

Autonomous Safety and Security System in Vehicles



G.Chandra Sekhar Babu

**PG Student (Embedded Systems),
Department of ECE,
AITS, Rajampet, Andhra Pradesh, India.**



K.Naganarasaiah Goud

**Assistant Professor,
Department of ECE,
AITS, Rajampet, Andhra Pradesh, India.**

ABSTRACT:

Every year, there are thousands of deaths and tens of thousands of serious injuries due to "Run-Off-Road" accidents. Every accident caused by driver inattentiveness, fatigue, callousness and drunk driving. Simple sensors can be fitted inside the vehicles that can be control various features like, automatic collision notification, vehicle security, speed control which can give impetus to an efficient car safety system. The objectives that are proposed in this paper are Automatic collision notification, Red light traffic control makes sure vehicle doesn't break signal, Speed control alters speed in the different zones, Horn control prevents honking in horn prohibited zone, Alcohol detection detects drunk driving and Vehicle security system is used to prevent theft. The proposed system has ARM7 architecture, which is high efficiency and low power consumption. The most important thing is that GSM modem is used to send the SMS to the relatives and emergency services like 108. GPS provides a solution for tracking location of passenger.

Keywords:

Accelerometer module, Alcohol sensor, LCD module, IR sensor, Relay module, Buzzer, Theft switch, ARM.

1. INTRODUCTION:

According to the World Health Organization, road traffic injuries caused an estimated 1.25 million deaths worldwide in the year 2015. That is, one person is killed every 25 seconds.

Only 28 countries, representing 449 million people (7% of the world population), have adequate laws that address all five risk factors (speed, drink driving, helmets, seat belts and child restraints). Over a third of road traffic deaths in low and middle income countries are among pedestrians and cyclists. However, less than 35% of low and middle income countries have policies in place to protect these road users. The average rate was 17.4 per 100 people. Low income countries now have the highest annual road traffic fatality rates, at 24.1 per 100 people while the rate in high income countries is lowest, at 9.2 per 100 people.

I. LITERATURE REVIEW:

The main causes for Road Accidents are distracted driving, Speeding, Drunk driving Reckless driving, Rain, crossing Red lights, Teenage drivers, Design defects, wrong way driving, Driver under the influence of drugs. The paper presents an alcohol detection and vehicle accident detection system using GPS and GSM modems. The system can be interconnected with the owner on his mobile phone. The Microcontroller processes this information is sent to the user/owner using GSM modem A GSM modem is interfaced to the MCU. The GSM modem sends an SMS to the predefined mobile number and informs about this accident. This enable it to monitor the accident situations and it can immediately alert the police/ambulance service with the location of accident. The drawbacks of exiting system are not voice alert to inform neighbors and No sensor to detect while someone tries to steal the vehicle.

II. PROPOSED SYSTEM:

Our main objective is to provide the passenger safety and security. Here the proposed system can provide safety in terms of the red traffic light zone, horn prohibited in restricted areas will be provided by RF transmitter and speed control which can give impetus to an efficient road safety system. The vehicle security is enhanced as all the features are embedded in it. Simple sensors can be fitted inside vehicles embedded with various features like, automatic collision notification, obstacle detection, alcohol detection and vehicle security. A voice module is also interfaced to give the voice output through speakers.

A. Block Diagram:

Transmitter section of proposed system is

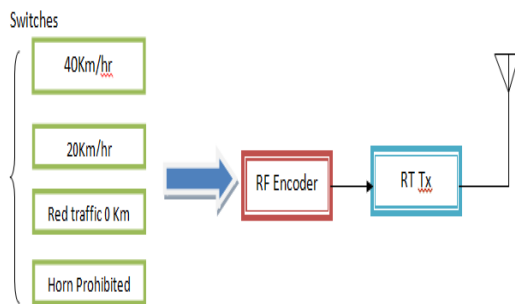


Figure 1: Transmitter section

Transmitter section can have three operations, they are different speeds like 20km and 40km, red traffic zone and horn prohibition areas. The transmitter section can do only one operation at a time. When red traffic zone activated, vehicle will stop automatically and horn prohibition switch is high, horn can't blow at all in the area. All the information can be transmitted in RF technology.

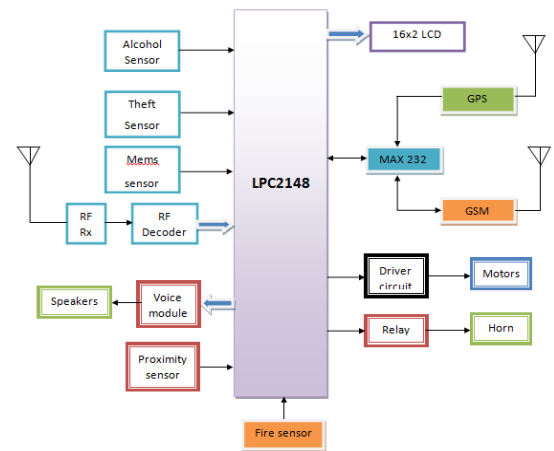


Figure 2: Receiver section

All the transmitted information can receive through the RF receiver. The receiver section contains alcohol sensor, theft switch, MEMS module, proximity sensor and fire sensor. If any input present in the receiver section, vehicle stop automatically and sends type of accident information sends SMS alert to victim relatives as well as emergency services along with GPS values. A voice module is also interfaced to give the voice output through speakers.

B. MMA7660FC:

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.

C. Fire sensor:

Sensitive material of MQ-2 gas sensor is SnO₂, which with lower conductivity in clean air. When the target combustible gas exist, the sensor's conductivity is higher along with the gas concentration rising.

D. IR Sensor:

Infrared Emitting Diode (IR333-A) is a high intensity diode, molded in a blue transparent plastic package. The device is spectrally matched with phototransistor, photodiode and infrared receiver module.

E. aPR33A:

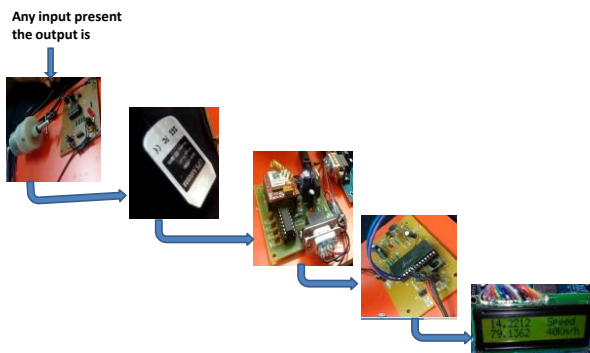
The aPR33A series are powerful audio processor along with high performance audio analog-to-digital converters (ADCs) and digital-to-analog converters (DACs). High quality audio/voice systems with lower bill-of-material costs can be implemented with the aPR33A series because of its integrated analog data converters and full suite of quality-enhancing features such as sample-rate convertor.

F. Theft switch:

A normal Electrical switch is used. When switch on it send the message theft is occurred.

G. Voice playback module:

It provides a high-quality, single chip, single-message, record/playback solution with user-selectable durations of 6 to 16 seconds. The CMOS devices include an on-chip oscillator (with external control), microphone preamplifier, automatic gain control, anti-aliasing filter, multilevel storage array, smoothing filter, and speaker amplifier.



IV.SOFTWARE SPECIFICATIONS

A. Windows xp:

This is an Operating System (OS) on which all the software applications required for our project are going to be run. This OS is flexible to any user to operate and easy to understood. Accessing the software's and using them is very convenient to user.

B. Express PCB:

Express PCB is easy to lean and fast to use. It is an all in one freeware in which schematic as well as PCB layout can be made.

C. Flash magic software:

It is used to burn them. hex file generated by the compiler into the IC. This is done by using the hardware kit wherein the IC is placed. It is then connected to the PC via its serial port for burning the code.

D. AT Commands:

AT commands is used to control MODEMS.AT Commands with a GSM/GPRS MODEM or mobile phone can be used to access following information and services.

V.EXPERIMENTAL RESULTS

1. Speed controlling condition



Figure4:Speed limit 40KMPH

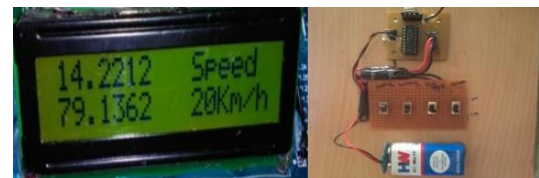


Figure5: Speed limit 20KMPH

To control the speed of the car, relays have been used to control the motor. Figure shows the speed of the car running at a speed of 40 Km/h and the longitude and latitude values for the present location of the car.

2.Horn prohibition:

The encoder will be fed that it is a no honking zone, so the transmitter will be transmitting the RF signal with the no honking condition.



Figure6: No horn zone

RF Receiver will receive signal which the decoder will decode and give to microcontroller, when the zone is activated the sound won't come.

3.Red Traffic condition



Figure7: Red signal stop

On the transmitter circuit a switch is used for indicating red traffic signal. When switch is put on, signal is transmitted to the receiver which is given to the microcontroller on the receiver circuit. The car remains in halt position as long as the switch is on

4.Collisiondetection

For collision detection, we use MEMS module, when the tilt is change the car is halted and "Collision Detected" is displayed on the screen. SMS is sent to the number that is pre fed.



Figure8: Collision detection

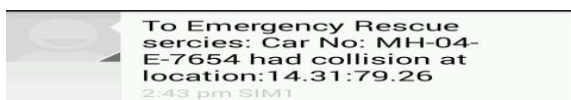


Figure9: SMS notification for collision detection

5. Theft detection



Figure10: Theft alert

A system operation is triggered when a limit switch is tripped. When the limit switch is pressed, theft alert is displayed on the LCD screen and SMS along with location of this car is given to the number that is pre fed via GSM Modem.



Figure11: SMS notification for theft detection

6. Alcohol detection



Figure12: Alcohol detection

To test this feature, the MQ3 alcohol sensor is being exposed to a liquid solution. If alcohol is detected, the buzzer rings, the car comes to a halt and "SMS to R.T.O "is displayed on the LCD screen. The SMS is sent to the number pre fed for this feature via GSM.

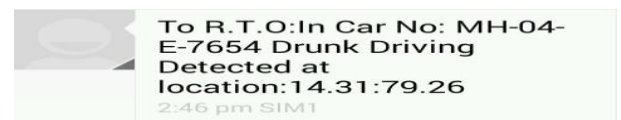


Figure13: SMS notification for drunk driving

7. Obstacle Detection



Figure14: Obstacle detection

To test this feature the IR sensor is used, any obstacle present in front of the vehicle that can be detected.

If detected, the buzzer rings, the car comes to a halt and “SMS to Relatives “is displayed on the LCD screen. The SMS is sent to the number pre fed for this feature via GSM

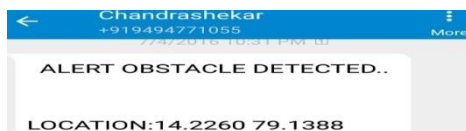


Figure15: SMS notification for obstacle

8. Fire detection



Figure16: Fire alert

To test this feature, the fire sensor is sense SnO₂, which with lower conductivity in clean air. When the target combustible gas exist, the sensor’s conductivity is higher along with the gas concentration rising. Use simple electro circuit, Convert change of conductivity to correspond output signal of gas concentration. The car comes to a halt and “SMS to Relatives “is displayed on the LCD screen. The SMS is sent to the number pre fed for this feature via GSM.

To Emergency Rescue Service:
Car No:AP28CN2148 Fire
detected at location14.2260
79.1388

Figure17: SMS notification for accident alert

III. FINAL PROTOTYPE

Hardware circuitry of proposed system has shown below

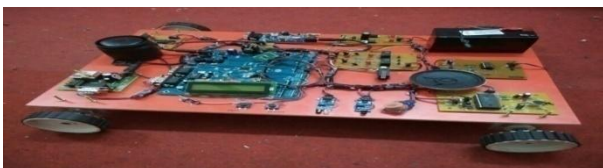


Figure17: Model car with circuitry

VII.CONCLUSION

With this proposed system, a cost effective embedded system has been successfully implemented which helps in curbing road accidents and flouting of traffic rules while also providing safety and security for the vehicle.

VIII.FUTURE SCOPE

Camera can be introduced for identification of horn prohibition area, speed controlling and traffic zone.

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