Asian Journal of Computer Science and Technology
ISSN: 2249-0701 (P) Vol.4 No.1, 2015, pp.34-39
© The Research Publication, www.trp.org.in
DOI: https://doi.org/10.51983/ajcst-2015.4.1.1744

Design and Development of Vehicle Theft Protection and Accident Information System

G..Vamsi Sai, D.Rishi Koushik and J.Jabanjalin Hilda
School of Computing Science and Engineering, VIT University, Vellore, Tamil Nadu, India
Email id: jabanjalin.hilda@vit.ac.in
(Received 17 April 2015; Accepted 12 May 2015; Available online 20 May 2015)

Abstract **- In the recent days most of the people possess their own vehicle globally. Protection of vehicle from theft, avoid accidents, immediate message transfer and care if accidents takes place play an vital role in this era. Theft which is one of the undesirable practices happens everywhere. Theft happens mostly while parking and driving through insecure places. So protection of vehicle is a vital requirement of motorists from theft. In this project effort has been taken to develop automobile location based system using GSM. This system alerts by sending a short message (SMS) to the owner of the vehicle when the engine is turned on. Immediately, the owner sends the message to turn off the engine in order to prevent the vehicle from theft. The notification is done with the help of GSM MODEM. In addition to the theft control system, the system also sends an appropriate message if an accident occurs. Air Bag System integrated with automobile location based system is used to sense the release of air bags during accident. Immediately a message will be sent to the police/emergency ambulance service for speedy action. This system has been designed and developed in a simple cost effective for USD 80 in a reliable manner.**
Keywords: **GSM,PIC Compiler, MEMS Sensor**

I.INTRODUCTION

In India an accident take place for every two minutes. Theft of vehicle is a global threat in this era. Many of the vehicles are not even found after the event. Due to accidents many lose their life members of body and disabled in their life. Losing vehicle causes loss of asset and stress and pain to human race. This problem has been taken into consideration and research has been carried out to avoid, minimize the effect using automated location based system using GPS and GSM-SMS services. This GSM and GPS in our project plays an important role by sending the exact information of the vehicle on basis where it have been lost and where the last location is been spotted out. This work provides highly efficient and user friendly design. And it is easy to operate with low power consumption. This works anywhere in the world (GSM availability).

This Project presents an automated location based system using GPS and GSM-SMS services. The system permits transmitting the position to the owner on his mobile phone as a short message (SMS) at his request. This system is also provided with emergency switch which can be turned off through an SMS. This switch takes the responsibility to turns OFF the engine and can be turned ON only after receiving a predefined password from the owner of the vehicle.

The system is interconnected with the car alarm system and alerts the owner on his mobile phone. This tracking system is composed of a GPS receiver, Microcontroller and a GSM Modem. GPS Receiver gets the location information from satellites in the form of latitude and longitude. The Microcontroller processes this information and this processed information is sent to the user/owner using GSM modem. This point of spotting is done by sending the SMS to nearby emergency services like police station and to one of the well-wisher of the individual present in the car.

II.METHODOLOGY

Technical specifications

While the overall goals, strategies and objectives have been stated, the specifications of the components will be determined as they are identified for their applicability in the project.

MEMS Sensor

The MMA7260Q is 3-axis accelerometer .An accelerometer measures acceleration (change in speed) of anything that it's mounted on. Single axis accelerometers measure acceleration in only one direction. Dual-axis accelerometers are the most common measure acceleration in two directions, perpendicular to each other. Three-axis accelerometers measure acceleration in three directions. Accelerometers are very handy for measuring the orientation of an object relative to the earth, because gravity causes all objects to accelerate towards the earth. A two-axis accelerometer can be used to measure how level an object is. (This would be a good place to fill in equations to calculate a body's angle from the X and Y accelerations on the body). With a three-axis accelerometer, you can measure an object's acceleration in every direction.

RS 232 cable

RS232 means recommended standard, it is a cable in which serial communications can be done. Information being transferred between data processing equipment and

peripherals is in the form of digital data which is transferred in either a serial or parallel mode. Parallel communications are used mainly for connections between test instruments or computers and printers, while serial is often used between computer and other peripherals. 81 Serial transmissionsinvolve the sending of data one bit at a time, over single communications line. In contrast, parallel communications require at least as many lines as there are bits in a word being transmitted (for an 8-bit word, a minimum of 8 lines are needed) serial transmission is beneficial for long distance communications, whereas parallel is designed for short distance or when very high transmission rates are required.

Buzzer

Basically, the sound source of a piezoelectric sound component is a piezoelectric diaphragm. A piezoelectric diaphragm consists of a piezoelectric ceramic plate which has electrodes on both sides and a metal plate (brass or stainless steel, etc.). A piezoelectric ceramic plate is attached to a metal plate with adhesives. Applying D.C. voltage between electrodes of a piezoelectric diaphragm causesmechanical distortion due to the piezoelectric effect. For a misshaped piezoelectric element, the distortion of the piezoelectric element expands in a radial direction. And the piezoelectric diaphragm bends toward the direction. The metal plate bonded to the piezoelectric element does not expand. Conversely, when the piezoelectric element shrinks, the piezoelectric diaphragm bends in the direction Thus, when AC voltage is applied across electrodes, the bending is repeated, producing sound waves in the air.

Microcontroller

The microcontroller used in this project is PIC18F452A. The PIC families of microcontrollers are developed by Microchip Technology Inc.

RAM	368 bytes
EEPROM	256 bytes
Flash Program Memory	8k words
Operating Frequency	DC to 20MHz
I/O port	Port A,B,C,D,E

This is the specification for PIC18F452A from Microchip. A single microcontroller which is very easy to be assembled, program and also the price is very cheap. It cost less than 10 dollar. The good thing is that single unit can be purchased at that 10 dollar price. Unlike some other Integrated Circuit that must be bought at a minimum order quantity such as 1000 units or 2000 units or else you won't be able to purchase it. One unit of PIC18F452A microcontroller can be programmed and erased so many times. Some said about 10 000 times. If you are doing programming and downloading your code into the PIC 20 times a day that means you can do that for 500 days which is more than a year.

Popularity of the PIC microcontrollers is due to the following factors:

a. Speed: Harvard Architecture, RISC architecture, 1 instruction cycle = 4 clock cycles.
b. Instruction set simplicity: The instruction set consists of just 35 instructions (as opposed to 111 instructions for 8051).
c. Power-on-reset and brown-out reset. Brown-out-reset means when the power supply goes
d. below a specified voltage (say 4V), it causes PIC to reset; hence malfunction is avoided. A watch dog timer (user programmable) resets the processor if the software/program ever malfunctions and deviates from its normal operation.
e. PIC microcontroller has four optional clock sources.
    i. Low power crystal
    ii. Mid range crystal
    iii. Programmable timers and on-chip ADC.
    iv. Up to 12 independent interrupt sources.
f. Powerful output pin control (25 mA (max.) current sourcing capability per pin.)
g. EPROM/OTP/ROM/Flash memory option.
h. I/O port expansion capability.

PIC Compiler

PIC compiler is software used where the machine language code is written and compiled. After compilation, the machine source code is converted into hex code which is to be dumped into the microcontroller for further processing. PIC compiler also supports C language code.

It's important that you know C language for microcontroller which is commonly known as Embedded C. As we are going to use PIC Compiler, hence we also call it PIC C. The PCB, PCM, and PCH are separate compilers. PCB is for 12-bit opcodes, PCM is for 14-bitopcodes, and PCH is for 16-bit opcode PIC microcontrollers. Due to many similarities, all three compilers are covered in this reference manual. Features and limitations that apply to only specific microcontrollers are indicated within. These compilers are specifically designed to meet the unique needs of the PIC 101microcontroller. This allows developers to quickly design applications software in a more readable, high-level language. When compared to a more traditional C compiler, PCB, PCM, and PCH have some limitations. As an example of the limitations, function recursion is not allowed.

LCD Background

One of the most common devices attached to a micro controller is an LCD display. Some of the most common LCD's connected to the many microcontrollers are 16x2 and 20x2 displays. This means 16 characters per line by 2 lines and 20 characters per line by 2 lines, respectively. In this project we use 16x2 LCD.

Crystal oscillator

The crystal oscillator speed that can be connected to the PIC microcontroller range from DC to 20Mhz. Using the CCS C compiler normally 20Mhz oscillator will be used and the price is very cheap. The 20 MHz crystal oscillator should be connected with about 22pF capacitor.

There are 5 input/output ports on PIC microcontroller namely port A, port B, port C, port D
and port E. Each port has different function. Most of them can be used as I/O port.

III. DESIGN APPROACH AND DETAILS

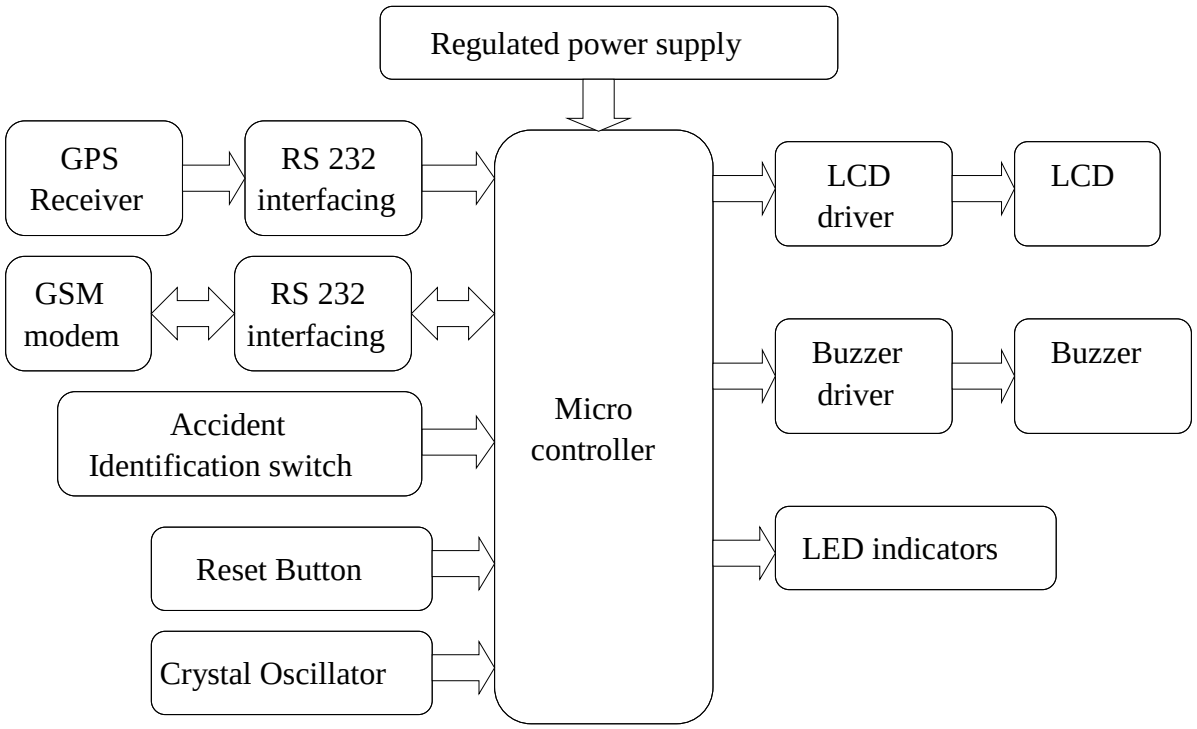

Fig. 1 Advanced vehicle security system with Accident Notification

The main blocks of this project are:

1. Micro controller (18F452)
2. Reset button
3. Crystal oscillator
4. Regulated power supply (RPS)
5. LED indicator
6. GPS module
7. GSM modem
8. RS232 cable
9. LCD
10. Buzzer
11. Mems Sensor

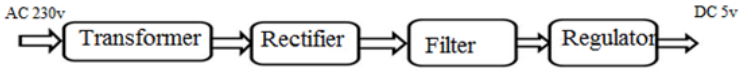

Fig. 2 Regulated Power Supply

A. GPS and GSM

GPS :

All the notifications that are need to be given are based on these two modules. And they are dealt mainly in the following functions:

The GPS reference station normally operates continuously, 24 hours a day. The coordinates of this station must be known before we can begin using GPS on any of our machines. First a proper site for the reference station is to be selected, and then a GPS survey is performed to obtain the known coordinates. This is usually done as part of the installation, either by the installation team or other. Once it is installed, the GPS reference station can perform two functions simultaneously:

a. Receive data from the satellites
b. Broadcast GPS data to the rovers in the mine

GSM :

GSM networks consists of three substations SS-the switching system, BSS-Base Station and the operation and support system for GSM systems.GSM (Global System for Mobile) / GPRS (General Packet Radio Service) TTL-Modemis SIM900 Quad-band GSM / GPRS device, works on frequencies 850 MHZ, 900 MHZ, 1800MHZ and 1900 MHZ. It is very compact in size and easy to use as plug in GSM Modem. TheModem is designed with 3V3 and 5VDC TTLinterfacing circuitry, which allows User to directlyinterface with 5V Microcontrollers (PIC, AVR, Arduino, 8051, etc.) as well as 3V3Microcontrollers (ARM, ARM Cortex XX, etc.). The baud rate can be configurable from 9600-115200 bps through AT (Attention) commands. This GSM/GPRS TTL Modem has internalTCP/IPstack to enable User to connect with internet through GPRS feature. It is suitable for SMSas well as DATAtransfer application in mobile phone to mobile phone interface.The modem can be interfaced with a Microcontroller using USART (UniversalSynchronous Asynchronous Receiver and Transmitter) feature (serial communication).

B. GSM – Architecture

A GSM network consists of several functional entities whose functions and interfaces are defined. The GSM network can be divided into following broad parts.

a. The Mobile Station (MS)
b. The Base Station Subsystem (BSS)
c. The Network Switching Subsystem (NSS)
d. The Operation Support Subsystem (OSS)

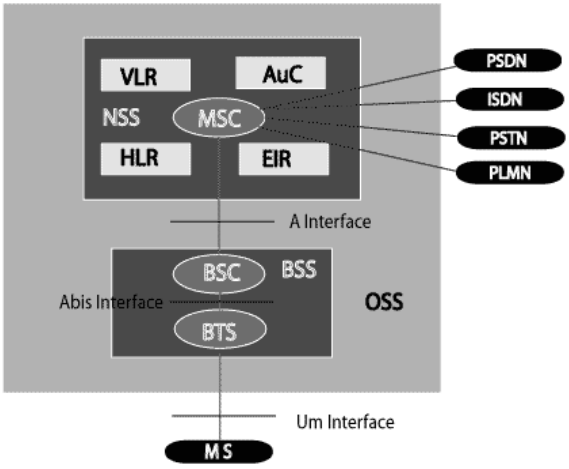

Fig 3. GSM Architecture

The added components of the GSM architecture include the functions of the databases and messaging systems:

a. Home Location Register (HLR)
b. Visitor Location Register (VLR)
c. Equipment Identity Register (EIR)
d. Authentication Center (AuC)
e. SMS Serving Center (SMS SC)

f. Gateway MSC (GMSC)
g. Chargeback Center (CBC)
h. Transcoder and Adaptation Unit (TRAU)

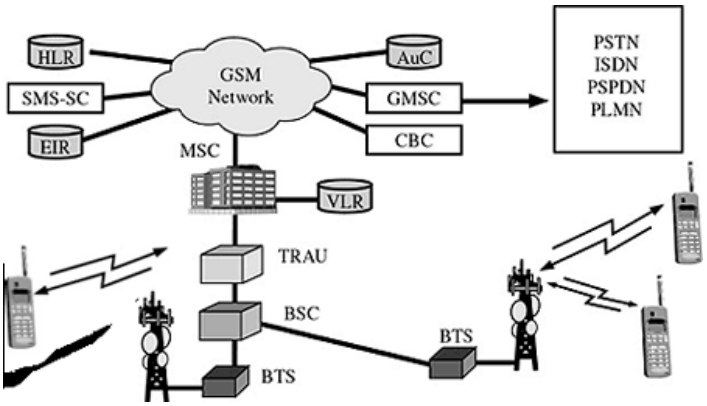

Fig. 4 GSM Network

C.GSM COMMANDS

Commands always start with AT (which means Attention).

i. Dial command D
   a. Eg :"ATD+33146290800;"
ii. Hang-Up command H
   a. Command syntax: ATH
iii. Answer a call A
   a. Command syntax: ATA
iv. Redial last telephone number ATDL
   a. Command syntax: ATDL
v. Read message +CMGR
   a. Syntax : Command syntax: AT+CMGR=<index>
vi. Send message +CMGS
   a. Syntax:AT+CMGS= <length><CR>
vii. Delete message +CMGD
   a. Syntax :Command syntax: AT+CMGD=<Index> [,<DelFalg>]

C. Codes and standards

1.Constraints and tradeoffs

Using a PIC microcontroller to control the vehicle would reduce the cost and itallows reprogramming. But PIC microcontroller has its limitation in providing a good development board and less user-friendly.

2. Functional requirements

a. The system must be able to add more number of contacts to send the message and keep up to a certain limit.
b. The device must be able to find out the proper location , where the vehicle have been lost .

3. **Non-functional Requirements**

a. Easy to Use
b. Accuracy – The Product must offer the accurate results as the prescribed accuracy of 90%.
c. Consistency – The product must offer consistent result.
d. Feasibility - The product is economically feasible.

D. Schedule, Tasks and Milestones:

There are five major milestones as well as sever smaller tasks that must be achieved in order to reach the milestones. The five milestones are

a. Identification of existing systems and finding new requirements.
b. Identification of Hardware components.
c. Design of System.
d. Coding.
e. Hardware Integration.

IV. CONCLUSION

Advanced Vehicle Security System of vehicle in order to identify theft has been designed and developed successfully.Advanced Vehicle Security System with Accident Notification was designed and developed.To find the location and the position of the vehicle is transmitted to the owner on his mobile phone as a short message (SMS) at his request using GPS and GSM modems and also alerts when there is an accident occurred.This system also enables to monitor the accident situations and it can immediately alert the police/ambulance service with the location of accident

REFERENCES

[1] Watthanawisuth, Natthapol, Tanom Lomas, and AdisornTuantranont. "Wireless black box using MEMS accelerometer and GPS tracking for accidental monitoring of vehicles." *Biomedical and Health Informatics (BHI), 2012 IEEE-EMBS International Conference on*. IEEE, 2012.

[2] Chakole, Saurabh S., Vivek R. Kapur, and Y. A. Suryawanshi. "ARM Hardware Plaform for Vehicular Monitoring and Tracking." *Communication Systems and Network Technologies (CSNT), 2013 International Conference on*. IEEE, 2013.

[3] Liu, Q., Lu, H., Zhang, H., & Zou, B. (2006, June). Research and design of intelligent vehicle monitoring system based on GPS/GSM. In *ITS Telecommunications Proceedings, 2006 6th International Conference on* (pp. 1267-1270). IEEE.

[4] Lili, Wan, and Chen Tiejun. "Automobile anti-theft system design based on GSM." *Advanced Computer Control, 2009. ICACC'09. International Conference on*. IEEE, 2009.

[5] Dinkar, AmbadeShruti, and S. A. Shaikh. "Design and implementation of Vehicle tracking system using GPS." *Journal of Information Engineering and Applications* 1.3 (2011): 1-6.

[6] Nagaraja, B. G., et al. "Design & Development of a GSM Based Vehicle Theft Control System." *Advanced Computer Control, 2009. ICACC'09. International Conference on*. IEEE, 2009.

[7] Hu, Hui, and Lian Fang. "Design and implementation of vehicle monitoring system based on GPS/GSM/GIS." *Intelligent Information Technology Application, 2009. IITA 2009. Third International Symposium on*. Vol. 3. IEEE, 2009.

[8] Bochmann, Harald, Andreas Vahle, and Richard Aumayer. "Telematic device for a motor vehicle." U.S. Patent No. 6,282,491. 28 Aug. 2001.

[9] Lin, Chin E., et al. "Verification of unmanned air vehicle flight control and surveillance using mobile communication." *Journal of Aerospace Computing, Information, and Communication* 1.4 (2004): 189-197.

[10] Deputy Director, Transpod. "RFID for road tolling, road-use pricing and vehicle access control." (1999).

[11] Al-Khedher, Mohammad A. "Hybrid GPS-GSM localization of automobile tracking system." *arXiv preprint arXiv:1201.2630* (2012).

[12] Guo, Huaqun, et al. "An automotive security system for anti-theft." *Networks, 2009. ICN'09. Eighth International Conference on*. IEEE, 2009.

[13] Watthanawisuth, Natthapol, Tanom Lomas, and AdisornTuantranont. "Wireless black box using MEMS accelerometer and GPS tracking for accidental monitoring of vehicles." *Biomedical and Health Informatics (BHI), 2012 IEEE-EMBS International Conference on*. IEEE, 2012.

[14] Aravind, K. G., et al. "On the architecture of vehicle tracking system using wireless sensor devices." *Ultra Modern Telecommunications & Workshops, 2009. ICUMT'09. International Conference on*. IEEE, 2009.

[15] Gnanavel, G. "Embedded based complete vehicle protection." *International Journal of Scientific & Technology Research* 2.4 (2013): 176-178.