Vehicle Theft Intimation Using GSM

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ABSTRACT:

This project uses a wireless technology for automobiles using GSM modem. With the help of GSM modem, we can stop the automobile engine when someone tries to steal the vehicle. When unauthorised person tries to unlock the door of car, then a programmable microcontroller 8051 gets an interrupt and order to GSM modem to send a SMS. GSM modem that stores owner's number upon a miss call for the first time sends an alert SMS to that authorized number. If owner reply to "stop the engine" then the control instruction is given to the microcontroller through interface that the output from which activates a relay driver to trip the relay that disconnects the ignition of the automobile resulting in stopping the vehicle.

Keywords - *Step down transformer 230/12V, Bridge Rectifier, Voltage Regulator 7805, Microcontroller 8051 and GSM modem.*

I. INTRODUCTION

GSM (Global System for Mobile communications) is an open, digital cellular technology used for transmitting mobile voice and data services. GSM differs from first generation wireless systems in that it uses digital technology and Time Division Multiple Access (TDMA) transmission methods. GSM is a circuit-switched system that divides each 200kHz channel into eight 25kHz time-slots. GSM operates in the 900MHz and 1.8GHz bands in Europe and the 1.9GHz and 850MHz bands in the US. The 850MHz band is also used for GSM and 3GSM in Australia, Canada and many South American countries. GSM supports data transfer speeds of upto 9.6 kbit/s, allowing the transmission of basic data services such as SMS (Short Message Service). Another major benefit is its international roaming capability, allowing users to access the same services when travelling abroad as at home. This gives consumers seamless and same number connectivity in more than 210 countries. GSM satellite roaming has also extended service access to areas where terrestrial coverage is not available Global System for Mobile Communications. The first European digital standard, developed to establish cellular compatibility throughout Europe.

It's success has spread to all parts of the world and over 80 GSM networks are now operational. It operates at 900 MHz.

- GSM stands for **G**lobal **S**ystem for **M**obile Communication and is an open, digital cellular technology used for transmitting mobile voice and data services.
- The GSM emerged from the idea of cell-based mobile radio systems at Bell Laboratories in the early 1970s.
- The GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard.
- The GSM standard is the most widely accepted standard and is implemented globally.
- The GSM is a circuit-switched system that divides each 200kHz channel into eight 25kHz time-slots. GSM operates in the 900MHz and 1.8GHz bands in Europe and the 1.9GHz and 850MHz bands in the US.
- The GSM is owning a market share of more than 70 percent of the world's digital cellular subscribers.
- The GSM makes use of narrowband Time Division Multiple Access (TDMA) technique for transmitting signals.
- The GSM was developed using digital technology. It has an ability to carry 64 kbps to 120 Mbps of data rates.
- Presently GSM supports more than one billion mobile subscribers in more than 210 countries throughout the world.

- The GSM provides basic to advanced voice and data services including Roaming service. Roaming is the ability to use your GSM phone number in another GSM network.

Throughout the evolution of cellular telecommunications, various systems have been developed without the benefit of standardized specifications. This presented many problems directly related to compatibility, especially with the development of digital radio technology. The GSM standard is intended to address these problems.

From 1982 to 1985 discussions were held to decide between building an analog or digital system. After multiple field tests, a digital system was adopted for GSM. The next task was to decide between a narrow or broadband solution. In May 1987, the narrowband time division multiple access (TDMA) solution was chosen.

1. GSM Modem

Fig 1. GSM Modem

Global system for mobile communication (GSM) is a globally accepted standard for digital cellular communication. GSM is the name of a standardization group established in 1982 to create a common European mobile telephone standard that would formulate specifications for a pan-European mobile cellular radio system operating at 900 MHz. A GSM modem is a wireless modem that works with a GSM wireless network. A wireless modem behaves like a dial-up modem. The main difference between them is that a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. The working of GSM modem is based on commands, the commands always start with AT (which means ATtention) and finish with a <CR> character. For example, the dialing command is ATD<number>; ATD3314629080; here the dialing command ends with semicolon. The AT commands are given to the GSM modem with the help of PC or controller. The GSM modem is serially interfaced with the controller with the help of MAX 232.

II. NEW APPROACHES

Recently, a GPS based system is use for automobile security. This GPS system helps to find out the exact location of the vehicle and find out the direction of the vehicle. This system uses geographic position and time information from the Global Positioning Satellites. The system has an "On-Board Module" which resides in the vehicle to be tracked and a "Base Station" that monitors data from the various vehicles. But this system is not able to give protection to the vehicle. To overcome this problem, a GSM Modem based project introduced in this security system. The main aim of this project is to use a wireless technology for automobiles using GSM modem. The main scope of this project is to stop the automobile engine with the help of GSM modem when any person tries to steal the vehicle. When unauthorised person tries to unlock the door of car, then a programmable microcontroller 8051 gets an interrupt and order to GSM modem to send a sms. GSM modem that stores owner's number upon a miss call for the first time, sends an alert sms to that authorized number. If owner reply to "stop the engine" then the control instruction is given to the microcontroller through interface that the output from which activates a relay driver to trip the relay that disconnects the ignition of the automobile resulting in stopping the vehicle.

Global usage: Originally GSM had been planned as a European system. However the first indication that the success of GSM was spreading further afield occurred when the Australian network provider, Telstra signed the GSM Memorandum of Understanding.

Frequencies: GSM networks operate in a number of different carrier frequency ranges (separated into GSM frequency ranges for 2G and UMTS frequency bands for 3G), with most 2G GSM networks operating in the 900 MHz or 1800 MHz bands. Where these bands were already allocated, the 850 MHz and 1900 MHz bands were used instead (for example in Canada and the United States). In rare cases the 400 and 450 MHz frequency bands are assigned in some countries because they were previously used for first-generation systems. Most 3G networks in Europe operate in the 2100 MHz frequency band. For more information on worldwide GSM frequency usage, see GSM frequency bands. Regardless of the frequency selected by an operator, it is divided into timeslots for individual phones. This allows eight full-rate or sixteen half-rate speech channels per radio frequency. These eight radio timeslots (or burst periods) are grouped into a TDMA frame. Half-rate channels use alternate frames in the same timeslot. The channel data rate for all 8 channels is 270.833 kb/s, and the frame duration is 4.615 ms. The transmission power in the handset is limited to a maximum of 2 watts in GSM 850/900 and 1 watt in GSM 1800/1900.

III.   GSM NETWORK

The network architecture of GSM can be broadly divided into these main areas –

- Mobile station
- Base-station subsystem
- Network and switching subsystem
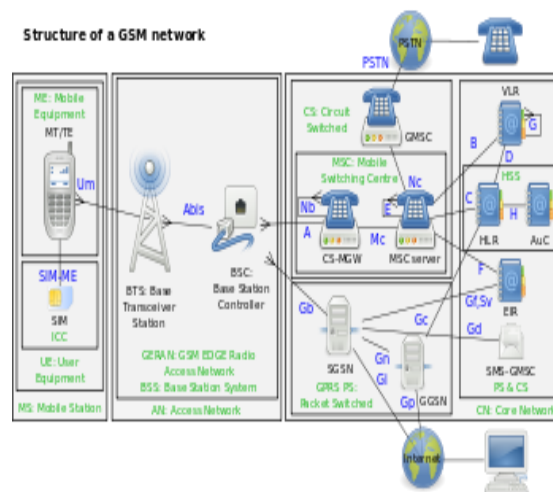- Operation and support subsystem.

Fig 3.GSM Network

GSM is a cellular network, which means that cell phones connect to it by searching for cells in the immediate vicinity. There are five different cell sizes in a GSM network—macro, micro, pico, femto, and umbrella cells. The coverage area of each cell varies according to the implementation environment. Macro cells can be regarded as cells where the base station antenna is installed on a mast or a building above average rooftop level. Micro cells are cells whose antenna height is under average rooftop level; they are typically used in urban areas. Picocells are small cells whose coverage diameter is a few dozen metres; they are mainly used indoors. Femtocells are cells designed for use in residential or small business environments and connect to the service provider's network via a broadband internet connection. Umbrella cells are used to cover shadowed regions of smaller cells and fill in gaps in coverage between those cells.

Cell horizontal radius varies depending on antenna height, antenna gain, and propagation conditions from a couple of hundred metres to several tens of kilometres. The longest distance the GSM specification supports in practical use is 35 kilometres (22 mi). There are also several implementations of the concept of an extended cell, where the cell radius could be double or even more, depending on the antenna system, the type of terrain, and the timing advance. Indoor coverage is also supported by GSM and may be achieved by using an indoor picocell base station, or an indoor repeater with distributed indoor antennas fed through power splitters, to deliver the radio signals from an antenna outdoors to the separate indoor distributed antenna system. These are typically deployed when significant call capacity is needed indoors, like in shopping centers or airports. However, this is not a prerequisite, since indoor coverage is also provided by in-building penetration of the radio signals from any nearby cell.

IV.   SPECIFICATIONS OF GSM

The GSM specification is listed below with important characteristics.

A.   Modulation:

Modulation is a form of change process where we change the input information into a suitable format for the transmission medium. We also changed the information by demodulating the signal at the receiving end. The GSM uses Gaussian Minimum Shift Keying (GMSK) modulation method.

B.   Access Methods:

GSM chose a combination of TDMA/FDMA as its method. The FDMA part involves the division by frequency of the total 25 MHz bandwidth into 124 carrier frequencies of 200 kHz bandwidth. One or more carrier frequencies are then assigned to each BS. Each of these carrier frequencies is then divided in time, using a TDMA scheme, into eight time slots. One time slot is used for transmission by the mobile and one for reception. They are separated in time so that the mobile unit does not receive and transmit at the same time.

C.   Transmission Rate:

The total symbol rate for GSM at 1 bit per symbol in GMSK produces 270.833 K symbols/second. The gross transmission rate of the time slot is 22.8 Kbps. GSM is a digital system with an over-the-air bit rate of 270 kbps.

D.   Frequency Band:

The uplink frequency range specified for GSM is 933 - 960 MHz (basic 900 MHz band only). The downlink frequency band 890 - 915 MHz (basic 900 MHz band only).
E.   Channel Spacing:

This indicates separation between adjacent carrier frequencies. In GSM, this is 200 kHz.

F.   Speech Coding:

GSM uses linear predictive coding (LPC). The purpose of LPC is to reduce the bit rate. The LPC provides parameters for a filter that mimics the vocal tract. The signal passes through this filter, leaving behind a residual signal. Speech is encoded at 13 kbps.

G.   Duplex Distance:

The duplex distance is 80 MHz. Duplex distance is the distance between the uplink and downlink frequencies. A channel has two frequencies, 80 MHz apart.

H.   Misc:
- Frame duration: 4.615 ms
- Duplex Technique: Frequency Division Duplexing (FDD) access mode previously known as WCDMA.
- Speech channels per RF channel: 8.

V.   COMPARISONS:

	GPS based System	Vehicle Theft Intimation Using GSM Modem
Definition	GPS stands for "Global positioning System". It is a satellite-based navigation system that was developed by the United States Department of Defence.	It is a specification of wireless network infrastructure. The system has been developed by the European Telecommunications Standards Institute.
Technology	Triangulation to at least three or four of the 24 satellites that orbit the earth.	An object's position is determined using signal strength and triangulation from base stations.

Features	GPS system helps to find location and tracking of the vehicle	This project can stop the vehicle when unauthorised person tries to steal the vehicle.
Vehicle Tracking	Digital maps, etc. are used to track the location in real time.	Phone's international mobile equipment identity number, etc. are used to track the location of a vehicle.
Accuracy	Comparatively difficult in area surrounded by tall buildings.	Base stations are capable of providing locations in areas like tunnel and dense areas.
Advantage	• Provides the exact location • Provides the exact latitude and longitude • Helps in searching the local area for nearby amenities • Assists in improving the accuracy for weather forecasts.	• World wide roaming • The facilities of GSM are highly protected • Reasonable Devices and Facilities • The GSM expertise usages five bands of MHz rate; 450, 850, 900, 1800 and 1900 MHz.

VI. FUTURE WORK

Vehicle tracking system is becoming increasingly important in large cities and it is more secured than other systems. Now a day's vehicle Stealing is rapidly increasing. Nowadays, GPS tracking system is used in the vehicle. But this security is not enough for security. Due to this reason, this project is introducing the wireless technology effectively for the automotive environments by using the GSM Modem. It is used in sending sms intimation to owner in case of theft of vehicle. When a person trying to steal the vehicle. At that time, programmable microcontroller 8051 gets an interrupt and microcontroller that stores owner's number upon a miss call for the first time, sends an alert sms to that authorized number. When someone tries to steal the car then microcontroller gets an interrupt and orders GSM Modem to send the sms, the owner receives a SMS that his car is being stolen then the owner sends back the SMS to the GSM modem to 'stop the engine', while the vehicle will be stopped. The control instruction is given to the microcontroller through interface, the output from which activates a relay driver to trip the relay that disconnects the ignition of the automobile resulting in stopping the vehicle. This project can be more effective when this is use in bank for security purpose. When unauthorized person tries to unlock bank locker then a security locker which is also available in bank locker automatically get locked. So that theft cannot able to open the bank locker. For this, we can also provide security in the bank.

VII. RESULT AND CONCLUSION

For fast development of the country transportation of men & materials is urgently require. For transportation of men & material in very large amount large numbers vehicle is of high capacity is required .The cost high capacity vehicle is very high .The Chances of theft vehicle is also increased due to high cost of vehicle, non availability of garage ,guards & parking space in the town or city. To stop the theft of the car /vehicle is urgently required for fast movement of the vehicle/car & also to control criminal activity. At present we are using GPS system for tracking the theft vehicle. GPS system is not full prove system for arresting the theft of vehicle or car. It only track the theft vehicle/car after theft.GPS system is also very costly system and needs internet connection for tracking the vehicles.

My project is based on GSM modem, which is a full prove system for arresting the theft of vehicles without using GPS system and internet connection. My system is based on wireless technology. This project is to use wireless technology to intimate the owner of the vehicle about any unauthorized door entry into the vehicle. This is done by sending an auto-generated SMS to the owner. An added advantage of this project is that, the owner can send back the SMS to the system, which will disable the ignition of the vehicle. Theft intimation of the vehicle over SMS using GSM modem by user programmable number upon a miss-call , to the owner, while unauthorized door entry is made in the vehicle. Owner can send command through his mobile to the system to stop the engine by activating the relay interfaced to a microcontroller along with the GSM modem used for the purpose. My system can be used remotely for stoppage the ignition of engine of the vehicles which will completely stop the theft of vehicle .The cost of my GSM modem system is very low in comparison to present GPS system and it is also very handy and light weighted. The circuit of my GSM modem is very simple, which can be repaired very easily. In my GSM modem system, we are providing separate power system through 12v battery. There will be no any connection in my GSM system through car/vehicle battery. It will be a hidden system fitted in the car/vehicles.

REFERENCES

[1]   "GSM Global System for Mobile Communications". 4G Americas. Retrieved 2014-03-22.
[2]   "GSM UMTS 3GPP Numbering Cross Reference". ETSI. Retrieved 30 December 2009.
[3]   Introduction to GSM: Physical Channels, Logical Channels, Network, and Operation by Lawrence Harte.
[4]   GSM Switching, Services and Protocols by Hans-Jorg Vogel, Christian Bettstetter
[5]   An Introduction to GSM (Mobile Communications Library) by Siegmund H. Redl, Matthias Weber, Malcolm W. Oliphant
[6]   GSM Networks: Protocols, Terminology and Implementation (Mobile Communications Library) by Gunnar Heine
[7]   Radio Interface System Planning for GSM/GPRS/UMTS
[8]   Fundamentals of Cellular Network Planning and Optimisation
[9]   GSM, GPRS and EDGE Performance: Evolution Towards 3G/UMTS
[10]   HSDPA/HSUPA for UMTS: High Speed Radio Access for Mobile Communications
[11]   Intelligent Networks for the GSM, GPRS and UMTS Network
[12]   National Research Council (U.S.). Committee on the Future of the Global Positioning System; National Academy of Public Administration (1995). *The global positioning system: a shared national asset: recommendations for technical improvements and enhancements*.
[13]   The Global Positioning System: Assessing National Policies, p.245. RAND Corporation