Vehicle Accident Prevention System using GSM and GPS Technique

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Abstract — *This project saves Human lives from an accident by detecting an accident before it occurs or in case it happens. But this need advance accurate human detection and also accident detection capability. Vehicle will avoid human or animal first then if possible it will try to avoid obstacles also. This project includes features like speed measurement, temperature of the engine, location of car, Eye blink rate detection, Gas and alcohol detection. Using GSM technology, the current detail of the car can be sent to a dedicated mobile. Also we can track the current location of vehicle using GPS technology in case of an accident.*

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Keywords— *Embedded ARM, GPS, GSM, Pre-crash Detection, Accident detection, Black box system.*

I. INTRODUCTION

In order to reduce the number of car crash Charles Birdsong, Ph.D., Peter Schuster, Ph.D., John Carlin, Daniel Kawano, William Thompson has designed Pre-crash detection system using ultrasonic, laser range finder and radar sensors [1]. Megalingam, Rajesh Kannan& their group mate have developed "Wireless vehicular Accident Detection andReporting System" [2]Accident Avoidance and Detection on Highways is designed by S.P. Bhumkar, V.V. Deotare, R.V.Babar [3]. These systems have the ability to detect obstacles but the most important to detect human being or animals and avoid them are missing. This sensing technology can reduce a large number of bikers, cyclist and passer by death. There are also lots of research work is available on accident avoidance, crash detection and alarm system.. Automatic Accident Detection via Embedded GSM message interface with Sensor Technology is developed by C.Vidya Lakshmi, J.R.Balakrishnan [4]. These methods uses break system, windows close, seat belt stiffen to save life from the accident but if the obstacle is human or animal then our system uses avoidance system also. Many cases remain pending due to unknown reason of an accident. To avoid these problems, a design is proposed to enhance on-board recording device (i.e. Black Box). Car

black box is a digital electronic device, which records and store vehicle speed, real time and vehicle's other status information. It helps to discover and to analyse the reason of an accident easily and to settle many disputes related to car accident such as crash litigation, insurance settlements. If avoidance is not possible and accident happens then SMS will be send (through GSM module) with position of vehicle (longitude and latitude through GPS system) to the concern authority or owner of the vehicle.

II. MAIN TECHNOLOGY USED

A. Obstacle detection & indication sensor

This is one of the photoelectric sensors which is a set of transmitter and receiver. Detection distance can be adjusted as it is required. The sensor can detect distance by visible light interference which is small, cheap, and easy to assemble, easy to use, and other characteristics are given bellow:- 1, output current DC / SCR / Relay Control output: 100mA/5V powered 2, DC current consumption < 25mA 3, response time < 2ms 4, point angle: 15 °, effective distance 3-50CM adjustable 5, detection of objects: transparent or opaque body 6, working environment temperature: 25 °C ~ 55 °C 7, standard sensing object: sunlight 10000LX The following incandescent 3000LX.

In both side of the car two IR obstacles sensors are placed. Anyone coming from the left side of the car or any obstacle found at the left side can be detected by left sensor and right sensor also work in same manner. The presence of an obstacle or human is indicated through red light when it detects human or obstacle. When human detection sensor detects human at the right side of the car and obstacle sensor detects an obstacle at the left side of the car then car will be moved toward left side to save human. As obstacles in both side of the car are detected thus both indication lights will be turned on.

diameter of 1 inch and has a flange that is 1.5 inches square. This flange is used for mounting the lens in a suitable frame or enclosure. Mounting can best and most easily be done with strips of Scotch tape
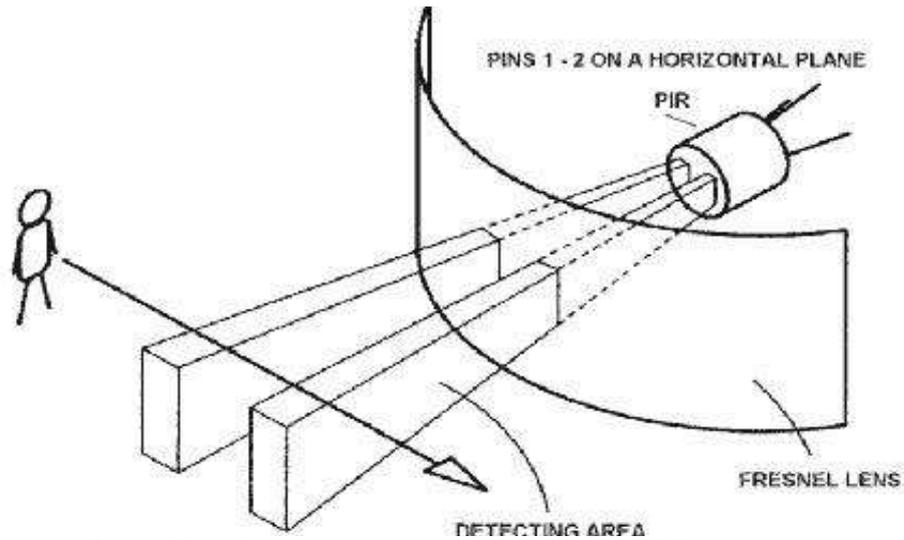
Fig. 1:- Fresnel lens, increase sensitivity and rang of PIR sensor

B.Passive Infra Red sensor:-

Human sensing technology is the key of this project. Passive Infra Red sensor has been used to detect human in this project. Infrared radiation exists in the electromagnetic spectrum at a wavelength that is longer than visible light. It cannot be seen but it can be detected. Objects that generate heat also generate infrared radiation and those objects include animals and the human body whose radiation is strongest at a wavelength of 9.4um [5] PIR sensor is able to detect the change of radiation of these infrared radiation

Bellow is a picture of working principle of PIR sensor PIR sensor generates +5v and -5v sine signal when any human or animal passes in front of the sensor or any movement is detected of human or animal in front of this. A breakout board is used to detect this signal and convert it into a longer digital signal. The.Output of PIR sensor can be adjusted. For max it can create an output signal for approximately 1.2 seconds [6]. This is more than enough to detect the signal.
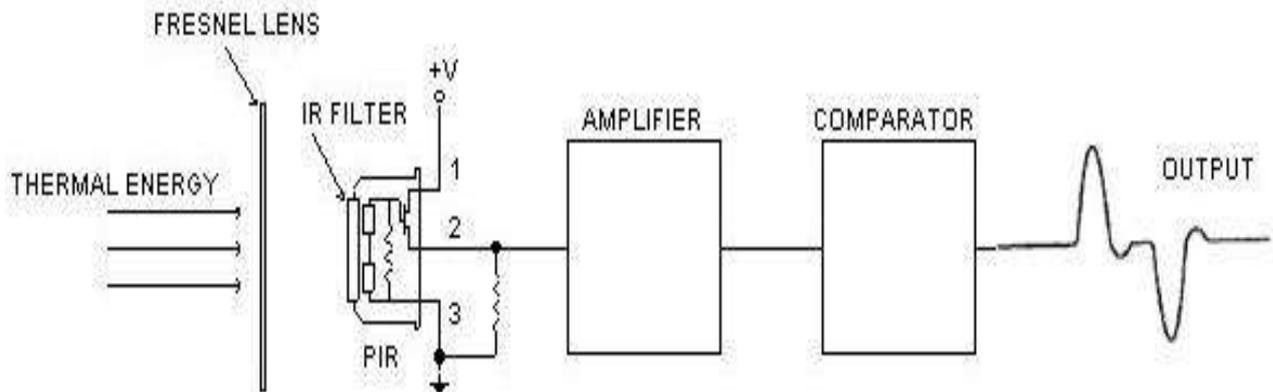

Figure 2:- Typical Configuration of PIR [5].

Detection area of a PIR sensor is 3m in width, 5m in length & 3m in height. But on average the width of any car is around 1.5m. We have to detect humans or animals within this width. So, we have covered the lens area to reduce the width to 1.5m.

In order to identify the position of the human being we need two sensors. Their detection area will overlap each other at the center. If both the sensor detect human means human is at the center. If left PIR only detect means the person is at the

left side of the car and same for the right side. Here is a figure describing the covered area.

C. Fresnel lenses:-
FL65 Fresnel lens is made of an infra-red transmitting material that has an IR transmission range of 8 to 14um which is most sensitive to human body radiation. It is designed to have its grooves facing the IR sensing element so that a smooth surface is presented to the subject side of the lens which is usually the outside of an

enclosure that houses the sensor. The lens element is round with a diameter of 1 inch and has a flange that is 1.5 inches square. This flange is used for mounting the lens in a suitable frame or enclosure.

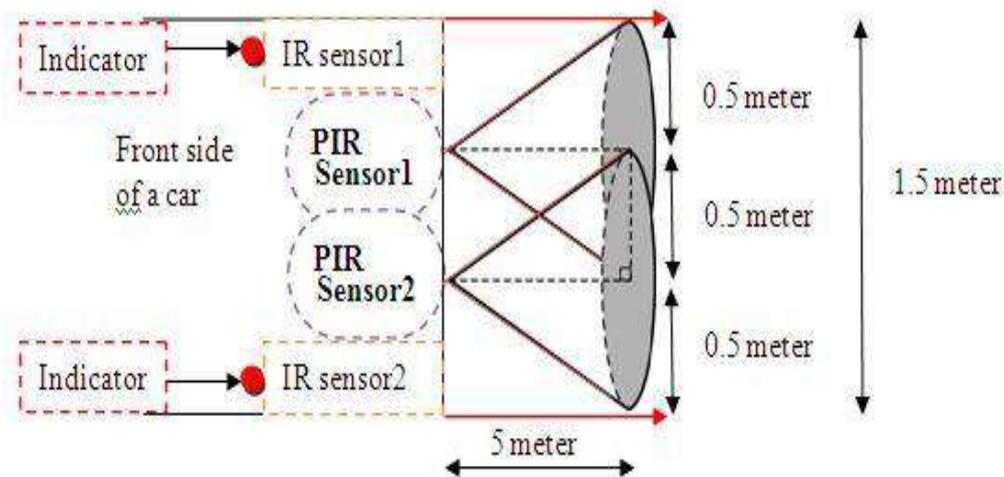Mounting can best and most easily be done with strips of Scotch tape.

Fig. 3:- Area covered by PIR & IR sensors, human position detection &indication [8]

D. Accident avoidance system:-

An advance pre-crash system is also capable to avoid accident by sensing human and their distance from vehicle. For example an automated braking force can be executed in this system. Moreover, the system can handle the steering by determining the position of human or obstacle. If driver forgets to press horn then the system can also generate an auto horn to indicate the person in front of the car.Also,We are design such a system which, in case of accident will records all the parameters and also help us to prevent any accident to happen in certain extends. This project gives the idea of different parameters changes in the motor vehicle which is very helpful to drive the car.
This project includes features like speed measurement, temperature of the engine , location of car using Global Positioning System, eye blink rate detection using IR sensor, alcohol detection, fuel leakage detection ,all these data is recorded on a smartcard. Using GSM technology, the current detail of the car can be sent to a dedicated mobile.

Sensing Parameters:
1.1 Analog Sensors:-

The µc continuously scans for the car parameters. Since ARM controller have inbuilt ADC we have to connect only an external to interface an analog sensors such as engine temperature, fuel level, alcohol sensor, LPG sensor.

Alcohol Sensor:
Shows the alcohol Concentration. µc first reads the value of Alcohol concentration which is changes regularly in the car and corresponding value gets sensed by Gas sensor MQ-3 if any alcohol is detected in the drivers cabin then display the alcohol concentration on LCD and buzzer on for indicate or alert the driver to avoiding any chance of accident.
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LPG gas sensor:
Shows the LPG Gas Concentration.µccontinuously scans for LPG gas leakage sensor corresponding value gets sensed by Gas sensor MQ-6. If any LPG gas leakage is detected then display the gas concentration on LCD and buzzer on for indicate or alert the driver to avoiding any chance of accident.

Base Unit:
The base unit consists of PC which has visual basic s/w. On the VB window receives the SMS and displays all the parameters of car in the respective boxes. Also we design inbuilt Google map software on VB window, the VB s/w reads the latitude and longitude and passes it to Google map and shows it on the map, indicating the current position of the car.

Speed of vehicle (RPM):
Speed of vehicle is measured on the basis of tachometer for this we use IR sensor TLP 1031A.

Engine Temperature:

It continuously monitors the temperature of engine & sends its value to microcontroller. If temperature

of engine exceeds desire value then system alert todriver by turned on the buzzer and also display on LCD
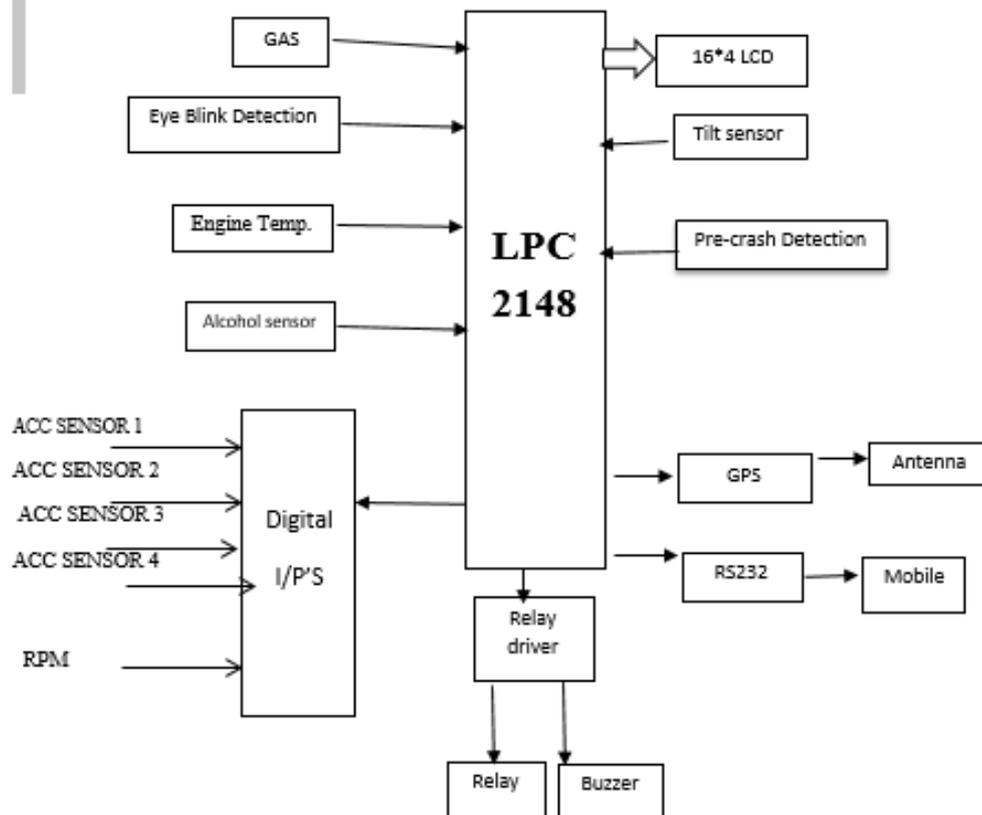

Figure 4. Vehicle Accident Prevention System Using GSM and GPS

1.2 Digital Sensors:

Accident Switches:
We are connecting impact switches on to the exterior of the car. As soon as the accident happens the corresponding accident switch is pressed as soon as the accident is detected. The μc stores all this data on the ram memory. All these data is sent to the base unit via SMS. The μc uses **"AT" commands** to initialize the mobile and send the SMS to the base Unit**AT commands** are the instructions used to control a modem. These commands are started with
"AT" or "at". AT abbreviation is **Attention.**

IR Sensors:
An opened eye has another reflective coefficient than a closed eye. This level of reflection can be measured, for instance with sender and receiver
IR LED is used to display eye status of the driver which shows open or closed.

E.GPS Receiver:-
The hardware interfaces for GPS units are designed to meet NMEA requirements. The GPS receiver provides data in NMEA 0183format with a 1Hz update rate. Generally message received by GPS is in NMEA [National Marine Electronics Association] message format and NMEA protocol which is most commonly used is NMEA0183 protocol. GPS sentences beginning with the following specifications: $GPGGA, $GPGSA, $GPGSV, $GPRMC, and $GPVTG And sentences also begins with $GPMSS, $GPZDA

F. Accident Detection:-
Most of the accident detection system uses complex 3 axis accelerometer, gravity sensor or costly android mobile phones with complex circuitry. In this system the accident detection method is also cheap and simple. We have used a tilt sensor to detect accident. Whenever any major accidents happens car jump or even flip over. We are detecting the amount of angle it rotated from ground. Tilt sensor can measure a rotation of minimum +15degree or -15 degree [7].
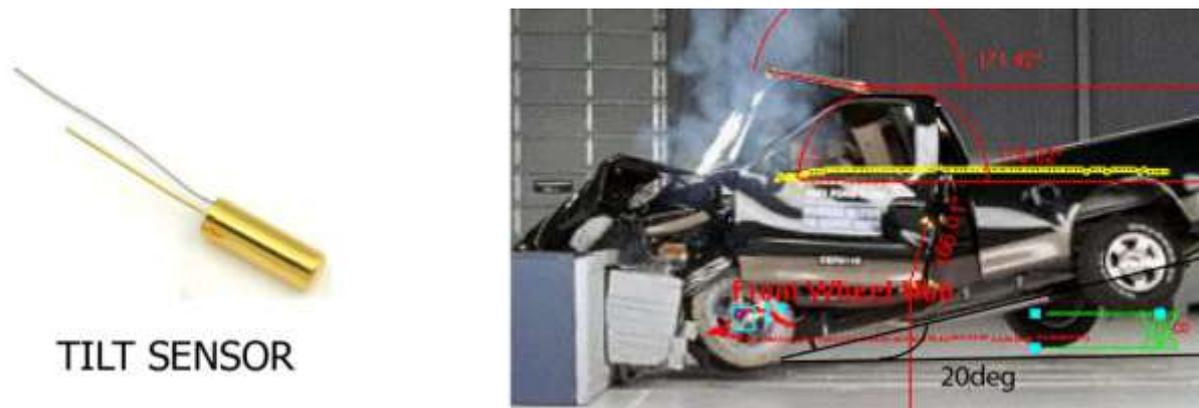
Figure 5:- Accident Detection using tilt sensor

FURTHER APPLICATION

1. Avoiding Helicopter or Air plane collision with birds.
2. Robots will be able to identify humans & animals.
3. In NASA robot to detect presence of life using sensor.
4. Earthquake survival finding inside buildings.
5. Fire survival finding inside buildings.
6. A wireless camera can be interfaced in the design to record the various action of the driver.
7. A camera can be added in front of the vehicle for lane tracking purpose

CONCLUSION

We propose an intelligent vehicle system for accident prevention and making the world a much better and safe place to live.

Passive Infra-red sensor is a reliable solution for detecting human or animals and this technique certainly can save lots of life. Pre-crash detection system must be equipped with combination of different sensors. Detecting humans or animals including obstacles will certainly give us a better solution to reduce the death of humans in road crash.

We continuously scan for various parameters of car, such as engine temperature, speed, Gas, eye blink and alcohol sensors. If the driver is found to have alcohol in the breath, it warns and then turns the buzzer is operated and hence possibility of accident is avoided. Also we have designed an eye blink sensor which continuously monitors the number of times the eye blinks, if the eye blinks count decreases that means the driver is sleepy, in that case a buzzer will operateor if in case an accident happenedthen by using impact sensors we are able to found out on which side the impact occurred.

After collecting all information which is stored in internal memory, µC send this data to base or surveillance unit via SMS using GSM modem.
On the base side we receive the data such as engine Temperature, speed, eye blink status, alcohol level, impact etc. and also the GPS co-ordinates on the online Google maps.

ACKNOWLEDGMENT

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