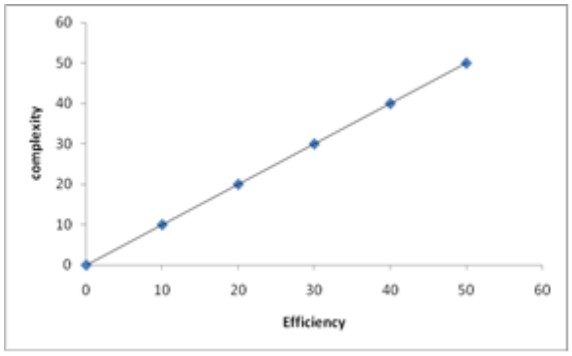


**Fig. 6** Efficiency vs complexity.

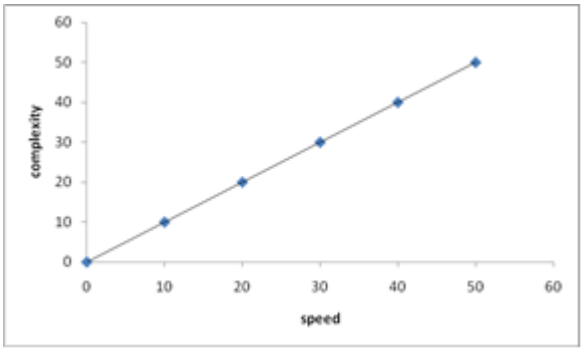


**Fig. 7** Speed vs complexity.

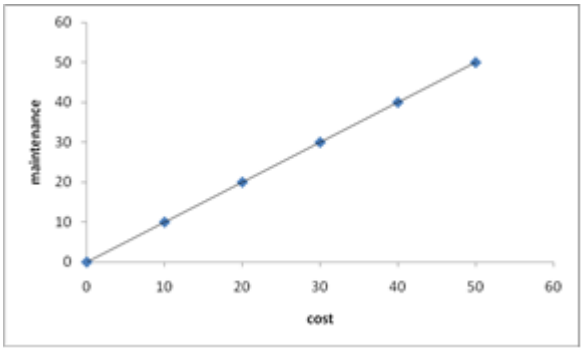


**Fig. 8** Cost vs maintenance.

The proposed real time advanced vehicle security system using GSM, GPS and image processing has the following advantages:

a. Simple circuit
b. Less complexity
c. Easy to maintain
d. Low power consumption
e. High flexibility

Our proposed system consists of vehicle tracking and locking systems which is used to track the theft vehicle by using GPS and GSM technology. This system puts into the sleeping mode vehicle handled by the owner or authorized persons; otherwise goes to active mode. The mode of operations changed by persons or remotely. When the theft identified, the responsible people send SMS to the micro controller, then issue the control signals to stop the engine motor. To restart the engine authorized person needs to enter the passwords. In this method, it become great tool to track the theft vehicle easily.

This system can also be used to capture the image of the driver and sends the image as well as information about location of the vehicle on owner mobile phone. In this method, tracking of vehicle place become easy and doors will be locked automatically, thereby thief cannot get away from the car.

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