

# ACCIDENT DETECTION AND ALARMING SYSTEM

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## Abstract

Road accidents are most unwanted thing to happen to anyone even though it happen quite often. Since 2009, India has been top of the list of countries with highest road fatalities that means one in every 11 road deaths occur India. In this paper an accident detection and alarming system is introduced in which if a vehicle meets with an accident, the vibration sensor and ultrasonic sensor discover the hint and send it to the microcontroller unit. If collision occurs, the vibration sensor senses the collision and send an indication message to the microcontroller unit. The microcontroller receive the coordinates of vehicle through GPS module and GSM module will send the received coordinates to the user through SMS. We have built a model, Internet of Things based accident detection and reporting system for a smart city environment. In addition to this a LCD display module is used for displaying status of a vehicle.

*Keywords— Vibration sensor, Ultrasonic sensor, Rain sensor, GPS, GSM.*

## I. INTRODUCTION

According to the survey one person is killed every 25 seconds. On road Accident is an major issue of concern. Only few countries in entire world have adequate laws that address all five risk factors that is speed, drunk driving, helmets, seat-belts and child restraints. Very few in low- and middle-income countries are of pedestrians and cyclists. less than 35 percent of low- and middle-income countries have policies to protect these users. The average rate was 17.4 per 100,000 people. We needed to propose a kind of vehicles which sends information about the accident including the location, the time and angle of the accident to a rescue team like a first aid centre and the police station For better environment. IoT can also be used to make roads safer through alerts that detect accidents and also rough and dangerous driving. IoT Now reports that there are already devices that automatically detect collisions and immediately contact emergency services with the location. The same technology can also provide a report to the vehicle's manufacturer so they can make any improvements. The majority of accidents on the road are because of human error and rough driving habits, and these could be reduced through IoT technology. This is because it can be used to monitor driving nature and behaviour and send recommendations to the driver or the registered number and alternate number.

## II. LITERATURE SURVEY

Many researchers studied the accident detection system. Aishwarya S.R maintained an IoT-based motor vehicle accident prevention and detection system for night drivers. This paper contains a Blink Eye Monitoring System (EBM) which alerts the subject in times of distress. [1] Sadhana B has explained the intelligent safety of a motorcycle helmet using a raspberry pi and an open CV. The idea comes from knowing that there have been more fatal road accidents over the years. This project is designed to introduce safety systems so that the motorcycle can wear the helmet properly. [2] Sarika R. Gujar described an advanced Embedding System of vehicle accident detection and detection system. The main goal of this system is to first locate the crash site and call the emergency services. Detection of a car accident is possible with the help of sensors. GPS and GSM module help to locate the vehicle. [3] Shailesh Bhavthankar explained Wireless System for Detecting and Reporting Vehicle Accidents Using Accelerometer and GPS. In this paper, an Accelerometer sensor is used to

detect an accident and GPS provides the location of the vehicle. In the event of any accident, the system will send an automated message to the pre-registered number such as a family member or emergency medical services via GSM. [4] Jagdish A.Patel explained a Raspberry Pi based smart home. This paper aims to design a basic home automation application on Raspberry Pi via Interfacing camera as a security purpose and the algorithm for the same is implemented in development in python environment which is like the basic programming environment on provided by Raspberry Pi. [5] Aravinda B, Caithralakshmi C, Deeksha, Ashutha K from their report, it is decided to prevent accidents in U-turn, S-turn, hilly Ghats and mountain roads using modern sensing technology, which uses Aurdino UNO, , RF module LED, etc. [6] R.Saranya, R.Arun Kumar This paper concludes, that accidents can occur in a number of factors on drunkenness and driving, texting while driving, speeding, speeding. Distract, sleep while driving. Sleep is a major cause of stress. When driving at 100km / h. driver falls asleep within 4 seconds buzzer will enable.

### III. COMPONENTS

- ARDUINO ATMEGA 328
- ULTRASONIC SENSOR
- VIBRATION SENSOR
- GSM
- GPS
- LCD
- GAS MODULE MQ6
- RAIN SENSOR
- ADXL 345
- DHT 11

#### ARDUINO ATMEGA328:

In this project we are using arduino nano microcontroller board which is designed by arduino.cc. Atmega 328 microcontroller used in this nano arduino which is same one used in arduino UNO board. It has characteristic like small size and flexibility that's why it can be used in various applications and major microcontroller projects. It has 22 input and output pins out of which 14 pins are digital pins. Arduino nano has 8 analog pins which used to interface with analog sensors, these analog pins also work as general purpose input output pins. Among the 14 digital pins it has 8 bit 6 PWM pins, PWM pins are used for getting analog result with digital signal. It has 16Mz crystal oscillator and oscillator circuit is built in a device itself, its operating voltage varies from 5V to 12V. This microcontroller board provided with mini USB port for upload a program. One of the main feature of arduino nano is its memory it is providing 32Kb flash memory in which 2Kb used for preinstalled bootloader. It has 8Kb of SRAM and 1kB of EEPROM. Because of its small size and flexibility used in Automation, Robotics, Control system etc.



**ULTRASONIC SENSOR** For measuring distance, detection of object and motion sensor we can use a ultrasonic sensor module. It is a high sensitive module which is integrate with microcontroller and used as a motion sensor circuit to make robotics project and other distance based projects and motion sensitive products. It works same as SONAR and RADAR system it sends 40Khz square wave pulses and if there is object or obstacle it will bounce back that pulses to a sensor. It is a digital sensor operates at a voltage at +5V and less than 2mA which is quite low. It can detect object or obstacle with distance 2m to 400cm (i.e 0.02M to 4M) it has highest precision up to 0.3cm.



**VIBRATION SENSOR:** The vibration sensor module used in this project based on the sensor SW-420 and LM393 comparator these both are used to detect vibrations. It has on board potentiometer which is help the adjust threshold value. During stable condition means no vibration the sensor sends Logic Low signal to the microcontroller and when it detect the vibrations it send Logic High signals to the microcontroller. The vibration sensor module's integrated circuit contains vibration sensor SW-420, resistor, capacitor, potentiometer, comparator LM393 IC, power and status LED. It has wide range of applications like shock triggering, theft alarm, smart car, etc. It has operating voltage of 3.3V to 5V dc supply and 15mA operating current. We can use this module with normal Digital/Analog microcontroller IC easily, it is small in size and cheap that's why it is



used in optimist circuits.

#### GPS:

Global Positioning System (GPS) module is based on satellite system. This system uses satellite station and ground stations to measure and calculate its position on the Earth. The GPS is also called as Navigation System with Time and Ranging (NAVSTAR) GPS. For the accuracy purpose it needs to receive data from 4 satellite at least and it never transmit any bit of information to the satellite. This GPS receiver module used in various application like smartphones, Cabs, Fleet Management etc. It has 50 channel receiver operates at 1575.42 Mhz. It provides 2.5m of horizontal position accuracy. This GPS modules have a navigation update rate of 1HZ at minimum and 5Hz at maximum. It has -161 dBm which is very high among all present GPS modules it follows NMEA, UBX Binary and RTCM communication protocols. This GPS module operates on 4800 to 230400 serial baud rate the default operating baud rate is 9600. It can operate on -40°C up to 85°C this is why we can use this module at very low and high temperature places, the operating voltage of this module is 2.7V to 3.6V and 45mA which is quite low power consumption. Its circuit has 510 Ohm transmitting and receiving impedance.

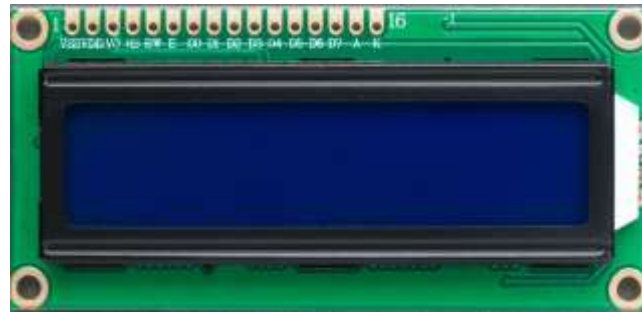


GSM: : It is a complete dual band GSM/GPRS SMT module which can be embedded in the customer application allowing the user to benefit from small dimensions and cost effective solutions. Featuring with an industry standard interface, the SIM900A GSM module gives us GPRS 900/1800MHz performance for voice communication, SMS, Data, and Fax with small form factor and with very low power consumptions, this GSM module operates at 3.4V to 4.5V supply voltage and typical power consumption of 1.5mA in SLEEP mode. One of main function of SIM900A is it can search two frequency band automatically. At command also used for set this frequency band. It belongs to small MS GSM class and the GPRS connectivity is multi-slot class 10 which is default and multi-slot class 8 which is optional. It can also operate at temperature  $-30^{\circ}\text{C}$  to  $80^{\circ}\text{C}$ . GSM module SIM900A supports CSD USSD, SMS, FAX with MIC and audio input. It has advance feature like keypad interface, display interface, features like Real Time Clock and USART interface. It also has firmware upgrade by debug port. Supports UART interface. It also has firmware upgrade by debug port.



#### LCD:

It is electronic display module which has a wide range of applications. It is a 16x2 LCD (Liquid Crystal Display) with very basic features and widely used with many devices and integrated circuits. We say it is 16x2 display because of 16 characters in one line and there are only two lines. In this display each character is displayed in pixel matrix of 5x7. It is capable of showing 224 different characters and symbols with its 16x2 alphanumeric dot matrix display. This LCD module has two common registers named as Command and Data.



#### GAS MODULE MQ6:

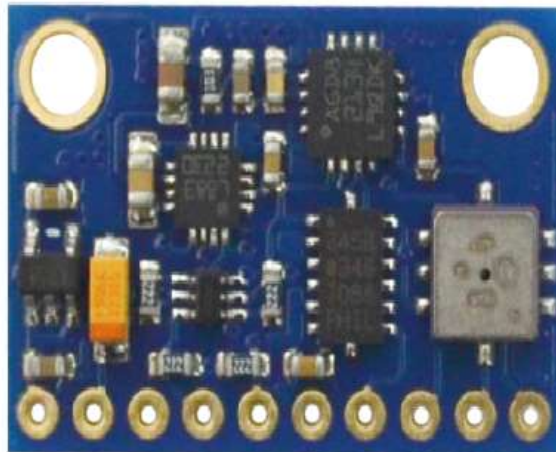
The gas module mq6 has a high sensitivity and fast response time. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC. Voltage required for operate this module is 5V and it can be used to detect LPG and butane gas but in this due to its high sensitivity we are using it as a smoke detector in case of fire. It has most advance feature which is we can use it as a digital sensor as well as analog sensor. The analog output voltage is 0V to 5V which is same as digital output voltage with TTL logic. This gas module has a preheat duration of 20 seconds. This module comes with potentiometer which is used to vary sensitivity.



RAIN SENSOR: With the weather being as unpredictable as ever, it's easy to leave your skylights open, only for it to suddenly start raining, leaving the interior below at risk. With this rain sensor, however, We can stop this from happening. We can use this sensor to monitor rain or slushy snow/hail and send closure requests to electronic shutters, windows, awnings or skylights whenever the rain is detected. This sensor module uses good quality of double-sided material. It has feature of anti-conductivity and oxidation with long time use. It is has very small surface area which is 5cm x 4cm and can built with a nickel plate on the side for easy installation. The integrated circuit of rain sensor module also has a potentiometer for adjusting threshold/sensitivity. This module require 5V dc supply for operation. It has a very small size of PCB is 3.2cm x 1.4cm which saves the space in main circuit.



ADXL 345: It is 3-axis accelerometer with 13 bit high resolution measurement at up to  $\pm 16g$ . It is small, thin, ultralow power consumption module. Output data of this module is digitally formatted as 16 bit two complement and it is accessible with a SPI or I2C interface. This ADXL 345 module is most common used in mobile devices applications. . It measures the static acceleration of gravity in tilt-sensing applications, as well as dynamic acceleration resulting from motion or shock. Its high resolution (3.9 mg/LSB) enables measurement of inclination changes less than  $1.0^\circ$ . It operates on 3V to 6V dc supply voltage. It has On board LDO voltage regulator and also built in voltage level converter which is MOSFET based. It can be interfaced with 3.3V as well as 5V microcontroller. This 3-axis accelerometer used for free fall detection and tilt sensing and it is



interface with SPI and I2C interface.

DHT 11: The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It is fairly simple to use, but requires careful timing to grab data. You can get new data from it once every 2 seconds, so when using the library from Adafruit, sensor readings can be up to 2 seconds old. Comes with a 4.7K or 10K resistor, which you will want to use as a pull up from the data pin to VCC. It operates on 3V to 5V dc supply and 2.5mA max current use during conversation means while requesting data. This temperature and humidity sensor module is good for 20 – 80% humidity reading with a 5% of accuracy and with the temperature it is good for  $0^\circ\text{C}$  to  $50^\circ\text{C}$  with  $\pm 2^\circ\text{C}$  accuracy. The sampling rate of this module is no more than 1 Hz sampling rate once in every second.



#### IV. IMPLEMENTATION

In this project there are two major part the first one is controller and the sensor and second one is GPRS (Global Packet Radio Service). We have used arduino nano ATmega328 as a controller which is used for controlling other modules in the system. The block diagram consist of two Arduino nano ATmega 328, ultrasonic sensor, vibration sensor, gas module, rain sensor, adxl 345, DHT-11. Also, we have used a LCD display which is used to display status messages and coordinates.

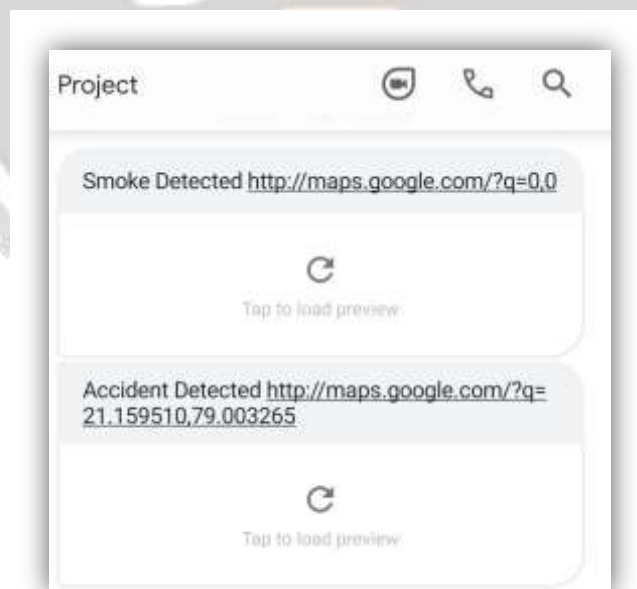


We used ultrasonic sensor for detecting the objects and a distance. An ultrasonic sensor is a electronic device that measures distance to an object by using sound wave. It works by emitting high frequency sound wave and wait for it to bounce back the time delay between transmission of sound and receiving of the sound is used to calculate the distance. In our project the vibration sensor works as a accident detection sensor, if in case accident happens, then the vibration sensor sense the vibration and send it to the microcontroller, which is arduino nano. The ADXL 345 is a 3 axis accelerometer which is generally used for sense both static and dynamic acceleration. It is used for detect vehicle fall or rotate. We have also used gas module MQ6 as a smoke detector in case of fire, this module sense the smoke of fire, it can detect smoke concentration anywhere from 200 to 10000ppm. Which is very highly sensitivity and is fast to response. After detecting the smoke it sends signal to the microcontroller, then the microcontroller sends message through the GSM to the register mobile number. The rain sensor detects the rain and show the status on the display in a “RAIN STATUS” “YES” and “NO” format. The DHT-11 sensor is used for to detect and show temperature and humidity around the vehicle. If accident happens or when the gas module detect the smoke then the signal send to the microcontroller and then microcontroller receive the coordinates from the GPS module and send it to the registered mobile number to the through the GSM module. It can find the vehicle location with high accuracy and low supply power. The received coordinates send to GSM module which is used to send the location of the vehicle with alert message to the registered mobile number.





These are the some output showing on a display and the message send by GPRS system as shown in figure below.



## V. CONCLUSIONS

The “Accident Detection and Alarming system” model can successfully detect the accident with help of vibration sensor and send alert message to the registered mobile number with the coordinates of vehicle through



the GPRS system. This system contains rain, temperature and humidity sensor which makes it unique from other existing system.

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