

# SENSOR BASED ACCIDENT DETECTION AND PREVENTION TECHNOLOGY

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## ABSTRACT

*The sensor based accident detection and prevention technique is one of the contributions to the life saving measures. In this paper we propose an efficient technique to overcome the drawbacks of the existing system. Most of the accident occurring today are because of drunk and drive and inadequate speed control measures. So in order to overcome that we propose a new system of sensor based accident prevention system. Various sensors are used to monitor the speed and provide efficient safety measures in avoiding accident. Along with prevention technique we propose a new system of accident detection technique to overcome the problem of rescuing people from accident. The existing system uses a vibration sensor to detect the accident occurrence and a GSM to intimate the accident occurrence to the nearby rescue team. The efficiency of this system is greatly affected in case of failure of the vibration sensor. So in order to overcome this drawback we go for a new system of accident detection technology with efficient utilization of sensors.*

## I. INTRODUCTION

An **accident** is an unpleasant event that no one ever wants to occur in their life. It ruins the life of many people causing tremendous loss of life of people. Preventing accident (accident prevention) refers to activities designed to foresee and avoid accidents. There has been an increase of 17.4% in the total number of death rate caused by road accidents during the period of 2011-2014. This percentage has raised eyebrows and caught the attention of many to curb the growing rate. It is found that 80% of the times it is the fault of the driver. Much prevention system has been so far suggested and some were successful to a few percentages. But unfortunately still the accident rate remains a mysterious and very serious problem yet to be solved. So we suggest a technique to prevent accident by alcohol sensor since most of the accident occurring today is mainly because of drunk and drive. In order to avoid rash driving we go for a new technique of speed reduction system which uses the ultrasonic waves fitted to the vehicle to detect the obstacles and the distance they are apart from which we could reduce the speed of the vehicle automatically if the obstacles are present mere closer. Prevention of accidents remains on one side as a huge question mark but rather on the other we look up for something as a life saving measures to safeguard our self in case of occurrence of any accidents. Many lives would have been saved if the emergency service could get the crash information in time. A study by Virtanen *et al.* shows that 4.6% of the fatalities in accidents could have been prevented only in Finland if the emergency services could be provided at the place of accident at the proper time [1]. In order to solve the problem of death caused by accident which occur because of the delay in help provided by rescue, can be solved by a new system of accident detection

technique which finds out the occurrence of accident through various sensors and intimate the occurrence of accident to the nearest rescue teams or patrol services by the use of GSM and GPS system.

As proposed in the existing system as proposed by Accident Detection and Reporting System using GPS, GPRS and GSM Technology [2], which contains a major advantage in case of accident detection by speed monitoring since this case may fail to provide the required throughput as it is difficult to monitor the speed of the vehicle continuously as it may and also the efficiency of the system is very low when compared to the proposed system.

## II. ARCHITECTURAL DESIGN

### 2.1 Global Positioning System (GPS)

Is a popular technology which was developed by American Department of Defense (DoD) for military use. Later on it was available for civilian use. It is utilized for wide range of applications such as location, direction, speed, timing, surveying, logistics, traffic management, security etc. GSM (Global System for Mobile Communications, originally *Groupe Spécial Mobile*), is a standard developed by the European Telecommunication Standard Institute (ETSI) to describe protocols for second generation digital mobile networks used by cellular phones.

### 2.2 Gps Receiver.

Nowadays, GPS technology has become more accurate, smaller, reliable, and economical. A very sensitive and accurate GPS signal acquiring device is required for the system. HI- 204III Ultra High Sensitive GPS module is proposed for this project. Why we go for a GPS here is to provide additional information to the rescue about the location where the accident has been occurred. It would be quite useful to them to send rescue team without any delay. The receiver continuously tracks all satellites in view and provides accurate satellite positioning data. Since we had to provide more accurate and faster data so that it could be easy for emergency or rescue team to save a life. However the data will contain geographical details like latitudes and longitudes. Now days google maps provide a very good services for accessing a particular location using latitude and longitude coordinates. So the GPS with its 20 parallel channels and 4000 search bins provide fast satellite signal acquisition and short startup time which is <8 second in hot start and <40 second in cold start. Tracking sensitivity of -159dBm offers good navigation performance even in urban areas having limited sky view.

### 2.3 GSM Modem

The GSM/GPRS modem utilizes the GSM network to send the location of the accident. The modem can be controlled by a microcontroller through AT Command set. The wavecom Q2403 is proposed for this system. It supports dual frequency (GSM/GPRS 900/1800MHz) with voice function and RS-232 interface. This modem supports all the AT Commands.

### 2.4 Microcontroller Unit

The microcontroller unit (MCU) is the heart of the system. It receives data from the GPS, processes all data and detects the accident from the processed data. The location of the accident is also sent by the microcontroller. PIC18F4550 is proposed for the system. The Large amounts of RAM for buffering, Enhanced Flash program memory and low power consumption make it ideal for the proposed system.

### 5.5 Vibration Sensor

When a car collides with a hard object like another car, wall etc. There will be a rapid deceleration. This rapid change in acceleration can be detected by MEMS based sensor **accelerometer** like ADXL203. It is available from analog devices. But it requires a complex circuit and sophisticated air bag arrangement with a very fast response time so that air bag opens in real time just after accident. These sensors are used as one of the main

### 2.6 Ultra Sonic Sensor

Bulletin 873M General Purpose Ultrasonic Sensors are designed to detect solid or liquid targets by using sound waves. These compact sensors provide enhanced flexibility for areas with limited space and are excellent for standard packaging and assembly applications. They are ideal for sensing targets that are challenging for photoelectric sensors to detect, including clear, shiny, or non-reflective objects. These sensors play a vital role in accident detection system. This sensors cover an area of sensing range of 30... 800mm analog output models (4...20 mA, 0...10V DC) contains discrete models (N.O./N.C., PNP). It is straight or right-angle threaded 18mm housing bright LEDs display output status and nickel-plated brass housing. Remote teach using pin #2 or an optional programming cable M12 connector and 4-pin QD is used.

### 2.7 Glass Breakage Detector

Glass break detectors usually use a microphone, which monitors any noise or vibrations coming from the glass. If the vibrations exceed a certain threshold (that is sometimes user selectable) they are analyzed by detector circuitry. Simpler detectors simply use narrowband microphones tuned to frequencies typical of glass shattering, and react to sound above certain threshold, whereas more complex designs compare the sound analysis to one or more glass-break profiles using signal transforms similar to DCT and FCT and react if both the amplitude threshold and statistically expressed similarity threshold are breached.

### 2.8 Alcohol Sensor Detector

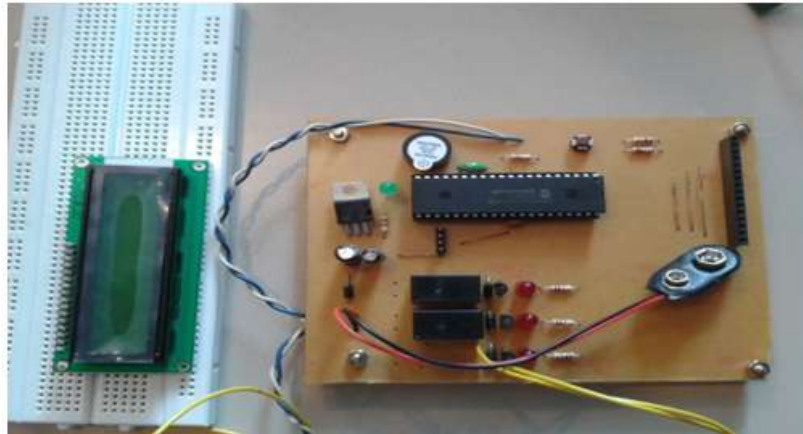
This alcohol sensor is suitable for detecting alcohol concentration on your breath, just like your common breathalyser. It has a high sensitivity and fast response time. Sensor provides an analog resistive output based on alcohol concentration. The drive circuit is very simple all it needs is one resistor. A simple interface could be a 0-3.3V ADC.

## III. WORKING MECHANISM

### 3.1 Prevention System

**Method 1:** Here we use an alcohol sensor fitted near the driver seat in such a way it can sense the alcohol content in the breath of the driver. If the driver has consumed alcohol and it has been detected by the sensor automatically the lock gets jammed so the driver can't even be able to start his vehicle.

**Method 2:** The next method to avoid rash driving we are fitting an ultrasonic sensor in front of the vehicle which covers the wide area at the front. If the ultrasonic sensor detects any vehicle much closer (by calculating the distance from the sensor result) the system automatically slows down the speed of the vehicle by using the automatic speed controller fixed to the vehicle engine.

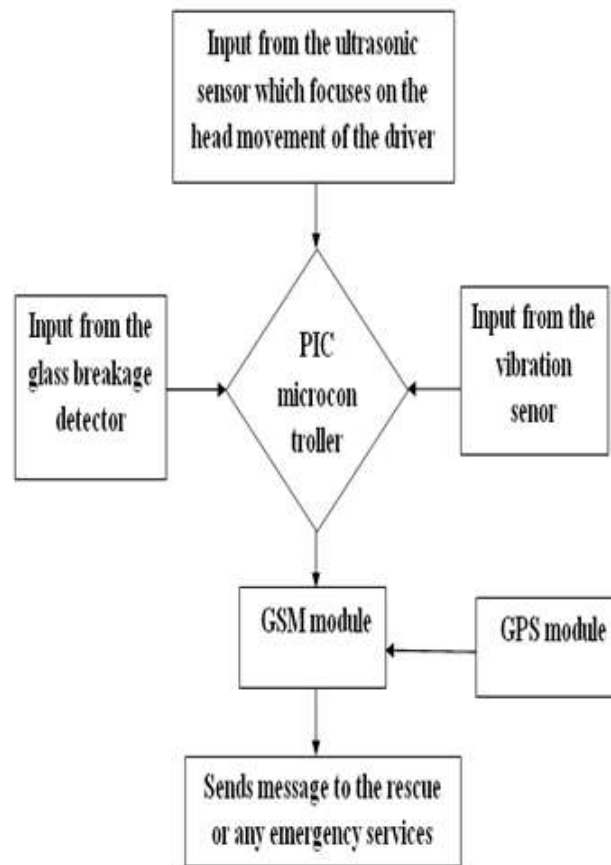


### 3.2 Detection System

The system is designed with a main motto to reduce the death rate caused because of delay in rescue of those who got seriously injured in the accident. In order to overcome the disadvantages proposed in the existing system we go for new systems which include the use of two more sensors viz., ultrasonic sensors and glass break detector. The ultrasonic sensor fixed in such a way that it monitors on the head movement of the driver. If the driver's head is displaced from his normal position such that if in case of any accident or in case of any health problems to driver such as heart attack can be identified by the sensor. The sensor switch on as once the driver started his vehicle. If the head movement of the driver is displaced from its normal position for more than 30 to 40 sec was considered as some emergency need. Similarly the vibration sensor placed near the air bag which opens when an accident occurs can be detected easily by this sensor since the air bag opens when accident occur producing some vibration. Next is the glass break detector which is used to detect the glass breakage. In cases of accident which mostly involves the breakage of glasses can be used to predict the accident occurrence. The output of the sensors are given as input to the microcontroller PIC which concludes based on the input that if any two or more outputs of the sensor are positive(that is accident has been predicted) then automatically the microcontroller initiates the GSM module to send the emergency message to the rescue team. In order to inform the rescue team about the exact location of the accident GPS system has been used. Along with the emergency message the GPS location is also sent.

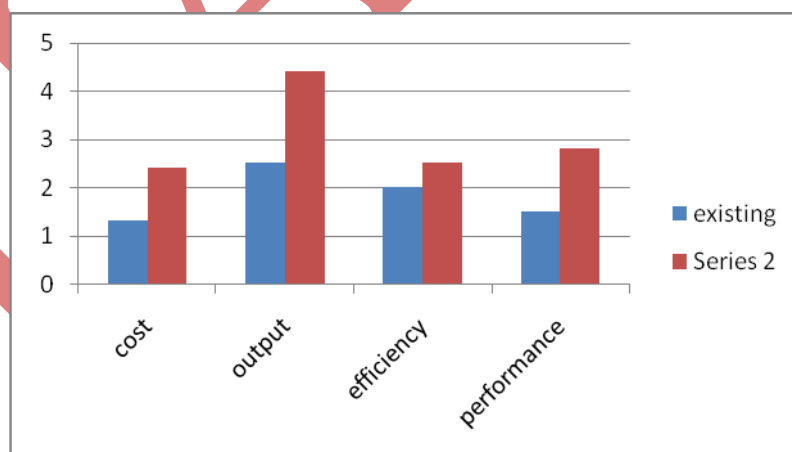


The Flowchart Of The Accident Detection System Has Been Shown Below:



#### IV. EXPERIMENTAL RESULTS

The system works well when compared to the existing system in case of failure of any one of the sensor and very effective concerned with preventing accidents caused by drunk and drive and the comparison chart is displayed as follows:



#### V. CONCLUSION

The proposed system provides an excellent results concerned with preventing accident caused by drunk and drive and rash driving. The system also includes a special feature of accident detection system to prevent a loss of life mainly due to the delay in the emergency services. The proposed system provides efficient results when compared to the existing system and sustains even in case of failure of any one of the sensors.

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