ACCIDENT DETECTION AND ALERT SYSTEM

REVIEW REPORT

Submitted by

Ananya Arora (20BCB0031)

Saloni Vyas (20BCB0064)

Prepared For

INTERNET OF THINGS (CSE3002) – PROJECT COMPONENT

Submitted To

Dr. Akash Sinha

Assistant Professor

School of Computer Science and Engineering

VIT®

Vellore Institute of Technology

(Deemed to be University under section 3 of UGC Act, 1956)

Table of Content

ABSTRACT

Road accidents are becoming more frequent as the number of vehicles grows. An annual global death toll of 1.4 million and an injury toll of 50 million are reported by the World Health Organization (WHO). The primary causes of this are either the lack of medical assistance on site at the time of the accident or the lengthy reaction time during the rescue effort. Well, this method offers a fix for the issue. Our system serves as an accident identification and prevention system, and it also aims to alert the nearby medical center about the accident to provide immediate medical aid. The primary goal is to prevent accidents by employing wireless communications technology to send a message to the registered mobile, hospital, and police station. A message is quickly delivered to the registered cellphone through a GSM module when an accident happens anywhere, whether it's in a city or not. The center of the system, Arduino, assists in sending messages to various system components. When an accident occurs, the vibration sensor will activate, and the GSM module will transmit the information to the registered number.

INTRODUCTION

Currently, the accident rate is increasing rapidly. Job hunting has increased the use of vehicles such as cars and bicycles, and speeding accidents are occurring frequently. Accident rates cannot be reduced because advanced technology is not available. In order to reduce the domestic accident rate, this paper presents a solution. Introduced an automatic accident detection and warning system. The main purpose is to control accidents by using wireless communication technology to send messages to registered mobile phones, hospitals and police stations. The main features of the project are speed monitoring of the driver, Automatic alert on crossing speed limit, Nearest hospital detection and location, Immediate help.

In the event of an accident, for example, in a city, a message will be sent to registered mobile phones in a short time via the GSM module. Arduino is the heart of the system that helps send messages to various devices in the system. In the event of an accident, a vibration sensor is activated and information is sent to the registration number via the GSM module. A GPS system can help locate an accident scene. The

proposed system checks if an accident has occurred and uses GSM and GPS modules to notify the nearest medical center and registered mobile phone number of the location of the accident. The location is transmitted through a tracking system and can cover the geographic coordinates of the area. A vibration sensor used as the main module of the system can detect accidents.

LITERATURE SURVEY

[1] Development of Message Queuing Telemetry Transport (MQTT) based Vehicle Accident Notification System

Journal: International Journal of Engineering and Advanced Technology (IJEAT) **ISSN:** 2249 – 8958, Volume-9 Issue-2.pp. 268-273.

Author: Bansal, B. and Garg, V

Objective: - This paper includes a proposed system for Accident notification, which if used in automobiles can save millions of lives and that too by just timely informing the concerned ones of the people involved in the casualty. This proposed system aims to save those lives, which can be saved if information of casualty is timely conveyed. The proposed system implements a low-power vibration sensor, a cost-effective microcontroller and a powerful IoT platform to create an application that does not depend on humans to function.

Methodology: - The system design makes use of a simple vibration sensor which senses the vibrations when the automobile is in motion. The vibration sensor continuously sends out these values to the NodeMCU which acts as a gateway between the Vibration sensor and Adafruit to the cloud platform. These values are uploaded to Adafruit every 2 seconds and are being sent to the IFTTT, which is a subscriber of these values. And whenever the value exceeds preset threshold limit, IFTTT activates the trigger and as a result of trigger activation an HTTP request is made to Click Send SMS and then it sends out the notification to registered mobile phone numbers. In a nutshell, using NodeMCU along with a vibration sensor, a system can be developed which can help save many lives. This is a very simple and reliable design, the use of cheaper but reliable sensors makes it very affordable to implement in automobiles. The Accident notification prototype saves lives by timely informing the concerned ones.

Result: - The designed prototype in this paper can help to save thousands of lives by timely informing the families of the concerned ones. The system designed makes use of a simple vibration sensor which senses the vibrations when the automobile is in motion. The vibration sensor continuously sends out these values to the NodeMCU which acts as a gateway between the Vibration sensor and Adafruit Io cloud platform. This is a very simple and reliable design, the use of cheaper but reliable sensors makes it very affordable to implement in automobiles. The Accident notification prototype save lives by timely informing the concerned ones.

Limitations: - False Alarms are observed due to ill maintained roads and speed breakers.

[2] Iot Based Automatic Accident Detection And Rescue Management In Vanet.

Journal: SSRG International Journal of Computer Science and Engineering (SSRG – IJCSE), ISSN: 2348 – 8387.Pp. 36-41.

Author: Manuja M

Objective: • To design a vehicle unit with sensor system to detect accident details and send the alert message to the Road side unit. • To design a road side unit that receives all alert message's and sends that into the rescue team.

Methodology: - The suggested system will utilize VANET [Vehicle Ad-hoc Network] to resolve these issues. wherein each a moving object is regarded as a node. Each car in the VANET interacts with another vehicle, which is where the vehicle-to-vehicle communication happens. In this system, the alarm message is transmitted using an RF module. A moving vehicle within the range of the RF module receives the alert message, which is then forwarded to the next moving vehicle. This process continues until the vehicle receives the message, which is in the network area. The car in the network area finally receives the message. Following that, the message will be sent to the base station (the road side unit). There are four different message types in the alert message. Piezoelectric sensors, MEMS sensors, flame sensors, and temperature sensors all pick them up. The fire station receives the message provided by the flame sensor. The crane station receives the signals sent by the tilt sensor.

Result: - This system provides the optimum resolution to poor emergency facilities provided to victims in road accidents within the most possible method. With the assistance of this technology immediate action are often taken once associate accident happens by alerting the various individuals by causation a message.

Limitations: - Costlier system, False Alarms are observed due to ill maintained roads and speed breakers. Sending of data isn't secure Not applicable for remote places where the network is poor.

[3] IoT Based Vehicle Tracking and Accident Detection System.

Journal: International Journal of Innovative Research in Computer and Communication Engineering, Vol. 5, Issue 3, ISSN(Online): 2320-9801. pp. 4424-4430.

Author: Priya, E

Objective: - In this research, some of the most recent methods for car accident detection using IoT technology are investigated and then obstacles, challenges and future trends are analysed and compared.

Methodology: - There are four methods analyse here

A. Using wireless sensor network and cloud computing
B. Accident detection using the IoT capabilities
C. Accident detection using Vanet and IoT
D. Mobile application for accident detection

Result: - Accident detection using the IoT capabilities is best option among all. The advantage of this system is that aid agencies are directly connected to it and can respond quickly

Limitations: - This method is overly reliant on humans, for example, if the user forgets to turn on their NFC, the system misses the user's ride and the entire system remains idle, increasing the likelihood of casualties and injuries. Also, if a person gets into a car that is not a member of the system, the system is completely unaware of their status.

[4] REAL TIME TRAFFIC ACCIDENT DETECTION SYSTEM USING WIRELESS SENSOR NETWORK

Journal: 6th International Conference of Soft Computing and Pattern Recognition (SoCPaR), 2014, pp. 59-64, doi: 10.1109/SOCPAR.2014.7007982.

Author: H. M. Sherif, M. A. Shedid and S. A. Senbel

Objective: - The major goal of this study was to develop a Real Time Traffic Accident Detection System (RTTADS) by combining RFID and Wireless Sensor Network (WSN) technologies.

Methodology: - This paper describes the RTTADS hardware prototype setup, used algorithms, and advantages and drawbacks of the overall system. Additionally, the setup and application software settings are discussed. The location of the collision, the car's speed right before the accident, and the number of passengers in the vehicle are all detected by sensors put in the vehicle. The monitoring station receives an alert signal from the sensors. The monitoring station, in turn, keeps tabs on the scene of the accident and sends a casualty alert to the appropriate authorities.

Results: - Our system makes use of the built-in vehicle sensors to detect an accident. But the interfacing part with the service provider is done in a simple and cost-effective manner compared with Wireless Sensor Network for Vehicle Speed Monitoring and Traffic Routing System, and Performance Evaluation of Road Traffic Control using a Fuzzy Cellular Model which describes an intelligently detector of an accident based on accident detection system. The project can detect an accident on real time system and inform the supervisory program with accident location, the vehicle's speed just before the impact sensor are activated, the number of passengers in the vehicle crash sensors which had been activated (front, back, right side and left side), rollover sensor status and finally fire alarm sensor status.

Limitations: - The live system can't work if any of the following occur at the time of the crash:

- Automatic or phone is disconnected or damaged.
- No GPS signal at the time of the crash.
- Insufficient cellular signal to upload crash details.

[5] Efficient Accident Detection and Notification System

Journal: - International Journal of Engineering Research & Technology (IJERT) http://www.ijert.org ISSN: 2278-0181 IJERTV10IS070176 Vol. 10 Issue 07, July-2022

Author: - Tony Sebastian, Rashmi P C, Abilash V, V Aljo Emerson Vishnu C

Objective: - The proposed system has the capabilities to automatically detect an accident and quickly inform to the emergency services or concerned family member with precise location through Short Message Service (SMS).

Methodology: - To diminish this unintentional death rate, a minimal expense programmed accident discovery system is suggested that consequently distinguishes the accident and sends notification through Short Message Services (SMS) of the accident spot to concerned relative with precise GPS location. The proposed system comprises equipment and programming modules. The equipment module depends on the Arduino board with push button and GPS which is installed in the vehicle while the software part is an Android application that is installed on user's phone.

Result: - The proposed programmed accident identification system can be a rescuer of life for the individuals who are concerned in light of street crash. It can assume a fundamental part to lessen the passing rate in accidents. The proposed system is exceptionally easy to understand that even a non-specialized individual can utilize it without any problem.

Limitations: - False Alarms are observed due to ill maintained roads and speed breakers.

Sending of data isn't secure. Not applicable for remote places where network is poor. Sending of data isn't secure. Costlier System.

S.no	Authors	Year	Journal/Conference	Contribution	Limitations
1	Bharat Naresh Bansal, Vivek Garg	2019	International Journal of Engineering and Advanced Technology (IJEAT)	The system design makes use of a simple vibration sensor which senses the vibrations when the automobile is in motion. The vibration sensor continuously sends out these values to the NodeMCU which acts as a gateway between the Vibration sensor and Adafruit to the cloud platform. These values are uploaded to Adafruit every 2 seconds and are being sent to the IFTTT, which is a subscriber of these values. And whenever the value exceeds preset threshold limit, IFTTT activates the trigger and as a result of trigger activation an HTTP request is made to Click Send SMS and then it sends out the notification to registered mobile phone.	False Alarms are observed due to ill maintained roads and speed breakers.
2	Manuja M	2019	SSRG International Journal of Computer Science and Engineering (SSRG – IJCSE)	The proposed system uses the IoT for vehicle accident detection and alarming the authorities regarding accidents and vehicle tracking using GPS Modem. In this project we have designed an IoT based vehicle accident	Costlier system False Alarms are observed due to ill maintained roads and speed breakers. Sending of data isn't secure Not applicable for remote places where the network is poor.

				detection and tracking system using GPS Modem. Hence IoT can revolutionise the way the system interacts and responds for a variety of applications especially in the case of traffic control.	
3	Mohammadrezaei, Mahziar & Fard, Hamed & Niaky, Reza & Soltani, Behnam. (2020). IoT-Based Vehicular Accident Detection Systems.	2020	IEEE 6th International Conference on Web Research (ICWR2020)	In this paper, a novel technique for the detection of a road accident is proposed. In this technique, a low cost ultrasonic sensor is used to detect an accident. There are many state-of-the-art techniques for the detection of road accidents automatically. These include smartphones, Infrared sensor (IR sensor), airbag system, and mobile application. The proposed system is reliable as it uses two ultrasonic sensor modules for road accident detection. In order to evaluate the performance of a proposed model, different simulations are performed using MATLAB to find out the factors that affect the detection of an accident using an ultrasonic sensor.	Ultrasonic sensor can be avoided Cost of the system increases due to use of the additional sensor. Nonfunctional in remote areas.

4	H. M. Sherif, M. A. Shedid and S. A. Senbel	2014	6th International Conference of Soft Computing and Pattern Recognition (SoCPaR)	The main objective of this paper was to create a Real Time Traffic Accident Detection System (RTTADS) using Wireless Sensor Network (WSN) and Radio-Frequency Identification (RFID) Technologies. Sensors installed in a vehicle detect the accident's location, the vehicle's speed just before the accident and the number of passengers in the vehicle. The sensors then send an alert signal to a monitoring station. The monitoring station, in turn, tracks the location where the accident has occurred and directs casualty alert to the authorities concerned	The live system can't work if any of the following occur at the time of the crash: ● Automatic or phone is disconnected or damaged. ● No GPS signal at the time of the crash. ● Insufficient cellular signal to upload crash details.
5	Tony Sebastian, Rashmi P C ,Abilash V, V Aljo Emerson Vishnu C	2021	International Journal of Engineering Research & Technology (IJERT)	To diminish this unintentional death rate, a minimal expense programmed accident discovery system is suggested that consequently distinguishes the accident and sends notification through Short Message Services (SMS) of the accident spot to concerned relative with precise GPS location. The proposed system comprises	False Alarms are observed due to ill maintained roads and speed breakers. Sending of data isn't secure. Not applicable for remote places where network is poor. Sending of data isn't secure. Costlier System.

				equipment and programming modules. The equipment module depends on the Arduino board with push button and GPS which is installed in the vehicle while the software part is an Android application that is installed on user's phone.	

Table 1: List of Existing Works

PROBLEM FORMULATION

This proposed idea was introduced during the modern era of mobile phones. Deploying GPS Sensors in Mobiles and introducing GPS-Based Security Applications that suggested special hardware that could connect to your phone. However, it had the drawback of buying additional hardware for more money. However, it is current available in very few countries. The existing system of accident detection are outdated and have become unreliable. They have a lot of drawbacks such as false alarms due to ill maintained roads and speed breakers, it becomes non-functional in remote areas, Ultrasonic sensor, that can be avoided in accident detection and overall Cost of the system that increases due to use of the additional sensor. When an accident occurs, it should be reported to investigation unit. It is Therefore necessary that the information is reached to the enquiry section in time and in turn the time for the investigation can be minimized. The main purpose of this project is to prevent accidents that are caused due to absence of medical assistance. Obviously, if the accident were caused by other causes, the electronic devices used could provide spontaneous messages and precise locations to the police and ambulance to rescue the victims. The main purpose of this paper is to avoid traffic accident victims using the accelerometer and GPS in mobile phones. Based on data collected by these sensors found in most mobile phones, the location of the accident is sent to the user's approved and saved friends and relatives, rescue and emergency services at the time of the accident.

SYSTEM MODEL

System Architecture

1. Input: IR Sensor, MQ-3 Sensor, Vibration sensor

2. Output: GPS location

3. Process:

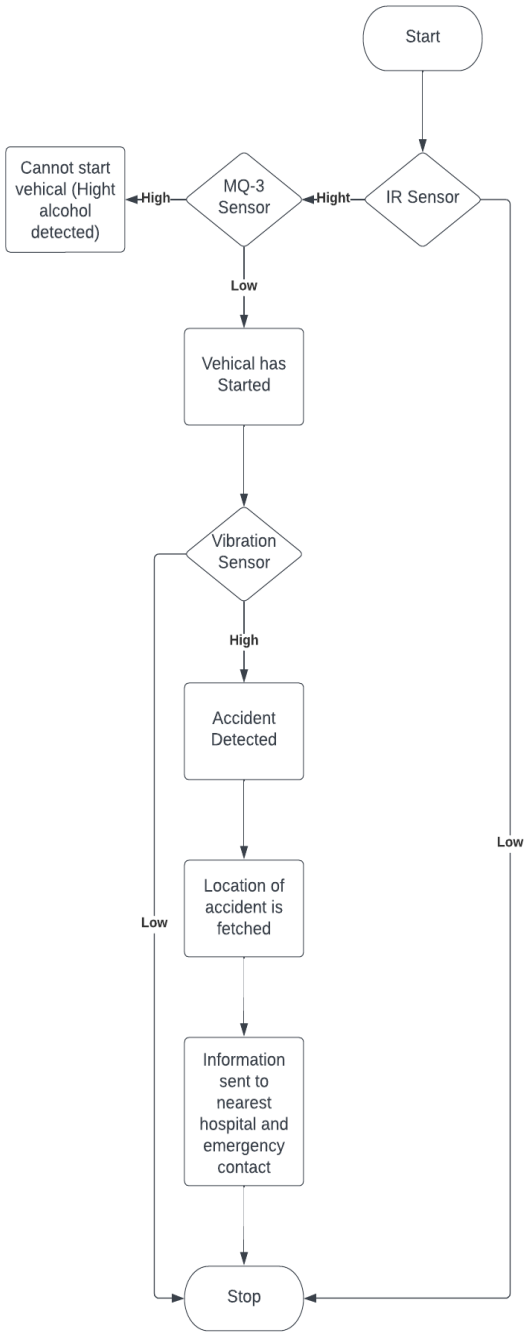
    1) If the IR sensor does not detect infrared radiation for more than 10 seconds after the vehicle starts moving, it could trigger an alert that the seatbelt is not fastened.

    2) If the digital value from the MQ-3 sensor exceeds a certain threshold level, it could trigger an alert that the person is likely intoxicated and should not be driving.

    3) If the vibration sensor detects a sudden change in movement or acceleration that exceeds a certain threshold, it could trigger an alert that an accident has occurred.

    4) Rule-based method for ZRP in an accident detection and alert system involves defining a set of rules and conditions that trigger an alert when certain data patterns or anomalies are detected in the data transmitted by the nodes.

Work Flow Diagram



PROPOSED ALGORITHM

Pseudocode

Step 1: Initially the value of the IR sensor (seat-belt detection) is checked.

Step 2: If the value of IR sensor is high, then it detects the value of MQ-3 sensor.

Step 3: If the value of the MQ-3 is not high then the vehicle is started and then continuously detects the value of the vibration sensor.

Step 4: On detecting a high value of the vibration sensor, indicating the accident has been detected.

Step 5: Immediately the location of the vehicle is fetched and sent to the emergency contacts

Step 6: As well as zone of the accident is detected and the location is sent to nearest hospital to the location with a message to send emergency services

Code

```
#include <LiquidCrystal.h>
#include <TinyGPS.h>
LiquidCrystal lcd(4, 5, 6, 7, 8, 9);

const int relay_Pin = 2;
const int buzzer_Pin = 3;
const int ir_Sensor = 10;
const int alcohol_Sensor = 11;
const int vibration_Sensor = 12;
TinyGPS gps;
long lat,lon;
bool ir_status = LOW;
bool alcohol_Status = LOW;
bool vibration_Status = LOW;

void setup() {
  pinMode(relay_Pin, OUTPUT);
  pinMode(buzzer_Pin, OUTPUT);
```

```
  pinMode(ir_Sensor, INPUT);
  pinMode(alcohol_Sensor, INPUT);
  pinMode(vibration_Sensor, INPUT);
  Serial.begin(9600);
  lcd.begin(16, 2);
  lcd.print("ACCIDENT DETECTION");
  lcd.setCursor(3,2);
  lcd.print("SYSTEM");

}
void loop() {
  ir_status = digitalRead(ir_Sensor);
  delay(100);
  if(ir_status == HIGH)
  {
    digitalWrite(buzzer_Pin, LOW);
    delay(200);
    lcd.clear();
    lcd.print("Seat Belt");
    lcd.setCursor(3,2);
    lcd.print("Detected");
    delay(500);

    while(1)
    {
      alcohol_Status = digitalRead(alcohol_Sensor);
      delay(100);
      if(alcohol_Status == LOW)
      {
       digitalWrite(buzzer_Pin, LOW);
       delay(200);
       lcd.clear();
       lcd.print("Alcohol not");
```

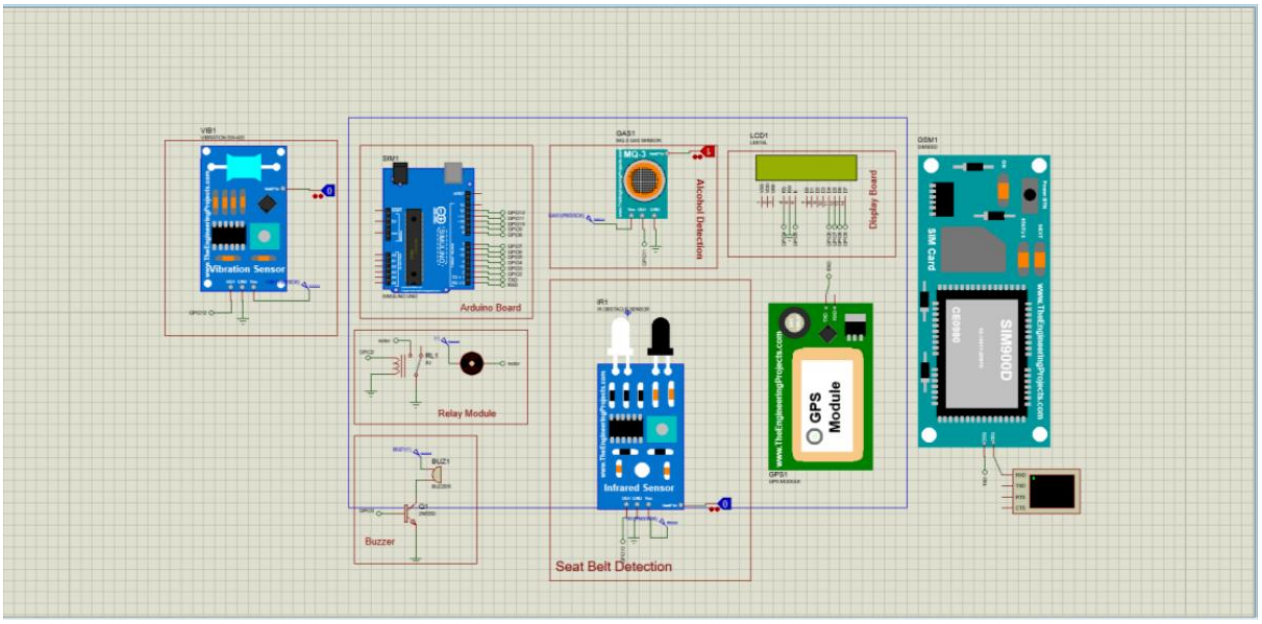
```
lcd.setCursor(3,2);
lcd.print("Detected");
delay(500);
digitalWrite(relay_Pin, HIGH);
delay(200);
while(1)
{
 lcd.clear();
 lcd.print("Vehicle Started");
 delay(500);
 while(1)
 {
  vibration_Status = digitalRead(vibration_Sensor);
  delay(100);
  if(vibration_Status == HIGH)
  {
   lcd.clear();
   lcd.print("Accident Detected");
   lcd.setCursor(3,2);
   lcd.print("Sending Msg");
   delay(500);
   Serial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
   delay(100);  // Delay of 1000 milli seconds or 1 second
   Serial.println("AT+CMGS=\"+919922512017\"\r"); // Replace x with mobile number
   delay(100);
   Serial.println("Accident Detected ");// The SMS text you want to send
   Serial.println("please check location");// The SMS text you want to send
   while(1)
   {
    gps_read();
   }
  }
  else
```

```
        {
         /* Do nothing */
        }
       }
      }
     }
     else
     {
       lcd.clear();
       lcd.print("Alcohol ");
       lcd.setCursor(3,2);
       lcd.print("Detected");
       delay(500);
       digitalWrite(relay_Pin, LOW);
       delay(200);
       digitalWrite(buzzer_Pin, HIGH);
       delay(200);
     }
   }
  }
  else
  {
    lcd.clear();
    lcd.print("Seat Belt");
    lcd.setCursor(3,2);
    lcd.print("not Detected");
    digitalWrite(relay_Pin, LOW);
    delay(200);
    digitalWrite(buzzer_Pin, HIGH);
    delay(200);
  }
}
```

```
void gps_read()
{
 byte a;

  if(Serial.available())
  {
    a=Serial.read();

   //Serial.write(a);

    while(gps.encode(a))   // encode gps data
    {
      gps.get_position(&lat,&lon); // get latitude and longitude

      Serial.println("Position: ");
      Serial.print("lat:");
      Serial.println((lat*0.000001),8);
      Serial.print("log:");
      Serial.println((lon*0.000001),8);
    }
  }
}
```

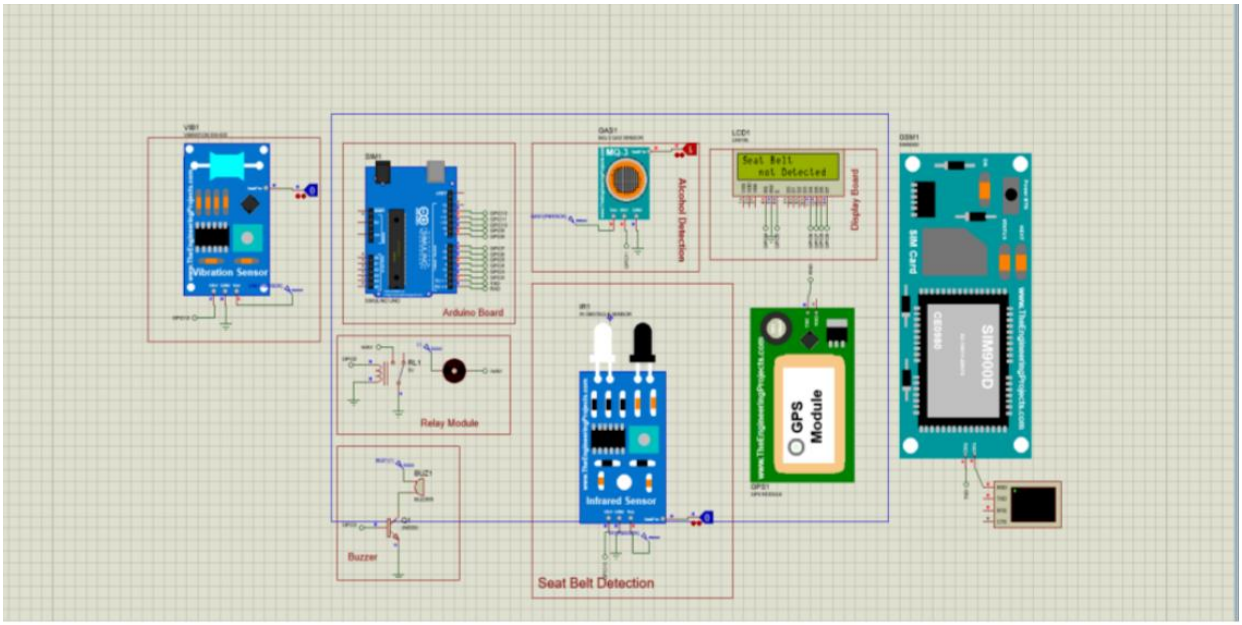
RESULT ANALYSIS

Circuit Diagram

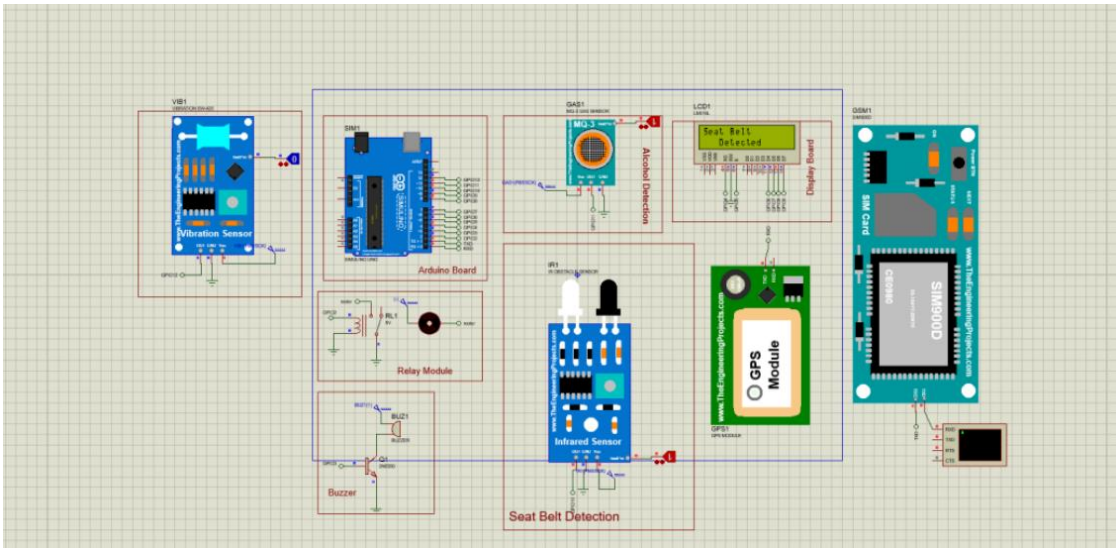


Simulation Results

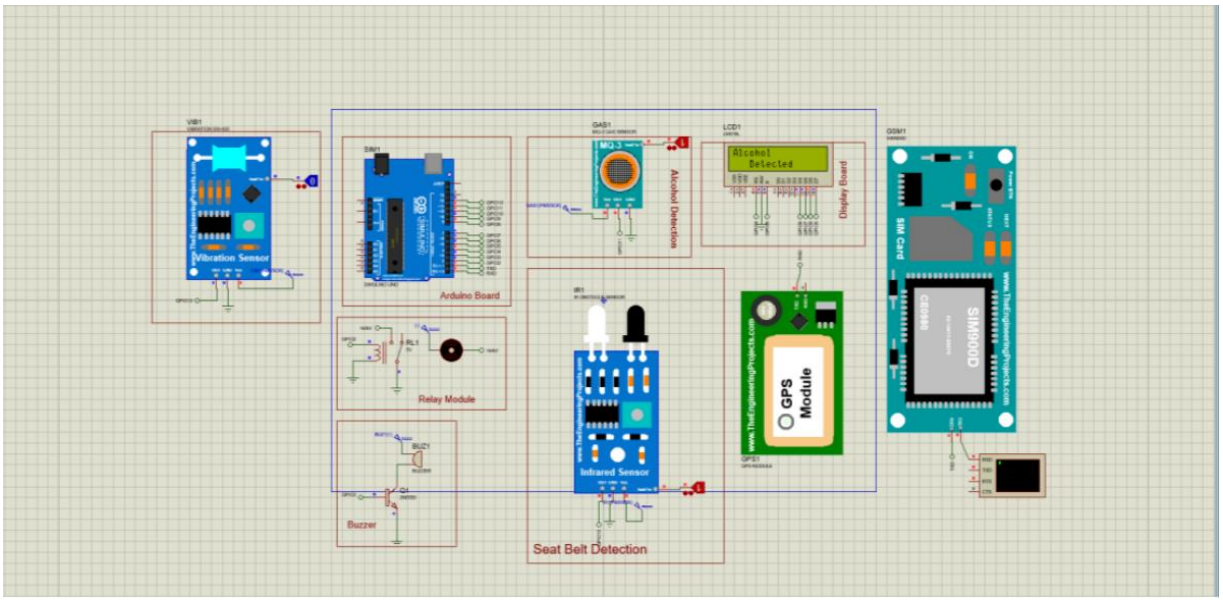
1) Seat belt not detected



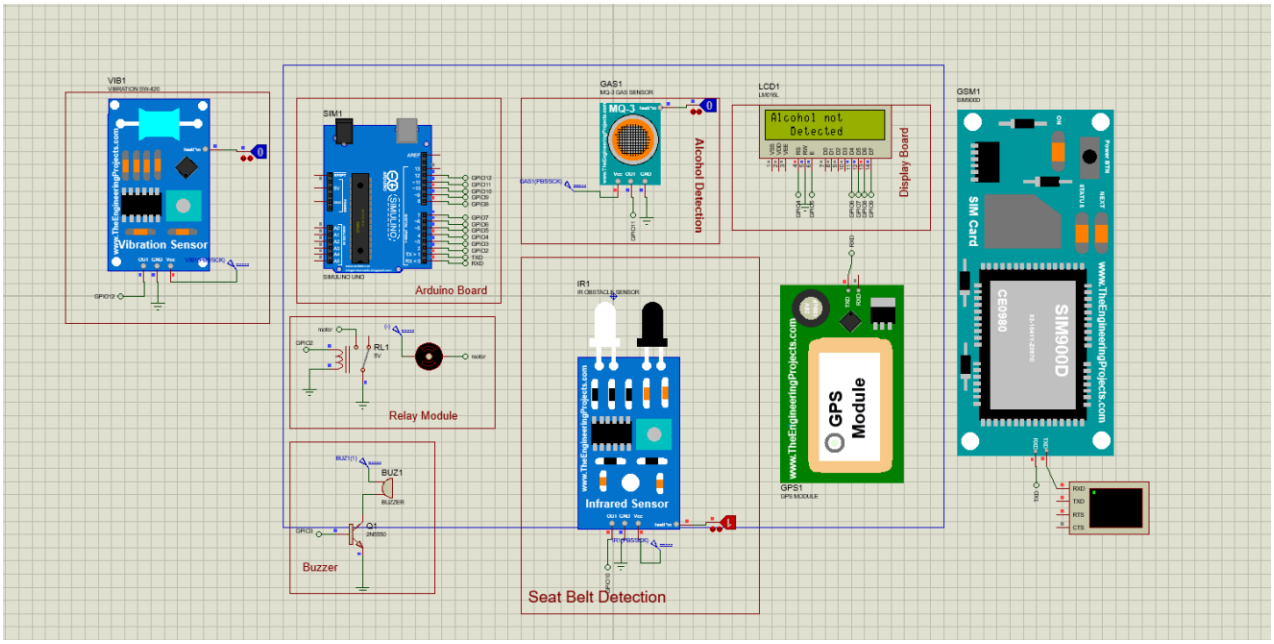
2) Seat belt detected



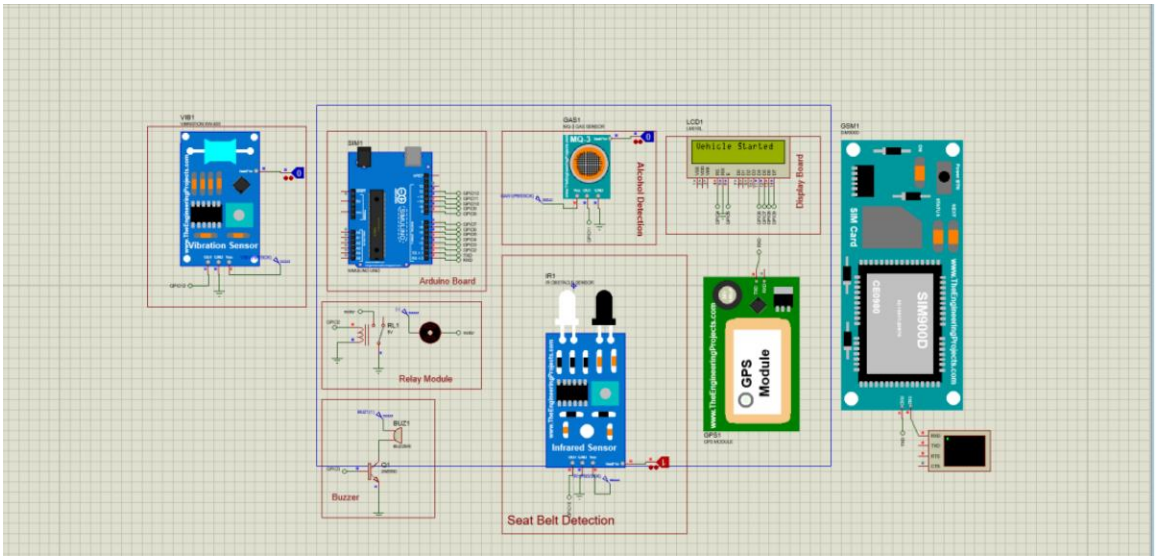
3) Alcohol detected



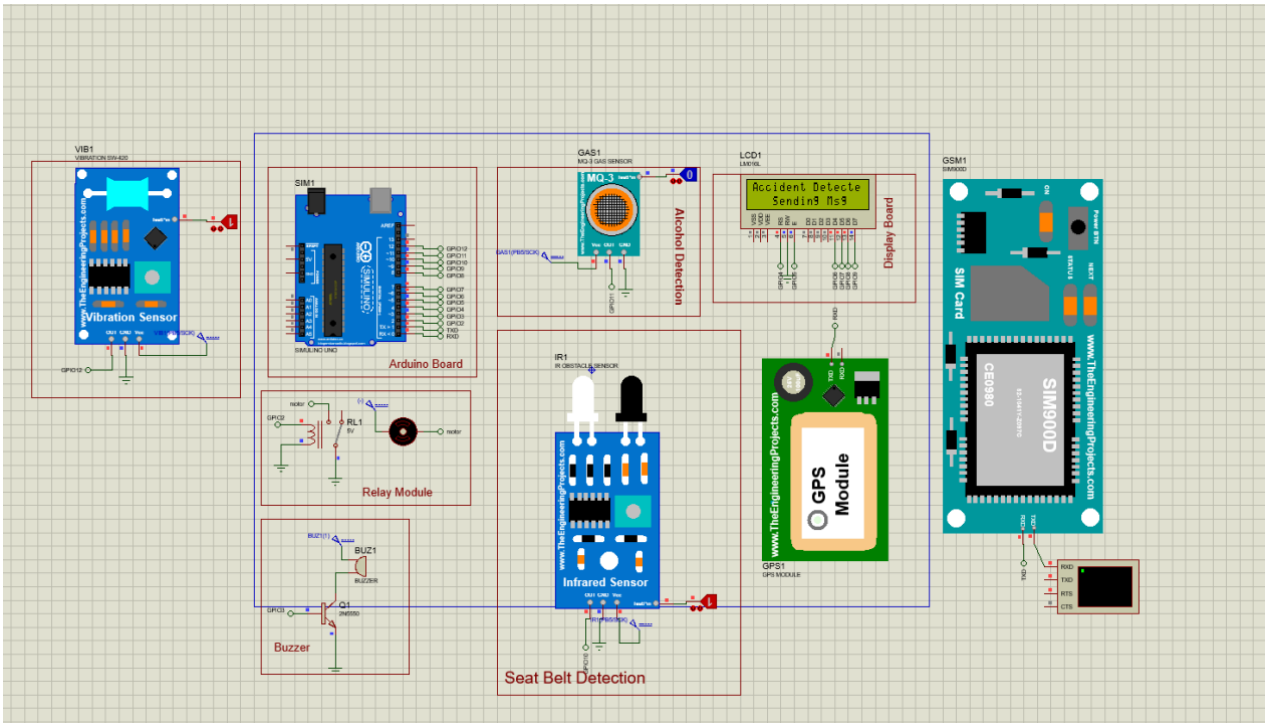
4) Alcohol not detected



5) Vehicle started



6) Accident detected



7) Virtual Terminal

```
AT+CMGF=1
OK
AT+CMGS="+919922512017"

Sending Location to Emergency Contact
Accident Detected
please check location
lattitude:30.23663902
longitude:-97.82145690


Accident Detected in Zone 1 Vellore
Sending Location to hospital:
Chettinad Health Center
AT+CMGS="97453342123"


Accident Detected Please sent Emergency Services
Location:
lattitude:30.23663902
longitude:-97.82145690
```

CONCLUSION

The accident detection system proposed in this project could save lives of those involved in accidents. What's impressive about this system is that it's user-friendly, making it easy for even non-tech savvy individuals to use. The system comprises two parts - the equipment part and the programming part. The equipment part has accident detection sensors linked to an Arduino board that's installed in the vehicle. The programming part is an Android application installed on the driver's Smartphone, which provides a detailed map of the accident location. This system is affordable, secure, and straightforward to operate. Its primary objective is to reduce the number of casualties caused by accidents. If successful, it could significantly improve road safety for drivers and passengers.

REFERENCES

[1] Bansal, B.N., & Garg, V. (2019). Development of Message Queuing Telemetry Transport (MQTT) based Vehicle Accident Notification System.

[2] Manuja M et. al., (2019). Iot Based Automatic Accident Detection And Rescue Management In Vanet. SSRG International Journal of Computer Science and Engineering (SSRG – IJCSE), ISSN: 2348 – 8387.Pp. 36-41.

[3] Mohammadrezaei, Mahziar & Fard, Hamed & Niaky, Reza & Soltani, Behnam. (2020). IoT-Based Vehicular Accident Detection Systems.

[4] H. M. Sherif, M. A. Shedid and S. A. Senbel, "Real time traffic accident detection system using wireless sensor network," 2014 6th International Conference of Soft Computing and Pattern Recognition (SoCPaR), Tunis, Tunisia, 2014, pp. 59-64, doi: 10.1109/SOCPAR.2014.7007982.

[5] Abilash V V , Aljo Emerson , Tony Sebastian , Vishnu C, Rashmi P C, 2021, Efficient Accident Detection and Notification System, INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY (IJERT) Volume 10, Issue 07 (July 2021).