Car Authentication and Accident Intimation System Using GPS and GSM

R.Monisha[1], Jessen Joseph Leo[2], B.T.Tharani Sri Sakthi[3]

Master of Engineering (Embedded Systems), Department of ECE, Bannari Amman Institute of Technology,

Sathyamangalam, Tamil Nadu, India[1, 2, 3]

ABSTRACT: Human life is more valuable than anything else, timely help is more important than lending a helping hand. This project is one among those which is designed in a way to save human lives in a timely manner. There are three main modules discussed in the project. When a car meets with an accident, immediately the car's number and the GPS co-ordinates of the location are messaged to the nearby hospitals, thereby ensuring timely help to the needy. When the car is tried to crank, a text message is sent to the owner thereby intimating the status of the car. Acknowledging the text message allows the driver to proceed further to move else the car is immobilized. While during a long drive, if the car's engine goes faulty. The error signals from the dash board of the car and the GPS co-ordinates are captured and sent to the near-by service centre, thereby saving time. Here the GSM is used to send the text message and the GPS is used to track the exact coordinates of the car. The serial communication interface UART is used for the communication between the Microcontroller (PIC 16F877A), GSM and GPS module. The RS232 communication standard is used for the following purposes. Electrical signal characteristics such as voltage levels, signalling rate, timing and slew-rate of signals, voltage withstand level, short-circuit behaviour. The microcontroller that meets the requirements for the usage of serial data communication and Analog inputs is preferably the PIC 16F877A series, which provides good interrupt capabilities and reliability.

KEYWORDS: Accident monitoring, GPS (global positioning system), GSM (global system for mobile communication), accident detection, malfunction detection. SMS (short message service), ignition alert, electrical signal characteristics.

I. INTRODUCTION

In the present growing economy of India, the country also faces the uprising of crime rate. The offense has generated losses in properties, valuables and money. Many solutions were practised for minimizing and preventing the crime rate. Car theft, which is the main concern for the conduct of this project, is one of the biggest crimes which is hard to eliminate. Maximum risks occur in situations where in an employee travels for money transactions. Also the Company to which he belongs should be aware if there is some problem and also should have control over the ignition system of the car. The   person travelling can be tracked and also secured in the case of an emergency. On the other hand safety has also become a major factor that is to be taken care of which numbers of accidents have rapidly increased day by day, many lives are lost due to improper post accident signalling and tracing out the exact location. Our project provides solution for the above stated problems which involves intimating the authorised person in advance about the current status of the vehicle if it is being intruded by a unauthorized person or an accident using GSM and GPS based technology. In addition to it our project also includes the work of intimating the car dealers regarding any malfunction of the car with exact location. This project involves intimating the authorised person in advance about the current status of their vehicle. The ignition control over the vehicle is with the owner and when the vehicle is being intruded by a unauthorized person, a message is sent. Post-accident signalling can be given in form of text message with the exact location using GPS and GSM based technology. Here the GSM is used in order to alert the prior person through a text message and the GPS is used to track the exact coordinates of the vehicle which is also included to the text message. Here the serial communication interface UART is used for the communication between the Microcontroller, GSM and GPS module. The RS232 communication standard is used for the Electrical signal characteristics such as voltage levels,

to find signalling rate. The microcontroller that meets the requirements for the usage of serial data communication and Analog inputs is preferably the PIC 16F874A series, which provides good interrupt capabilities and reliability.

II.   EXISTING SYSTEMS

The number of cars is increasing rapidly and so is the number of car theft attempts. There are a lot of car security systems that had been produced lately, but the result is still disappointing as the number of cases still increases. The thieves are inventing cleverer and stronger stealing techniques that need more powerful security systems. It also shows that the alarm itself does not contribute much in preventing a car theft. The previous system is with the installation of SMS feature during the thefts, the vehicle owner can be notified immediately so that he or she can take preventive measure to check their vehicle or save precious time if the vehicle is stolen by informing the police department as soon as possible. In most cases, the owner realized when the vehicle is stolen hours after the theft. The malfunction in cars can be indicated only using the signals in dash board. This will not help during a long distance travel since the owners have to search for service centre which is available nearby. In spite of many safety precautions accidents have increased in day to day life. In the previous system only the buzzer will raise during any accidents, and hence the patrol cannot exactly locate the accident spot. Sometimes, the alarm siren does not even attract the attention of most of the pubic because of the mentality of people nowadays that intend to ignore such alarms. Statistics show that 96% of the public are not aware when they hear an alarm. The problem faced in the existing system is that there is no ignition control over the car. In previous methods only after the theft of the car the location can be traced. There is no preventive measure. The theft or accident indication can be given by blowing off siren which cannot be heard over long distances. It is also difficult to identify the location of the accidents. Most of the times people ignoring such an alarm in this fast moving world. So this is not possible solution for safety of persons. Same alarm for most of the cars.

A. Problem Statement Faced With Previous Systems:

The present security system is not efficient due to the following reasons:

- Distance- Cover Area, the siren cannot be heard over a long distance
- Same sound (siren) for most of the cars
- False Alarm
- Cannot be heard in buildings
- Cannot identify exact accident locations during accidents

III. PROPOSED SYSTEM

Our proposed system consists of three modules (1) SMS Ignition Module: This is user defined module. When the car starts it sends the short message service (SMS) to the owner of the car, only if a reply is received the user is enabled to crank the car (2) Malfunction Module: This helps to send message to the service centre if there is any malfunction in the car (3) Accident Alert Module: This module sends alert message to hospital or to the specified person when the car is met with an accident. Here the GSM is used to send the text message and the GPS is used to track the exact coordinates of the car. The serial communication interface UART is used for the communication between the Microcontroller (PIC 16F877A), GSM and GPS module. The RS232 communication standard is used .The microcontroller that meets the requirements for the usage of serial data communication and Analog inputs is preferably the PIC 16F877A series, which provides good interrupt capabilities and reliability.

A. Main Components of the Project

- Microcontroller based motherboard with regulated power supply.
- GPS Receiver for Location Information.
- GSM Modem/Mobile phone for remote communication.
- LED Indicators

- Local alarm/alert system in case of accident situations.

B. Sms Ignition Control Module:

   Whenever a glitch is detected in the keyhole, the Input signal to the PIC microcontroller goes high, this in turn instructs the GSM module to send a SMS to the fed-in number as "IGNITION ALERT". Once the owner receives the message, he needs to acknowledge the message by replying back "YES" or "NO". Assume that the received SMS is "YES", then the PIC compares the received message with the condition set, if true output line goes high, microcontroller can produce current only in terms of micro Amps which is not sufficient to drive a relay. So the output from the, microcontroller is given to a signal conditioning circuit, here Darlington pair amplifier is used as a signal conditioner. Since it has high current gain. The signal from the Darlington pair drives the relay circuitry which in turn closes the circuit to the starter motor and thereby allowing the driver to start the car. PIC starts a count timer within which the SMS has to be acknowledged else the car is immobilised. Whenever the car is tried to crank, a sms is sent to the owner. Only when the owner acknowledges the sms with "YES" the microcontroller closes the relay circuitry to the starter motor and the car starts. In this case the signal conditioning unit is a darlington pair amplifier which has a high current gain so as to drive the relay circuitry which requires current in terms of milliamps but the microcontroller can produce an output current of only micro amps. GSM and GPS modems communicate to the microcontroller through the UART (Universal Asynchronous Receiver/Transmitter) which is a serial communication port.

C. Accident Alert Module:

   Crash sensors are placed on the chassis of the car, this crash sensor is capable of sensing the force produced by an accident i.e. in terms of 'G' (G - Force against gravity). Once the force is greater than or equal to the threshold value set on the sensor, the sensor produces an output which in turn is amplified by a signal conditioning unit, normally a CE mode amplifier acts as a signal conditioner. Finally the signal is sent to the PIC microcontroller, and there by triggering the GSM modem to shoot out an SMS to the near-by hospitals along with the GPS co-ordinates.

1).Vibration Sensor:

   It is a piezo electric material placed on the chasis of the car to sense the vibration produced during an accident. Accidents produce vibrations which are very huge and abnormal and are nearly equal to 9 G (G-Force against gravity). Once the threshold is crossed the sensor sends a signal to the PIC microcontroller which in turn triggers the GSM modem to shoot a sms containing the car number and location (GPS Coordinates) to the nearby hospitals/ambulance services.

D. Engine Malfunction Module:

   Firstly, the Oil level which is a mandate for a engine to function. Here we use a up and low level contacts to sense the oil level, this in turn is connected to a signal conditioner (CE Amplifier) to boost the signal level. In this case the input line to the PIC is always high which means the level is met. When the input line goes low, the microcontroller triggers the GSM module to send an SMS containing the fault, car details and the GPS co-ordinates to the near-by service centre. Secondly the battery level, Signal from the car battery is tapped an given to ADC (8-bit ADC, Step size - 256) of PIC through a signal conditioner, In this case the signal conditioner is a voltage drop circuit. Since the car battery is of 12 volts and PIC can with stand only up to 5 volts, the voltage is dropped to 5 volts using series of resistors. Whenever the battery level goes below 9 volts, the, microcontroller triggers the GSM module to send an SMS containing the fault, car details and the GPS co-ordinates to the near-by service centre. Finally the temperature level, A Temperature sensor is responsible to produce the signal as per the temperature detected. The signal in turn is sent to a signal conditioner (CE Amp) and then to the PIC microcontroller. Crossing the threshold level the microcontroller triggers the GSM module to send an SMS containing the fault, car details and the GPS co-ordinates to the near-by service centre. This module is very helpful to save human life in this busy moving world.

1). Oil Level Sensor:

 This is a float sensor, the output of the sensor is proportional to the oil level. Once the level goes below the threshold level, a sms is triggered to the nearby service centre along with the GPS information. Voltage is analog input which is not understandable by the microcontroller. So this is converted to a digital signal with the help of a inbuilt ADC which is of 8-bit resolution
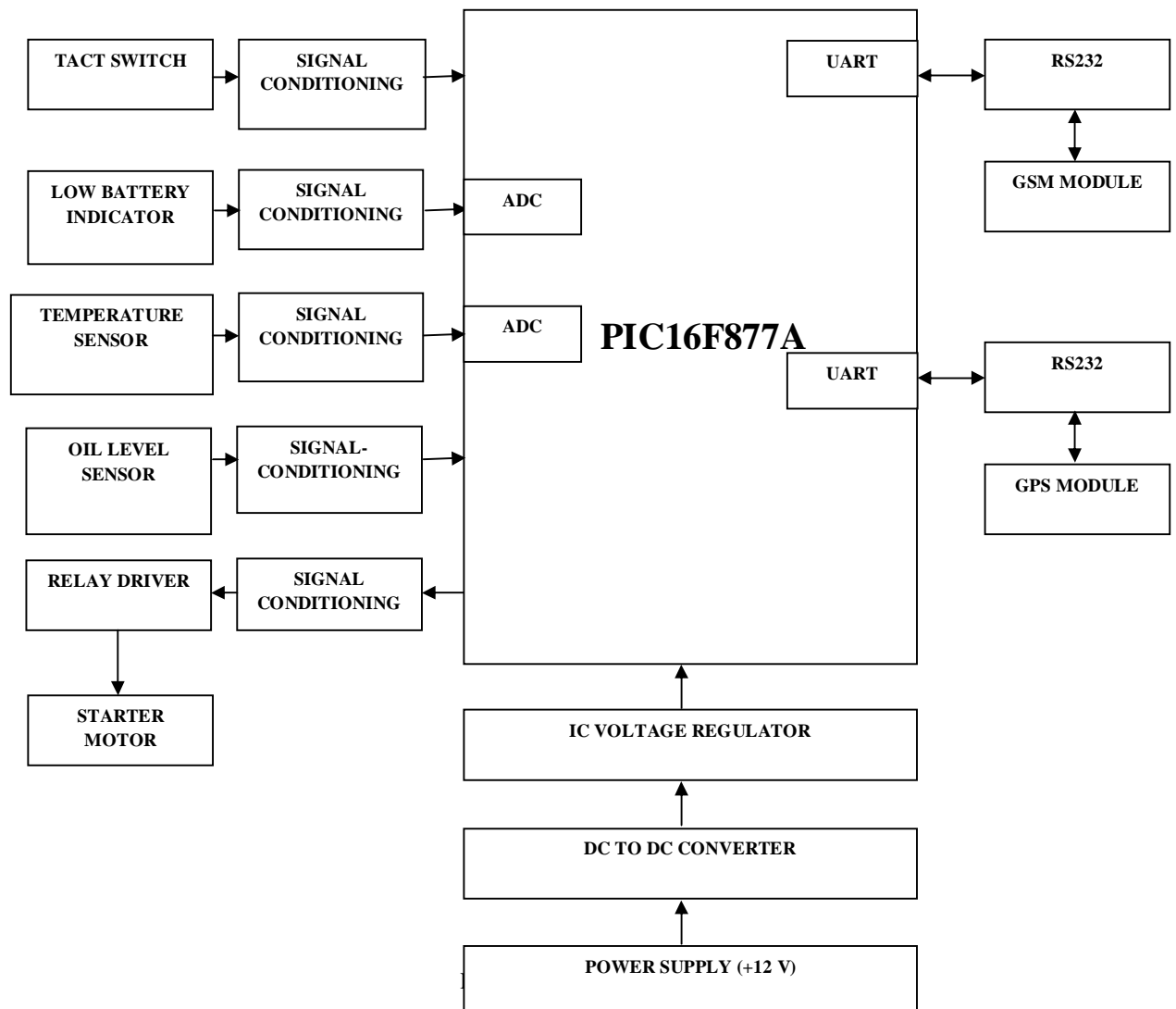
2). Temperature sensor:

This is a thermistor, whose output is inversely proportional to the resistance. When the temperature varies the resistance of the device drops, and when the output voltage crosses the threshold level, a sms is sent through the GSM modem. Voltage is a analog input which is not understandable by the microcontroller .
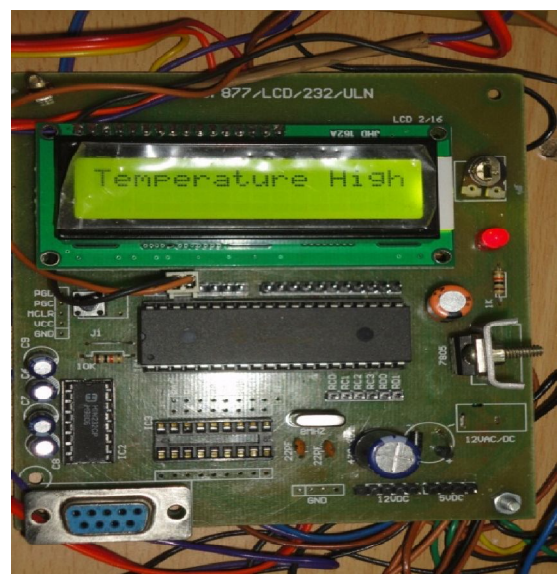
E. Output Snapshots:

Fig 2 Overview Of The Work

fig 3 Data Transmission

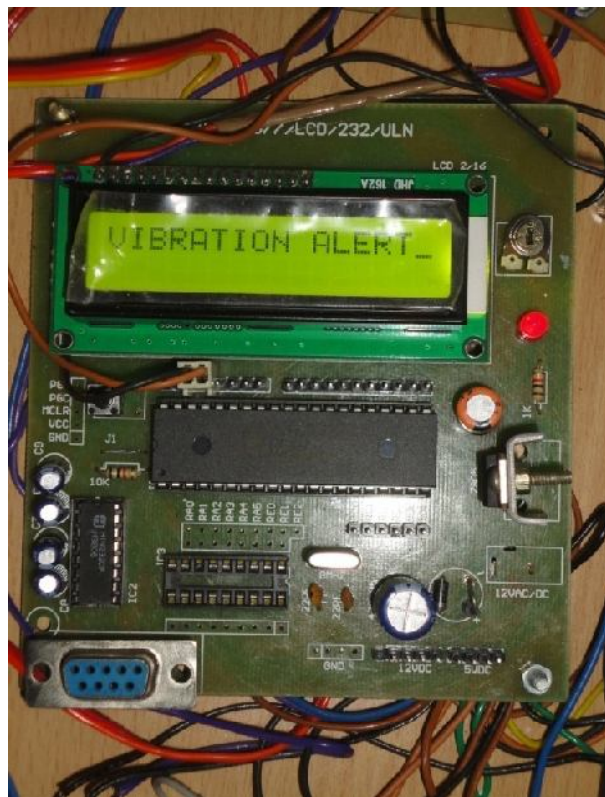Fig 4.Ignition Module Output   Fig 5 Malfunction Module Output

Fig. 6 Accident Alert Module Output

F Features of the Proposed Work:

- High security is obtained since the car can be started only after acknowledgement from the owner.
- We no need to search for service centre if there is malfunction in cars.
- A quick medical support for the accident victims can be given.
- Exact coordinate can be identified during accidents.

G. Applications of the Project:

This GPS/GSM/GPRS tracking technology can be used in the following areas, just to name a few:
- Vehicle tracking to accomplish

- o Monitoring of speed and location of the mobile asset
- o Monitoring of various compliances related to safety, driver behaviour, etc.
- o Emergency Services: crash reporting, engine stall, etc
- o Fleet management;
- Driving pattern, behaviour and understanding
- High Value Asset tracking:
  - o High Value asset/consignment tracking
  - o This could be International Bulk containers, High Value Containers (airlines, etc), and several other such assets.

IV. CONCLUSION

Thus our project Intelligent Car Safety System intimates the authorised person about the current status of the vehicle and if it is being intruded by a third person or an accident using a GSM and GPS based technology. Our project also includes the work of intimating the car dealers regarding any malfunction of the car with exact location, time and date. We can also change mobile number at any time. The Alert message to mobile phone can easily reach the remote location .Thus the system provides better safety of the car.

V. FUTURE ENHANCEMENTS

Our present security system consists of user defined SMS ignition module which will allow the driver to crank the car only after the acknowledgement from the owner. This feature can be improved by going for face recognition and identification of the person and then allowing the driver to crank.Also our system consists of malfunction module this system can be further enhanced by sending SMS with proper faults to the nearby service centre.

REFERENCES

[1].J. Miller, "Vehicle-to-vehicle-to-infrastructure (V2V2I) intelligent transportation system architecture," in 2008 IEEE Intelligent Vehicles Symposium, june 2008, pp. 715–720.
[2] F. Martinez, C.-K. Toh, J.-C. Cano, C. Calafate, and P. Manzoni, "Emergency services in future intelligent transportation systems based on vehicular communication networks," IEEE Intelligent Transportation Systems Magazine, vol. 2, no. 2, pp. 6–20, summer 2010.
[5] M. Fogue, P. Garrido, F. J. Martinez, J.-C. Cano, C. Calafate, and P. Manzoni, "Prototyping an automatic notification scheme for traffic accidents in vehicular networks," in 4th IFIP Wireless Days Conference, October 2011.
[4]. S. M. Tang and H. J. Gao, "Traffic-incident detection-algorithm based on nonparametric regression," IEEE Transactions on Intelligent Transportation Systems, vol. 6, 2005, pp. 38-42.
[5].L. Chuan-zhi, H. Ru-fu, Y.E. Hong-wu, "Method of Freeway Incident Detection Using wireless Positioning," in Proceedings of the IEEE International Conference on Automation and Logistics, 2008, pp. 2801 - 2804.
[6]. D. A.Whitney and J. J. Pisano TASC, Inc., Reading, Massachusetts, "Auto Alert: Automated Acoustic Detection of Incidents", IDEA project, [Online]. Accessed on 15 October 2011, Available: http://pubsindex.trb.org/view.aspx?id=481489.
[7] . R. K. Megalingam, R. N. Nair and S. M. Prakhya, "Wireless Vehicular Accident Detection and Reporting System," in International Conference on +Mechanical and Electrical Technology (ICMET 2010), 2010, pp. 636-640.