Advanced Car Security System Using GSM

Hnin Pwint Han, Hla Myo Tun

Email: kohlamyotun@gmail.com

Abstract- This system proposes the design and construction of an advanced car security system using GSM. It uses the GSM mobile communication networks to transmit alarm signal and control instruction. The control and communication between the user and the proposed system are achieved through a short message services (SMS) protocol available in the mobile phone. If the car door is illegally opened or the car is vibrated, an alarm will be activated and it send SMS message to the owner's mobile phone immediately and automatically. The user could easily protect and control their car anywhere at any time. The proposed system consists both hardware and software parts. The hardware components include vibration sensors, a PIC microcontroller, a GSM modem, LCD and buzzer. The software part includes a program controller interface. PIC MikroC programming language is used for this control system. The control system is based on the PIC16F877A microcontroller and AT COMMAND.

Index Terms- GSM Modem, Microcontroller, Vibration sensors, LCD, Buzzer.

I. INTRODUCTION

Nowadays, automobile thefts are increasing as well as production of cars in yearly world. So, vehicle theft is a universal problem. To solve this problem, most of the vehicle owners have started using the theft protection systems. A wireless vehicle security system which implements mobile communication protocol is proposed. The most popular existing car security system is car alarm and has a lot disadvantages. They are;

- Distance- Cover Area, the siren cannot be heard over a long
- distance
- Same sound (siren) for most of the cars
- False Alarm
- Not 100% secure
- Cannot be heard in buildings

This type of security system is less effective if the car is far away from the owner as the alarm cannot be heard by the owner. So, this paper proposes a car security system using GSM. This GSM based car security system is an advanced security system. When the car is vibrated, the system will produces an alarm signal and immediately send a SMS to car owner's mobile phone. The user could easily supervise, protect and control their car anywhere at any time. The system is divided into three sections and it was designed using MikroC language. Serial communication is used for data communication between GSM modem and PIC16F877A. In this system, firstly, vibration sensors sense the instruction and produce output signal and these output signal arrive at the PIC microcontroller. PIC acts as electric brain or message sending controller that control all of the functionality and interfaced circuit attach to the system. It sends SMS message to the mobile phone via GSM modem. GSM modem sends the signal (SMS) to the user's mobile phone when receive signal from the PIC microcontroller. In this way, the users can protect from being stolen.

II. PROPOSED SYSTEM

The developed system makes use of an embedded system based on GSM technology. When an unauthorized person tampers with a vehicle in which an antitheft system is settled up then the microcontroller commands the GSM modem to send a text alert to the vehicle owner. In this system we interfaced PIC16F877A microcontroller with SIM-com 900 modem to decode the received message and do the required action. The protocol used for the communication between the two is AT command. The commands are standard AT. The PIC communicates with the modem and a further piece of equipment using serial protocol.

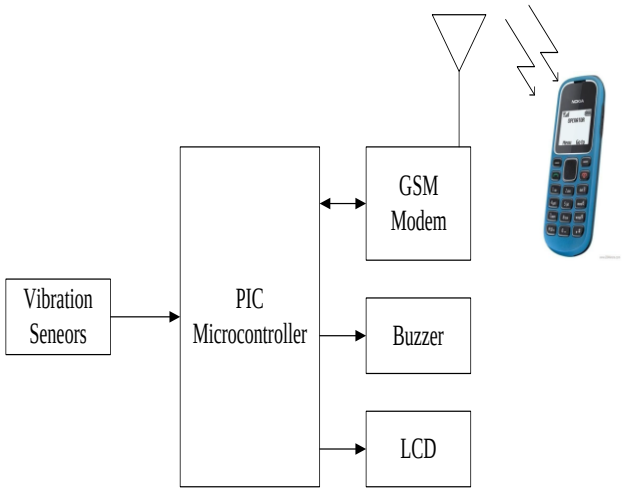

Fig 1: Block Diagram of the Advanced Car Security System using GSM

The figure shows that the GSM modem is controlled by the microcontroller that sends signals to the GSM to receive and transmit messages.The system is divided into three sections and it was designed using MikroC language. Serial communication is used for data communication between GSM modem and PIC16F877A. In this system, if the car door is illegally opened or the car is vibrated, an alarm signal and SMS message will be sent

out to the owner's mobile phone immediately and automatically via GSM modem. When receiving a predefined message, the car owner can know that their car is in a danger condition and take an immediate action. The proposed system has the following advantages: low cost, high performance, high security, easy to implement, and strong security control pattern. In this case, the driver can leave the car safely.

A. Vibration Sensor

Piezoelectric sensor is used in this security system. It is generated by pressure on certain crystals which will develop a potential difference or voltage on the crystal face. When crystal flexes or vibrates, an AC voltage is produced. A piezoelectric sensor is modeled as a charge source with a shunt capacitor and resistor, or as a voltage source with a series capacitor and resistor.

B. Microcontroller

PIC16F877A microcontroller is used here to which are attached an LCD, Buzzer, Vibration sensors and GSM modem.

C. LCD

A 4x20 LCD is used for displaying the message when the car is vibrated.

D. Buzzer

It sounds when the vibration sensor detect the vibrate signal on the car.

E. GSM modem

A GSM modem is a specialized type of modem which accepts a subscriber identity module (SIM) card and operates over a subscription to a mobile operator just like a mobile phone. The working of GSM modem is based on commands, the commands always start with AT (which means ATtention) and finish with a <CR> character. . In this system, IcomSat v1.1 SIM900 GSM modem is used. The GSM module is communicate the microcontroller with mobile phones through UART.

F. GSM Technology

it is stands for global system for mobile communication (GSM). It is widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operates at the 850MHz, 900MHz, 1800MHz and 1900MHz frequency bands.

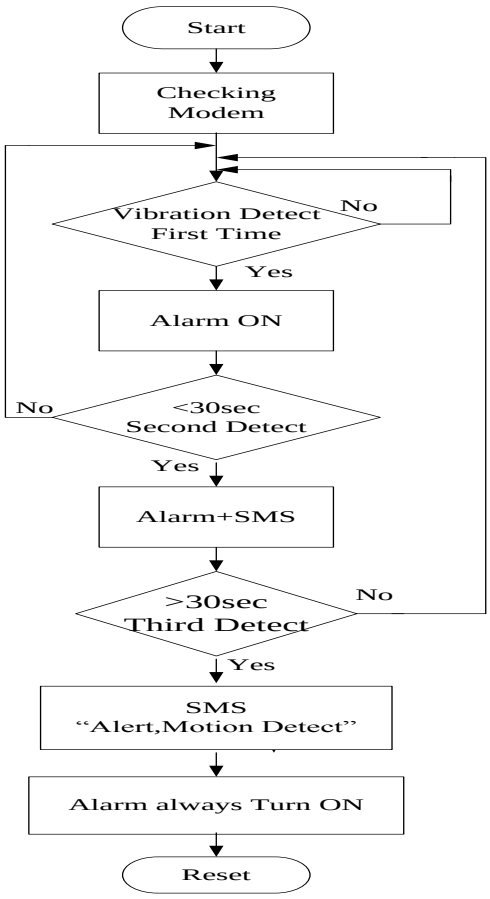

Fig 2: Flowchart of Advanced Car Security System using GSM

In this security system, when the car door is locked, the security system is automatically turned ON. Firstly, the system is checking the modem and starting the vibration sensor detect the vibration when the GSM modem response OK. If the sensor is first detect, the system activate alarm only. When the system occur second detection during 30 seconds, the system will be activated alarm and send SMS message to the owner's GSM. And a next detection occurs over 30 seconds, the alarm always turn ON and then it send SMS to the user. In the security system, it is needed to ground the reset pin for the alarm turn OFF.

III. SIMULATION RESULT

Advanced Car Security System is simulated using PROTEUS SOFTWARE and their results are presented here. The circuit model of the above system is shown and sensors are connected to measure output result.

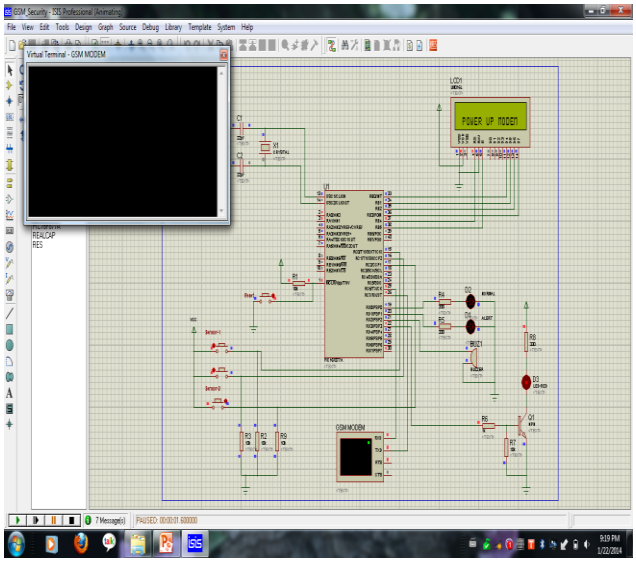

Fig 3: Simulation Result when Power Up Modem

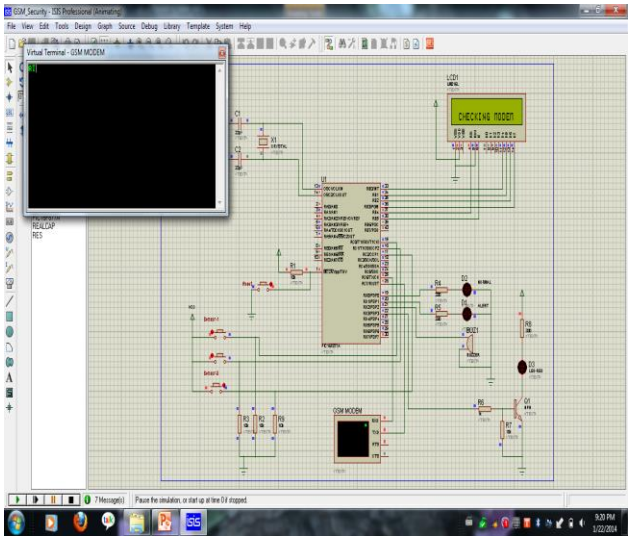

Fig 4: Simulation Result when Checking Modem

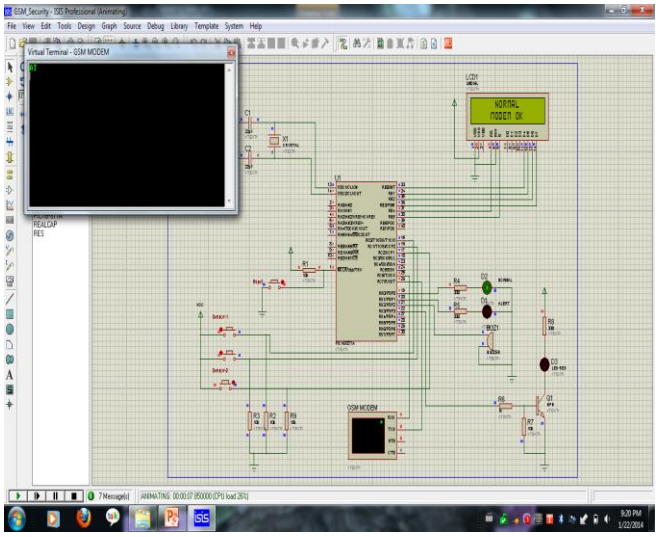

Fig 5: Simulation Result when Normal Modem OK

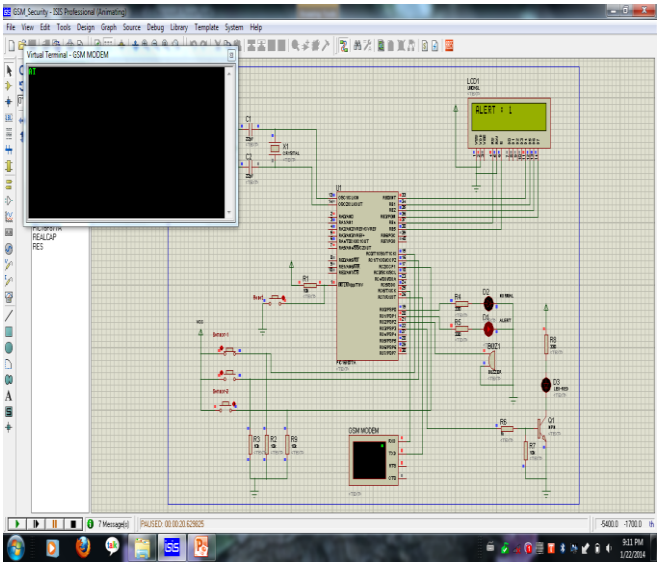

Fig 6: Simulation Result when First Vibration Detect

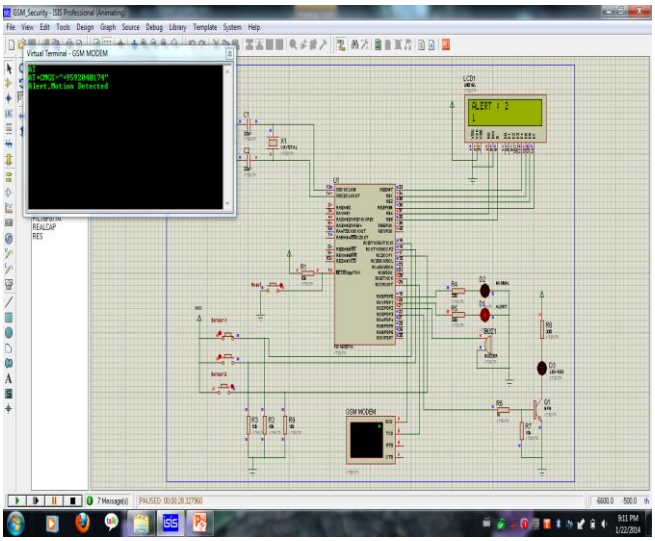

Fig 7: Simulation Result when Second Vibration Detect during 30sec

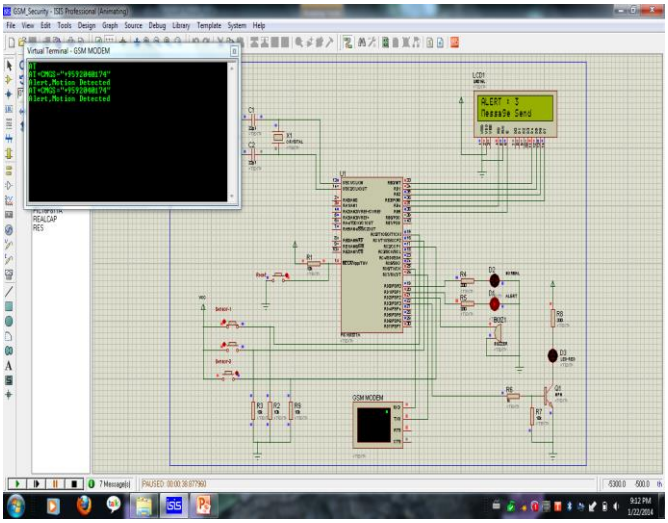

Fig 8: Simulation Result when Third Vibration Detect over 30sec

IV. HARDWARE DESIGN

In this section we are interfacing microcontroller and GSM modem.

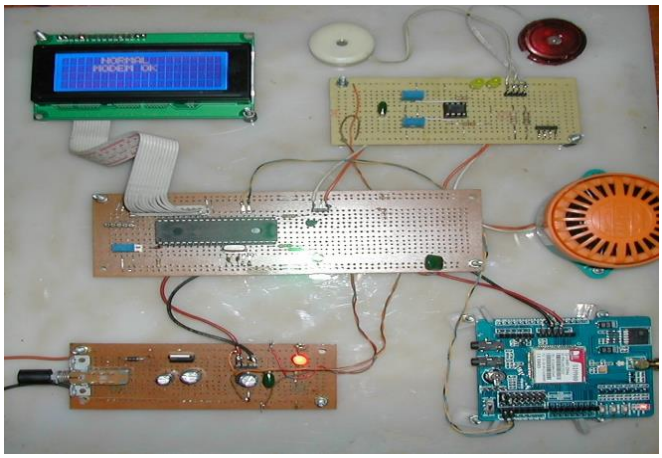

Fig 9: Advanced Car Security System

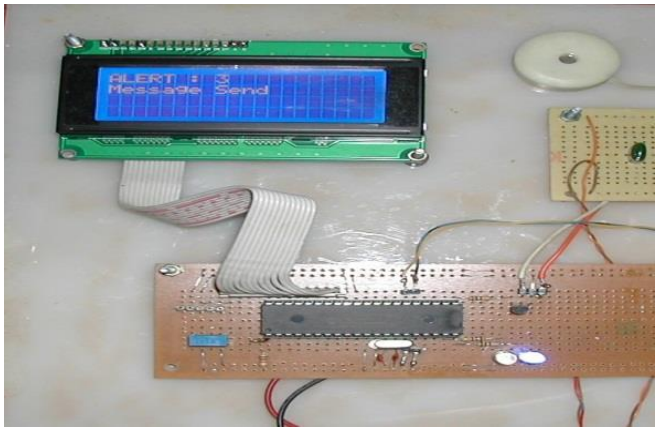

Fig 10:

The system consists of three conditions to be working. If vibration sensor is first detect, the buzzer of this system activate alarm only. If the second detection during 30 seconds, the system will be activated alarm and automatically send SMS to the owner's phone. When a next detection occurs over a 30 seconds, the alarm of this security system always turn ON and send SMS ("Alert, Motion Detected").Power supply is interfaced to provide 5V supply to PIC16F877A and to other modules in the system.

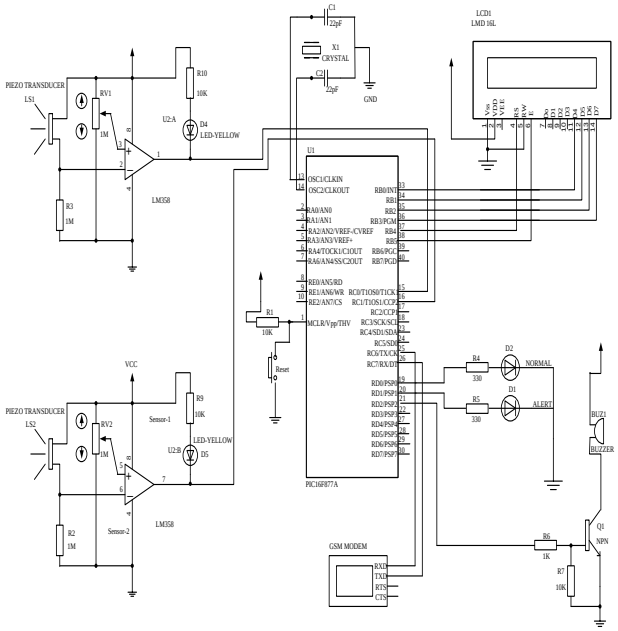

Fig 11: Overall circuit diagram

Text message may be sent through the modem by interfacing only three signals of the serial interface of modem with microcontroller i.e.,TxD,RxD and GND. In this scheme RTS and CTS signals of serial port interface of GSM Modem are connected with each other. The transmit signal of serial port of microcontroller is connected with transmit signal (TxD) of the serial interface of GSM Modem while receive signal of microcontroller serial port is connected with receive signal (RxD) of serial interface of GSM Modem.

V. Conclusion

Advanced Car Security System implemented on PIC 16F877A microcontroller and is very commonly used in homes, offices, vehicles, bank and so on. This system is becoming increasingly important in large cities and it is more secured than other systems.

References

[1] SMS Send/Receive At Command Set. Available at: http://www.cellular.co.za/sms_at_commands.htm

[2] MarkoWolf, AndreWeimerskirch, and ThomasWollinger, "State of the Art: Embedding security in vehicles", Journal on Embedded Systems, Volume 2007, Article ID 74706.

[3] http://www.idc-online.com/technical_references/pdfs/mechanical_engineering/GPS%20Vehicle.pdf

[4] http://www.seminarpaper.com/2011/12/gsm-based-vehicle-theft-control-system.html

Authors

First Author – Hnin Pwint Han
Second Author – Hla Myo Tun