International Journal for Modern Trends in Science and Technology
Volume: 03, Issue No: 04, April 2017
ISSN: 2455-3778
http://www.ijmtst.com

Vehicle Theft Intimation and Capturing by using GSM

R.Renuga[1] | T.Suganya[2] | R.Satya[3]

[1,2,3]UG Scholars, Department of ECE, Roever Engineering College, Perambalur, India.

To Cite this Article
R.Renuga, T.Suganya and R.Satya, "Vehicle Theft Intimation and Capturing by using GSM", *International Journal for Modern Trends in Science and Technology*, Vol. 03, Issue 04, April 2017, pp. 154-158.

ABSTRACT

This paper deals with the design & development of theft intimation & capturing for an automobile which is being used to prevent / control the theft of a vehicle. The developed system makes use of an embedded system based on GSM technology. The designed & developed system is installed in the vehicle. An interfacing mobile is also connected to the microcontroller, which is in turn, connected to the engine. Once, the vehicle is being stolen, the information is being used by the vehicle owner for further processing. The information is passed onto the central processing insurance system, where by sitting at a remote place, a particular number is dialed by them to the interfacing mobile that is with the hardware kit which is installed in the vehicle. By reading the signals received by the mobile, one can control the ignition of the engine; say to lock it or to stop the engine immediately. Again it will come to the normal condition only after entering a secured password. The owner of the vehicle & the central processing system will know this secured password. The main concept in this design is introducing the mobile communications into the embedded system. The designed unit is very simple & low cost. The entire designed unit is on a single chip. When the vehicle is stolen, owner of vehicle may inform to the central processing system, then they will stop the vehicle by just giving a ring to that secret number and with the help of SIM tracking knows the location of vehicle and informs to the local police or stops it from further movement.

KEYWORDS: *GSM, SIM Tracking, Liquid Crystal Display, Keypad, Relay, Microcontroller.*

I. INTRODUCTION

In recent years, vehicle thefts are increasing at an alarming rate around the world. People have started to use the theft control systems installed in their vehicles. The commercially available anti-theft vehicular systems are very expensive. Here, we make a modest attempt to design & develop a simple, low cost vehicle theft control scheme using an inbuilt microcontroller. This scheme involves a microcontroller & a mobile for the communication purposes [1].

Tracking of the stolen vehicle can be done through the Internet interface. Once the position of the stolen vehicle is found out using the GPS, a location request is sent back to the central processing system, which takes care of the event to be performed using remote control functions.

Control functions of the tracking system allow us to perform much function such as to lock & unlock the doors, engine stopping & starting, automatic position reporting based on time or distance, over speed detection reporting, remote Start output on tracking device, etc. The paper is organized in the following sequence. A small literature survey on the theft control system was given in the previous paragraphs. This is followed by the review of the GSP mobile communication concepts. Section 2

describes the development of the block diagram and its components for the design & development of the theft control system. The electronic circuitry hardware details are presented in the section 3. Tracking & working of the system using mobile technology is presented in section 4. This is followed by the conclusions & the references.

The Global System for Mobile communications (GSM) is the most popular standard for mobile phones in the world. Over billion people use GSM service across the world. The usability of the GSM standard makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs significantly from its predecessors in that both signaling and speech channels are digital, which means that it is considered a second generation (2G) mobile phone system. This fact has also meant that data communication was built into the system from very early on [2].

The structure of the GSM network is explained in the following paragraphs. The network behind the GSM system seen by the customer is very large and complicated in order to provide all of the services, which are required & is divided into a number of sections, viz., The base station sub-system (the base stations and their controllers). The network and switching sub-system (the part of the network most similar to a fixed network): sometimes also called as the core network. The GPRS core network (the optional part which allows packet based internet connection).

All of the elements in the system described above combine to produce many GSM services such as voice calls and SMS. One of the key features of GSM is the Subscriber Identity Module (SIM), commonly known as a SIM card. The SIM is a detachable smart card containing the user's subscription information and phonebook. This allows the user to retain his information after switching handsets. Alternatively, the user can also change operators while retaining the handset simply by changing the SIM [3].

The Mobile Station (MS) consists of the mobile equipment (the terminal) and a smart card called the Subscriber Identity Module (SIM). The SIM provides personal mobility, so that the user can have access to subscribed services irrespective of a specific terminal. By inserting the SIM card into another GSM terminal, the user is able to receive calls at that terminal, make calls from that terminal, and receive other subscribed services.

The mobile equipment is uniquely identified by the International Mobile Equipment Identity (IMEI). The SIM card contains the International Mobile Subscriber Identity (IMSI) & is used to identify the subscriber to the system, secret key for authentication and other information. The IMEI and the IMSI are independent, thereby allowing personal mobility. The SIM card may be protected against unauthorized use by a password or by a personal identity number.

The base station sub-system is composed of two parts, viz., the Base Transceiver Station (BTS) and the Base Station Controller (BSC). These communicate across the standardized ABIS interface, allowing (as in the rest of the system) operation between components made by different suppliers. The base transceiver station houses the radio transceivers that define a cell and handle the radio-link protocols with the mobile station. In a large urban area, there will potentially be a large number of BTS's deployed, thus, the requirements for a BTS are ruggedness, reliability, portability, and minimum cost.

The base station controller manages the radio resources for one or more BTS's. It handles radio-channel set-up, frequency hopping and handovers. The BSC is the connection between the mobile station and the Mobile Switching Service (MSS). The central component of the network subsystem is the Mobile services Switching Center (MSC). It acts like a normal switching node of the PSTN or ISDN and additionally provides all the functionality needed to handle a mobile subscriber, such as registration, authentication, location updating, handovers, and call routing to a roaming subscriber.

These services are provided in conjunction with several functional entities, which together form the network sub-system. The MSC provides the connection to the fixed networks (such as the PSTN or ISDN). Signaling between functional entities in the network sub-system uses Signaling System Number 7 (SSN7), used for trunk signaling in ISDN and widely used in current public networks Messaging Center (MSC).

II. DESIGN OF THE EMBEDDED SYSTEM BLOCKS

The block diagram of the design is shown in the Fig. 1 & has a GSM mobile, Microcontroller, Relay, Keypad, LCD, Power supply blocks which interact with each other as follows: When switched on, the power supply supplies 5V to microcontroller for its operation and 12V to relay which is assumed to

come from the battery of the vehicle to the key assembly. When the vehicle is stolen, a ring is made to the secret number by authorized person, then mobile gives high signal from its ringer circuit to the micro controller, then the microcontroller disconnects the connection from the relay which is 12V, until the person comes to the spot and enters the specified password the will not start. If there is an error, error message is displayed on LCD for convenience [4]. If the entered password is correct, then normal operation will proceed.

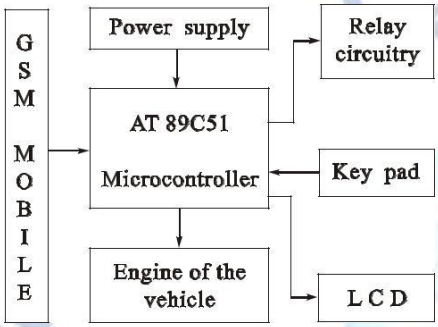


Fig. 1. Block Diagram of Designed System

A. Microcontroller

Microcontroller is the heart of the designed unit, which handles all the signals. All other interfacing blocks are interfaced to it. By accepting high pulse from the mobile's ringer circuit it sends command to the relay connected to Port P1.7, which cuts the connection. The AT89C51 is a low-power; high performance CMOS 8-bit microcontroller with 4K bytes of flash programmable & erasable read only memory (PEROM). The device is manufactured using Atmel's high density non volatile memory technology and is compatible with the industry stander MCS-51 instruction set and pinot. The on-chip flash allows the program memory to be reprogrammed in system or by a conventional nonvolatile memory programmer. By combining a versatile 8-bit CPU with flash on a monolithic chip, the Atmel AT89C51 is a powerful microcomputer which provides a highly-flexible and cost effective solution to many embedded controlee applications. The µC circuit diagram is shown in Fig. 3.

B. Power Supply

The power supply consists of AC voltage transformer, diode rectifier, and ripple filter and voltage regulator. The transformer is an AC device. It has two coil windings, the primary and the secondary, around a common magnetic core. The current flowing in the primary winding generates a time varying electromagnetic field, which in turn induces an output voltage across the secondary winding. The ratio of the turns in the two windings determines the ratio of the input voltage and output voltage. The higher voltage side has a thinner (high gauge) wire with more turns while the lower voltage side has thicker (low gauge) wire and fewer turns [5].

C. Relay

The relay we are using in this work is a 230V / 2A relay and it's an electromechanical relay. The excitation voltage that is required is +12V DC. It is driven using the relay driver IC ULN2003 /VLN 2003A. The device is connected to the electro mechanical relay. When the relay is excited by applying the 12V DC the relay gets activated and in the process turns ON the device and when the excited voltage is stopped, the relay gets deactivated and in the process turns OFF the devices. In magnetic relay, insulated copper wire coil is used to magnetize and attract the plunger. The plunger is normally connected to N/C terminal. A spring is connected to attract the plunger upper side. When output is received by the relay, the plunger is attracted and the bulb glows.

D. Keypad

Keypad used here for inputting the data is of the form (4 × 3) matrix board, which is used to connect to the microcontroller (From P3.0 to P3.3 row wise & from P1.3 to P1.5 column wise). It is used to input the password for validation purposes. The Fig. 2 shows a (4 × 3) matrix connected to two ports. The rows are connected to an output port and the columns are connected to an input port. If no key has been pressed, reading the input port will yield 1's for all columns since they are all connected to high (V_{cc}). If all the rows are grounded and a key is pressed, one of the columns will have 0 since the key pressed provides the path to ground. It is the function of the microcontroller to scan the keyboard continuously to detect and identify the key pressed.

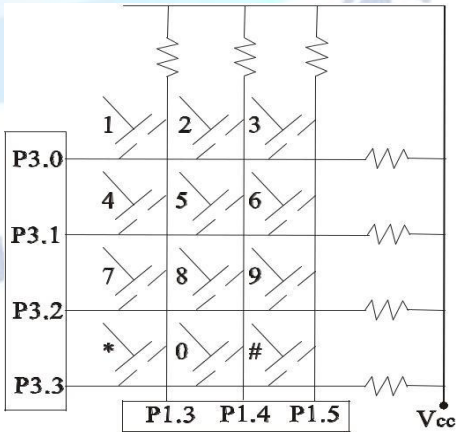


Fig. 2. Block Diagram of Keyboard Design

E. GSM mobile

Mobile used in our work is NOKIA3315 from which a pair of wire comes from its ringer circuit to micro-controller's port P1.6 and to the GND. When

a ring is made, a high pulse is provided to the microcontroller. The mobile's ringer circuit output, where the ringer is connected normally is given to the microcontrollers port P 1.6. When the ring is given to that mobile, output will become high which is read by microcontroller and stops the vehicle via the relay.

F. LCD

Here, the LCD is connected to Port2 (P2.0 to P2.7) of the microcontroller. It is used to display messages (either error or accepted). Variable resistor connected to Pin3 of LCD, is used to control the brightness of LCD. A liquid crystal display is a low cost, low power device capable of displaying text and images. LCD's are extremely common in embedded systems, since such systems often do not have video monitors like those that come standard with desktop systems.

LCD can be found in numerous devices like watches, fax and copiers and calculators. The LCD (L1682) used here is the seiko instruments standard temperature make. A variable or fixed resistor must be used on any LCD module as it appears in the above schematic. Seiko instruments intelligent dot matrix liquid crystal display modules have on-board controller and LSI drivers, which display alpha numerics and a wide variety of other symbols in either (5 × 7) dot matrix.

The internal operation in the controller chip is determined by the signals sent from the MPU. The signals include [6]

- Register select RS input consisting of instruction register (IR) when RS = 0 and data register (DR) when RS = 1.
- Read / write (R/W).
- Data bus (DB7-DB0)
- Enable strobe (E) depending on the MPU or through an external parallel I / O port.

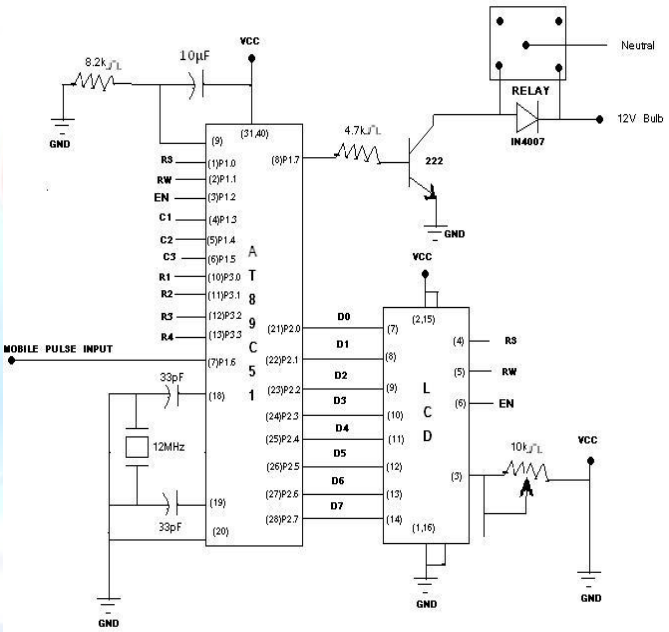
The LCD command modes are listed in the form of a table shown below in table 1.

Table 1 : LCD command modes

HEX	Register
1	Clear display screen
2	Return home
4	Decrement cursor (shift cursor to left)
6	Increment cursor (shift cursor to right)
5	Shift display right
7	Shift display left
8	Display off, cursor off
A	Display off, cursor on
C	Display on, cursor off
E	Display on, cursor blinking
F	Display on, cursor blinking
10	Shift cursor position to left
14	Shift cursor position to right
18	Shift the entire display to the left
1C	Shift the entire display to the right
80	Force cursor to beginning of first line
C0	Force cursor to beginning of second line
38	2 lines and 5 × 7 matrix

III. Electronic Hardware Details

The components used in the design of the control unit are the microcontroller (Atmel AT89c51), 16 × 2 LCD (L1682) 4 × 3 Key pad, Capacitors (2 × 33pF, 10µF), Transistor (222), Relay-12V, Resistor (8.2 kΩ, 4.7kΩ, 10 kΩ varistor), Mobile (NOKIA3315 used), Step down transformer 230V/12V AC, Diodes (4 × IN4007), Series voltage regulators (LM7812, LM7805) with heat sink, Capacitors (1000µF, 470µF, 100µF), LED (red used) & the Resistor (100Ω).



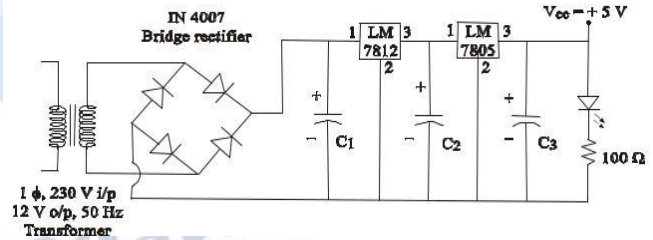


Fig. 3. Circuit Diagram of Microcontroller
Fig. 4. Power Supply Unit

The power supply that is built in this experimental research work is a linear power supply which is shown in the Fig. 4. In other words, the circuit functions with analog signals. In the design, there is a small transformer, which can convert 230V AC from the wall plug to 6-12 V AC. In the experiment, power rectifying diodes 1N4001

or IN4007 have been used. The most important thing to know is the polarity of the diode. The arrow is the p-side and the bar is the n-side [7].

A positive voltage is needed on the p-side to make the diode conduct. IN4001 can block off large negative bias in the hundred voltage range. The specifications of the DC power supply include the output voltage, the current and power ratings. For example, the computer power supply can provide a number of voltages, such as, 5 V, 3.3 V, 12 V, −5 V and −12 V. It has a power rating of 300 - 500 W. The combined current of the 5 V and 3.3 V supply should not be above 25-30 A. The ripple is often specified as percentage, e.g., 1.5 % ripples. The most prominent effect of ripple is on audio circuits. If you hear a low frequency humming noise, it indicates that there is a ripple. This humming noise is also quite pronounced when there is a ground loop somewhere.

IV. SIM Tracking Technology

The designed unit employs a system that uses information available to the cell phone operators as a matter of course to determine location of any mobile phones within the GSM network. The system uses timing advance methodology to determine the relative position of the phone from a cell site. When combined with an accurate map of the cell tower locations, a good position of the mobile phone can be calculated. This is done without any action of the mobile phone user and does not send any information to the phone to know that it is being tracked.

A location server is installed at the mobile phone operator's site (at the location of the vehicle) connected to the internal server, which, in turn, serves as the gateway and connects to the mobile phone locator server via the Internet. Because the issue of personal privacy, today the service is only being offered to commercial entities, not to general consumers. However, as the technology can also be used when dealing with consumer and public safety, it is likely that consumers will be offered a mobile phone for useful purposes, say in the control of thefts in vehicles [8].

Commercialization of the service today requires that the person being tracked signs a consent form. The tracking PC is then loaded with the software and map. When in operation, the PC must be connected to the Internet. The request is then sent to the tracking server, which then passes the request to the server at the mobile operator. After the request is serviced, the data is then sent back to the PC for display of the location. Accuracy of mobile phone tracking varies with the size of the cell site coverage and varies from 200 meters to several kilometers. Still, the location of the phone can be very useful depending on the application [9].

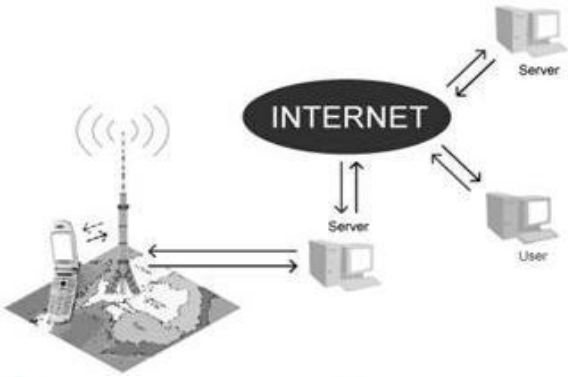


Fig. 5. SIM Tracking

V. CONCLUSION

A novel method of designing a low-cost, compact theft control system for a vehicle was designed & demonstrated in this paper. This work is an ultimate threat for vehicle thieves. Nowadays, the vehicles are least secured when it is stolen by thieves. By this work which is presented in this paper, it is very easy to track the vehicle at a higher degree of accuracy, since it is based on GSM Technology, which is very developed now. So, it is very much easy to get back the vehicle. The crux of the work is that the whole process is done at the least possible cost and it is almost accomodable to the practical implementation. In future, there is no doubt that all of the vehicles will be embedded with this unique kit. Microcontroller codes were written in assembly language to control the theft of the vehicle.

References

[1] M. A. Mazidi, "The 8051 Microcontroller & Embedded Systems", Pearson Education Asia, India, 2003.
[2] Kenneth J. Ayala, "The 8051 Microcontroller Architecture, programming &applications", Penram International, India, 1996.
[3] Douglas V Hall, "Microprocessor and Interfacing-Programming & Hardware".
[4] http://www. gisdevelopment.net
[5] National motor vehicle theft reduction conference 2000, Conference Papers (Australia)
[6] Stolen and Wrecked Vehicles Monitoring Program, CCMTA June 1994 (Canada)
[7] CCMTA Best Practice Models for Combating Auto Theft, Version 6.1,Oct. 2006, Anti Auto-Theft Project Group
[8] http://www.wikipedia.org
[9] http://www.howstuffworks.com