COLLISION DETECTION WARNING SYSTEM AND ALERT SYSTEM

A Project Report

Submitted in partial fulfilment of the

Requirements for the award of the Degree of

BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)

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MAHARASHTRA
2020

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DEPARTMENT OF INFORMATION TECHNOLOGY

CERTIFICATE

This is to certify that the project entitled **COLLISION DETECTION WARNING SYSTEM AND ALERT SYSTEM** is bonafied work of **ASHISH BABAN KOKANE** bearing Seat.No: _____ submitted in partial fulfilment of the requirements for the award of degree of BACHELOR OF SCIENCE in INFORMATION TECHNOLOGY from University of Mumbai.

Internal Guide **Coordinator**

External Examiner

Date: **College Seal**

DECLARATION

I hereby declare that the project entitled, **"COLLISION DETECTION WARNING SYSTEM AND ALERT SYSTEM"** done at **SDSM College**, has not been in any case duplicated to submit to any other university for the award of any degree. To the best of my knowledge other than me, no one has submitted to any other university.

The project is done in partial fulfilment of the requirements for the award of degree of **BACHELOR OF SCIENCE (INFORMATION TECHNOLOGY)** to be submitted as final semester project as part of our curriculum.

DIPU ANIL JHA

ABSTRACT

This is an Arduino –based collision detection warning system. This kind of system is the fastest growing safety feature in automotive industries. Such a system enables vehicle to identify the chances of collision and give visual and audio warning to driver, so that the driver can take necessary action to avoid collision. This project idea is based on an Arduino controller and the whole project will give you very good understanding of how this system works. The step-by-step method is explained so that you can make this system. The hardware connection, pin information and Arduino program is explained clearly.

The system is an collision detection warning system relying on GPS module and a GSM modem. In the case of an accident the system detects it using the fact that the vehicle would be suddenly decelerated in such a condition. An accelerometer continuously monitors the acceleration of the vehicle and will detect decelerations greater than threshold value and send the data to the microcontroller via an ADC.

The controller compares this with the threshold set value and immediately sends an SOS message to preset numbers. With this message the controller also transmits the GPS coordinates of the vehicle which it continuously obtain from the GPS module. This system will highly aid the search and rescue of vehicles that have met with an accident.

ACKNOWLEDGEMENT

The successful completion of any task would be incomplete without mentioning all those people who made it possible, the constant and encouragement, crowns the effort with success.

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Chapter 1

Introduction

1.1 Background

Vehicles are an important way of transportation all over the world. There are many cases of road accidents every day in the world. Such accidents create traffic jams on road from hours to days, consequently resulting loss of valuable time. Frequency of road accidents is very high which causes a lot of damage to human life and valuable properties. Commonly many road accidents caused by collision between vehicles due to the inability of the drivers to sense the perimeter of their vehicles and other reason unawareness of nearby vehicles. Timely detection of other vehicles on road is of extreme importance to help avoid accidents and potential loss of human life, traffic jams especially in Hilly areas and reduced visibility condition in dense foggy areas like motorway. The high incidence of on road accidents due to collision propels our concern on collision detection & warning system mainly for dense fog affected areas.

Here in this project, we are going to build a Arduino based vehicle accident alert system using GPS, GSM and accelerometer. Accelerometer detects the sudden change in the axes of vehicle and GSM module sends the alert message on your Mobile Phone with the location of the accident . Location of accident is sent in the form of Google Map link, derived from the

latitude and longitude from GPS module. The message also contain the speed of vehicle in knots. See the Demo Video at the end. This Vehicle Accident alert project can also be used as a Tracking System and much more , by just making few changes in hardware and software.

Heavy machinery is crucial for many industries, but it can also be hazardous for users, pedestrians, and property. However, collision avoidance systems can make operation of these systems safer and more efficient by boosting visibility and safety while reducing liability. Here is a closer look at some of the advantages of collision avoidance systems.

Vehicle collision Prediction System which is based on VANETs solves the issue of collision avoidance .Intelligent control unit (ICU) and vehicle to vehicle communication is used which predict the probability of collision at highways .For the improvement of traffic situation in urban environment ant colony optimization is used. Based on ant colony optimization (ACO) International Research Journal of Engineering and Technology (IRJET) Dynamic Travel Path Optimization System (DTPOS) for the prediction of best path to a given destination is used. In this system, number of factors are taken into consideration such as average travel speed, average time taken by the cars for waiting and the number of cars that are stopped in a queue.

After vehicle detection follows the vehicle tracking process. The basic duty of vehicle tracking is to focus on the target all long until it's out of the range of the camera's eyesight. The cost of tracking detected target is much cheaper than carrying out another detection process in subsequent frames, because it exploits the property of continuity between adjacent frames and only tackles known local areas rather than the whole image.

1.2 Objectives

This system is an Arduino based collision detector. It is currently being use by automotive industries. This system enables vehicles to identify the chances of collision and gives visual or audio warning to the driver or it could also be used to burst open the air bags in a car to avoid serious injuries. This project is about making cars more intelligent by issuing warnings and taking automatic action necessary.

We will be using the ultrasonic sensor HR SC-04 that will receive and transmit ultrasonic waves and detect the distance of the distance of objects coming towards the vehicle. An

Arduino (AVR Based microcontroller) board for processing of data and for warning generation.

The main objectives of our projects is to provide optimum solution to the traffic hazards and the road accidents. According to this project When a vehicle meets with an accident, immediately vibration sensor will detect the signals and sends it to ARM controller. Microcontroller sends the alert message through the GSM MODEM including the location to Police control room or rescue team. So the police can immediately trace the location throug the GPS MODEM after receiving the information. Accident alert system main aim is to rescuing people in accidents. This accident alert system in it detects the accident and the location of the accident occurred and sends GPS coordinates to Specified mobile, Computer etc.

1.3 Purpose and Scope

1.3.1 Purpose

The purpose of every collision warning system is to alert drivers about the existence of unexpected or unseen vehicles. In producing an effective product, the system should provide a reliable real time warning system that is not only capable of warning the driver, but also gives the driver time to react, as well. In doing so, the system should pass through several phases.

Figure a: Intersection collision warning system

In the first phase, the system must detect vehicles approaching the intersection and capture all data needed for collision prediction in real time. The sensing functionality used should have the ability to differentiate between signals coming from the vehicle and extraneous noise. During the second phase, acquired telematic data is transmitted to the base station. The use of a transceiver is required. After the BS receives the data, it is placed into input queues for analysis. If the analysis in the third phase results in a high probability of collision, a warning system is activated to alert drivers of possible collision.

1.3.2 Scope

After the invention of airbags many casualties has stopped. Anyhow, the pressure created when the airbags burst open sometimes causes neck injuries. Moreover, the system of airbags opening is not up to the mark. Airbags might burst open in any minor accident. Although airbags are very helpful, it still has its own drawbacks. Our collision detector will be much smarter and much efficient then the airbags. We will be using sensors that will detect any collision possibilities and give warning to driver so that he can be alert. If the accident cannot stopped by just warnings, the car will automatically apply brakes and decrease the speed to a certain amount, if this is also not possible or the speed of the car is too high the last resort will be the airbags. Well renowned automobile brand Volvo are using such sort of principles in their latest trucks. These trucks detects any car in front of it and the braking systems in these trucks is so advanced that it comes to a complete stop in just a span of more inches and prevents the chance of any accident.

Scope Of Alert System

We can monitor some parameter of vehicle like overheat or LPG gas leakage.

We can dial an emergency call if vehicle goes out of a certain/pre-dedicated track.

This system can be interfaced with vehicle airbag system that prevent vehicle occupants from striking interior objects such as the steering wheel or window.

1.3.3 Applicability

The proposed system deals with the detection of the accidents. But this can be extended by providing medication to the victims. At the accidents spot. By increasing the technology we can also avoid accidents by providing alerts system that can stop the vehicle to overcome the accidents.

The system can be interfaced with vehicle airbag system that prevents vehicle occupants from striking interior objects such as the steering wheel or window. This can also be developed by interconnecting a camera to the controller module that takes the photograph of the accidents spot that makes the tracking easier.

1.4 Achievements

The goal of this task was to define a test methodology at the Driver-Vehicle-System level for the countermeasure system investigated. The deliverable was a summary report including a test protocol design to assess the crash reduction potential for these countermeasures. Although the original scope of the task was only to develop this test protocol, a near term test protocol proposal was added to the driver-vehicle system test protocol. The driver-vehicle system proposal did address the statement of work but it required an investment of significant resources to develop and implement.

1.5 Organisation of Report

The balance of this report is organized as follows. Chapter 2 will discuss the available for technologies for collision detection warning system. Current research will be presented as well. Chapter 3 will discuss the presented collision detection warning system. To provide a problem definition and system requirements are listed. The chapter also lists the chosen system components and gives logical analysis for each choice. Afterwards, a detailed hardware description is presented. Chapter 4 In this chapter logical explanation of the algorithms used. represents the processing aspect of the system.

All the software algorithms that are used to discussed and presented. Chapter 4 will present simulated test results that was conducted in a lab sitting and provide appropriate discussion for each test.

Chapter 2

Survey Of Technologies

Nihalahmad Shikalga, 2015[1], Each year there have been over 40,000 fatalities and 2,788,000 non-fatal injuries due to traffic accidents in the United States. In addition, it is predicted that hospital bills, damaged properties and additional accident-related costs will add up to approximately one to three percent of the world`s gross domestic product. Accordingly, developing a collision warning system that is capable of preventing accidents regardless of unexpected conditions is of great importance. Although there have been a number of technological innovations in vehicle safety, the number of accidents continues to rise. This is especially true for intersection accidents. It has been reported that nearly 30% of the reported accidents in the United States due to intersection collision. This report presents an intersection warning system framework ICW that utilizes the concept of Wireless Sensor Network (WSN) to perform even driven operations.

One Drawback to the aforementioned research projects is that all are vehicle dependent, i.e. the vehicle is equipped with either sensors or a warning system.

Today in this article we are going to build a project called Collision Detection And Alert System using Arduino UNO, GSM module, GPS module and Vibration Sensor Module.

Savita Soma, April 2017[2], Transportation has great importance in our daily life and it's development has made many of our chores much easy. IoT based vehicle accident detection system using GPS and WIFI has gained attention. When accident occurs, this system sends short message to WhatsApp of a mobile number via Wi-Fi over internet. Message will give longitude and latitude values. From these values location of accident can be determined.

Arun Francis G, November 2018[3], Now a days, a major part of the accident are due to the uneven interruptions. Speed is one of the reasons for most of vehicle accidents. Hope this project will provide the solution for this drawback. If emergency services get the accident information in time, then many lives could have been saved. If a vehicle meets with an accident, the accelerometer and ultrasonic sensor detect the signal and sent it to the Arduino .The project is helpful in detecting the accident and alerting the near-by help center by tracking the geographic location. In future, we can enhance the project by capturing the accident images using wireless webcam.

Mahendra Vucha, March 2019[4], As the usage of vehicles is increasing drastically, the hazards due to vehicles is also increased. The main cause for accidents is high speed, drunk and drive, diverting minds, over stress and due to electronic gadgets. This paper deals with accident detection system that occurs due to carelessness of the person who is driving the vehicle. This introduces accident alerting system which alerts the person who is driving the vehicle. If the person is not in a position to control the vehicle then the accident occurs. Once the accident occurs to the vehicle this system will send information to registered mobile number.

Chapter 3

Requirements And Analysis

3.1 Problem Definition

3.1.1 Problem Definition

To build proper and full proof system that can't be plagued by accident. It provides more accuracy in detection of ride the alcoholic person and save people's life that seat in the car in the situation of an accident.

3.1.2 Problem Solution

For a car, accident detection will be simply dropped by using GSM (SIM 900A) module and GPS module. If ant state of affairs is formed by the car crash or collision by any angle, the system sends the message to closed 108 (Ambulance) Service centre at the moment with its accident location.

3.2 Requirements Specification

3.2.1 Safety Effectiveness

Safety can be computed by comparing the vehicle's collision rate to the population's "normal" collision rate.

When the system starts, a visual and audio alert should be given to the driver

The driver must have override capability (by pressing the brake)

3.2.2 Efficiency

The system will attempt to return to steady state velocity as soon as the potential hazard of a pedestrian is no longer present.

Collision detection always has priority over time efficiency.

3.2.3 Vehicle

The vehicle for this application will have a normal steady state speed of 50km/h.

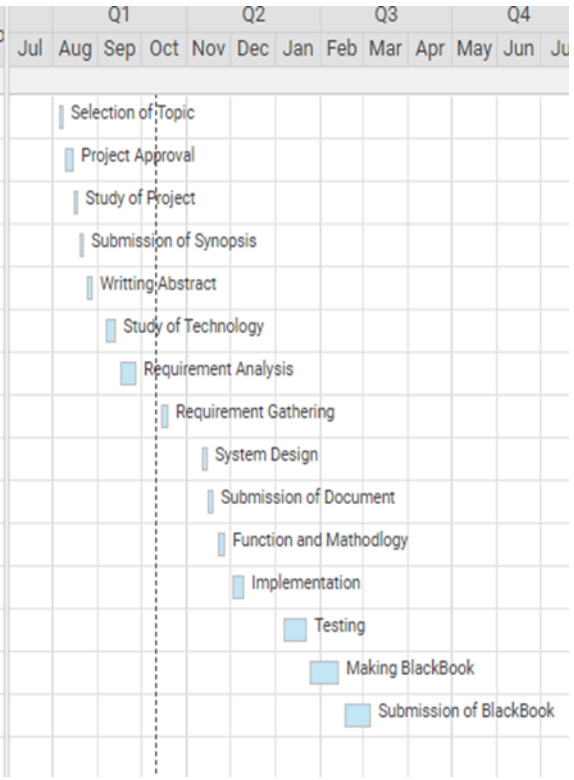
After the auto brake apply, the vehicle will return to a steady state speed with an acceleration of 2.45m/s^2.

The width of the vehicle is 2m.

The driver may be present in a semi-automated vehicle, or may not be present in a full-autonomous vehicle.

3.3 Planning and Scheduling

Task Name	Start	Finish	Duration	Predecesso
Selection of Topic	08/05/19	08/05/19	1d	
Project Approval	08/09/19	08/14/19	4d	
Study of Project	08/15/19	08/16/19	2d	
Submission of Synopsis	08/19/19	08/21/19	3d	
Writting Abstract	08/24/19	08/27/19	3d	
Study of Technology	09/06/19	09/12/19	5d	
Requirement Analysis	09/16/19	09/26/19	9d	
Requirement Gathering	10/14/19	10/18/19	5d	
System Design	11/11/19	11/14/19	4d	
Submission of Document	11/15/19	11/18/19	2d	
Function and Mathodlogy	11/22/19	11/26/19	3d	
Implementation	12/02/19	12/09/19	6d	
Testing	01/06/20	01/21/20	12d	
Making BlackBook	01/24/20	02/12/20	14d	
Submission of BlackBook	02/17/20	03/05/20	14d	



3.4 Software and Hardware Requirements

Software of Collision Detection and Alert System using Arduino

The software is written in Arduino programming language and compiled in Arduino IDK. You can directly download the software code from the link given below. Before using the code change the mobile number.

Hardware Parts of Collision Detection and Alert System using Arduino

Arduino Uno

It is the central control unit for the project Accident detector and alert system. It basically gathers information from vibration sensor module and GPS sensor module, process it and display output to LCD and send message alert to the mobile.

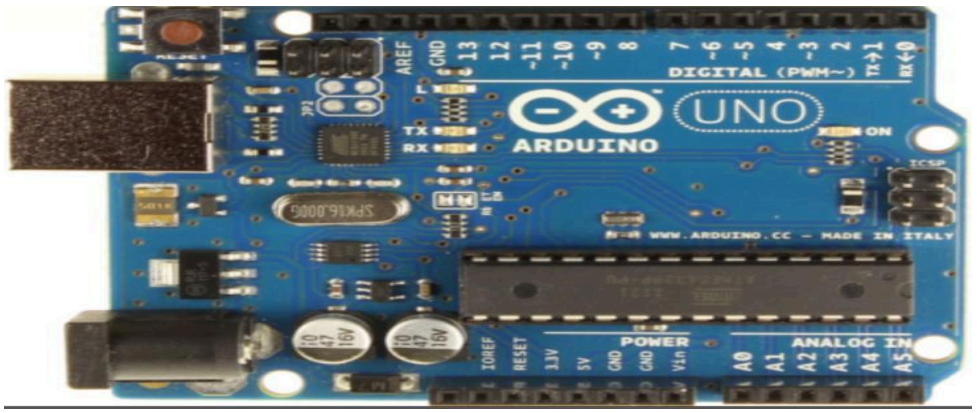


Figure: 3.4.1 Arduino Uno

GSM Module (SIM900a)

SIM900 GSM module is preferred for this project for communication between accident detector and alert system and mobile phone. It is basically tri-band work on various frequency range (EGSM 900 MHz, DSC 1800 MHz and PCS 1900 MHz). In order to make communication between GSM mobile and Arduino Uno we had only used Rx pin of GSM module and Tx pin of Arduino pin.

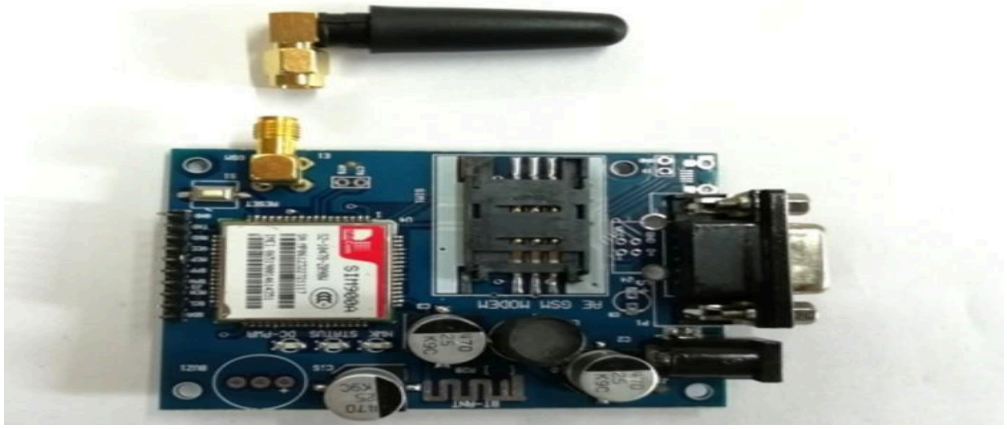


Figure: 3.4.2 GSM Module (SIM900a)

GPS Module (SIM28ML)

SIM28ML GPS module is preferred for this project. The main function of this module is to transmit location data to the Arduino Uno. The connection between arduino uno and GPS module is set by connection transmit pin Tx of GPS to Arduino Uno Rx pin. This module operates in L1 frequency (1575.42 MHz) and up to a fix territory of about 10 meters in sky, it

generates accurate information. The output of GPS module is in NMEA format which includes data like location in real time.

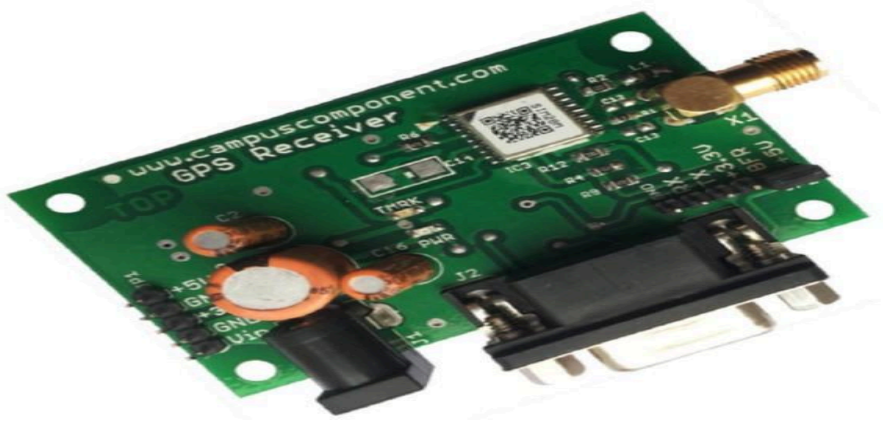


Figure: 3.4.3 GPS Module (SIM28ML)

Vibration Sensor Module (SW-18010P)

SW-18010P vibration sensor module is preferred for this project. As we have already listed that vibration sensor module is designed to analyze linear velocity, displacement and acceleration. It is basically a spring type vibration sensor module thus it detects vibration in any direction.

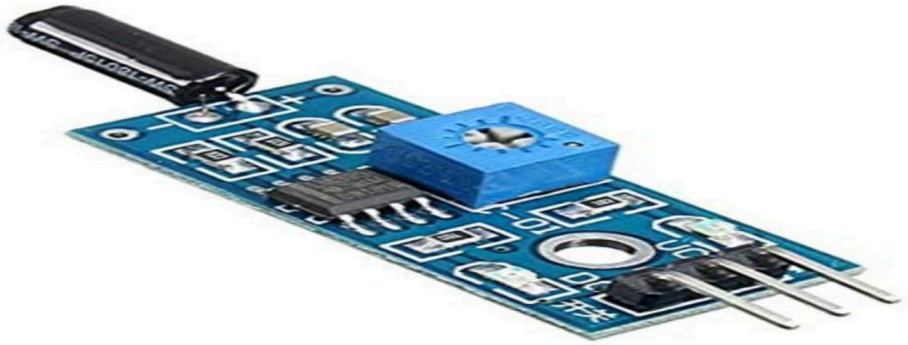


Figure: 3.4.4 Vibration Sensor Module (SW-18010P)

16×2 LCD Module

LCD module used in this project is of 16×2 alphanumeric type which is used to display alphabet, number and special character. LCD interface with a Arduino in 4-bit mode by connecting higher bit data line of LCD (pin 11, 12, 13 and 14) to digital pin (pin 8, 9 10 and

11) of Arduino as shown in circuit diagram. Similarly, pin 12 and pin 13 of Arduino is connected to RS and E pin of LCD. The RW pin of LCD is grounded to perform write operating on LCD to perform write operation on LCD.

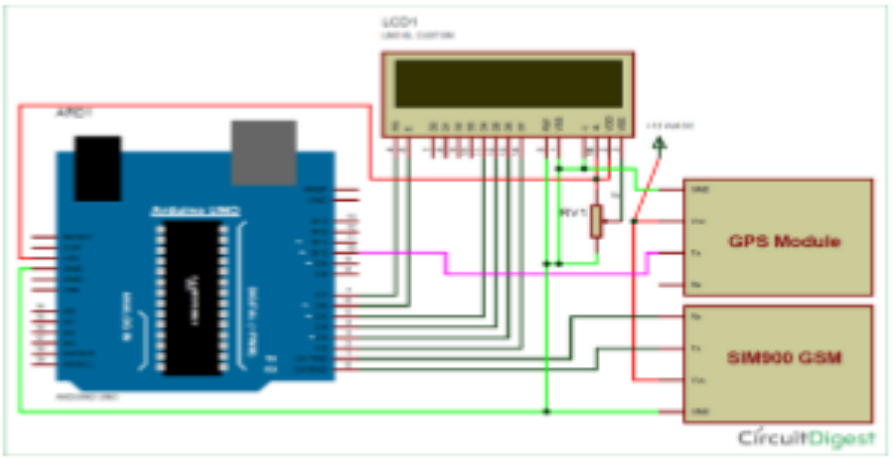


Figure: 3.4.5 Working module of collision detection and alert system

10K Variable Resistor

A variable resistor is a device that is used to change the resistance according to our needs in an electronic circuit. A variable resistor consists of a track which provides the resistance path. Two terminals of the device are connected to both the end of the track. The third terminal is connected to a wiper that decides the movement of the track. The motion of the wiper through the track helps in increasing and decreasing the resistance.

Figure: 3.4.6 10K Variable Resister

Ultrasonic Sensor HR SC-04

HC-SR04 distance sensor is commonly used with both microcontroller and microprocessor platforms like Arduino. Power the sensor using a regulated +5V through the Vcc ad Ground

pins of the sensor. Used to measure the distance within a wide range of 2cm to 400cm can be used to map the objects surroundings the sensor by rotating it.

3.5 Preliminary Product Description

The sensor has Four pins: VCC, Trig, Echo, and GND. Connect:

VCC pin to 5V on controller

GND pin to GND on controller

Trig pin to pin-7 on controller

Echo pin to pin-4 on controller

Piezo buzzer has two pins:

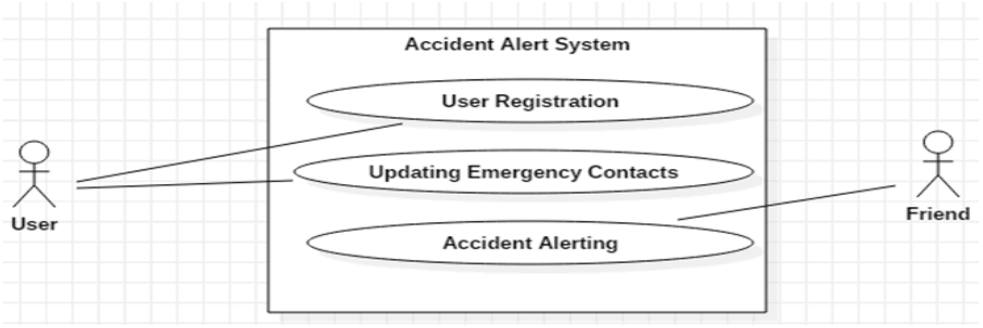
Connect one pin to pin-10 on controller

Connect another pin to GND on controller

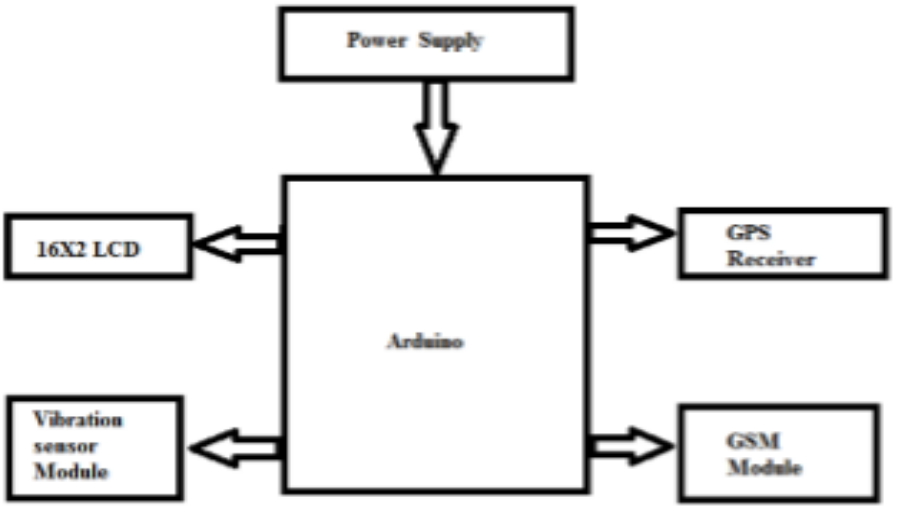
You have a USB data cabel that you get with buying the Arduino. With the data cable you, connect the computer to the Arduino board. After connecting the computer, you must select the board and port from the menu.

3.6 Conceptual Models

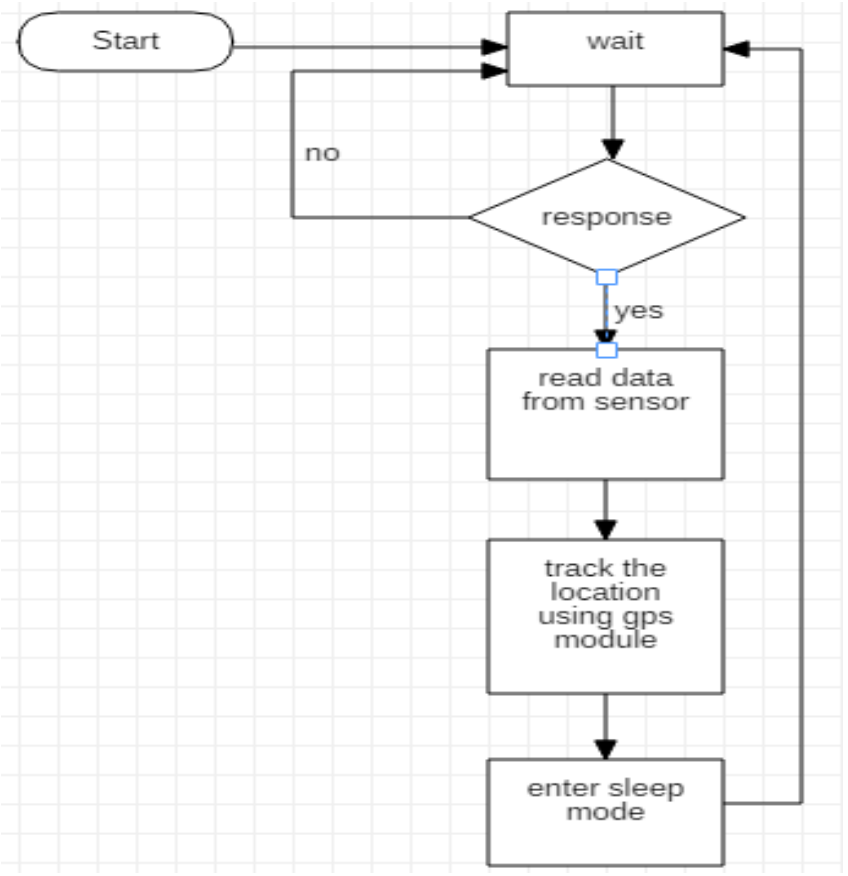
Use Case diagram



Block diagram of collision detection and alert system



Flow Chart diagram



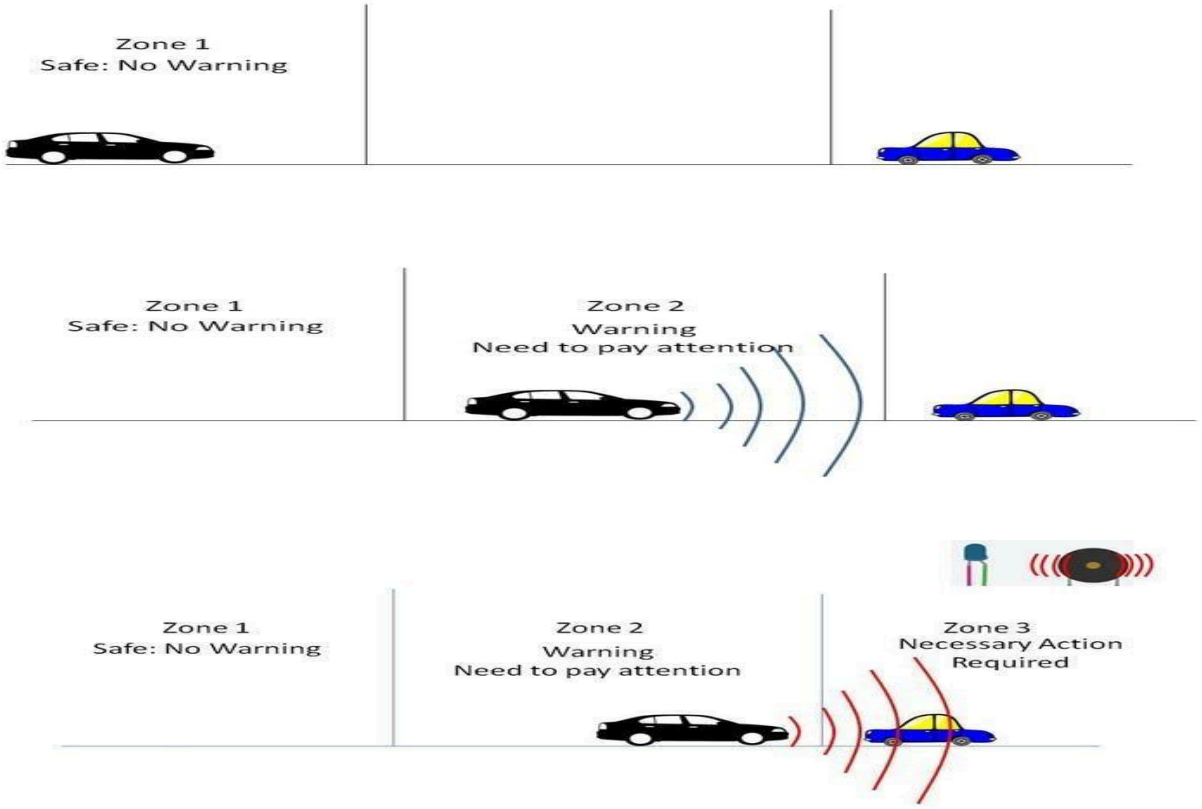
Chapter 4

System Design

4.1 Basic Modules

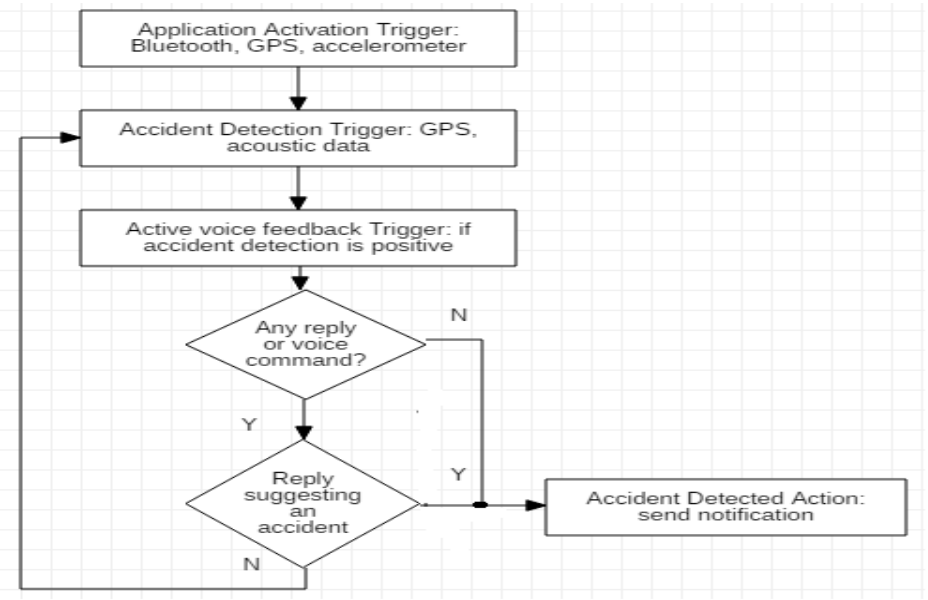
Let me explain for you how this system works. I defined three different zones:

- Zone 1: No warning
- Zone 2: Only visual warning (in this zone, driver has to pay attention)
- Zone 3: Both visual and audio warning (driver has to take necessary action to avoid collision)



4.2 Data Design

4.2.1 Schema Design

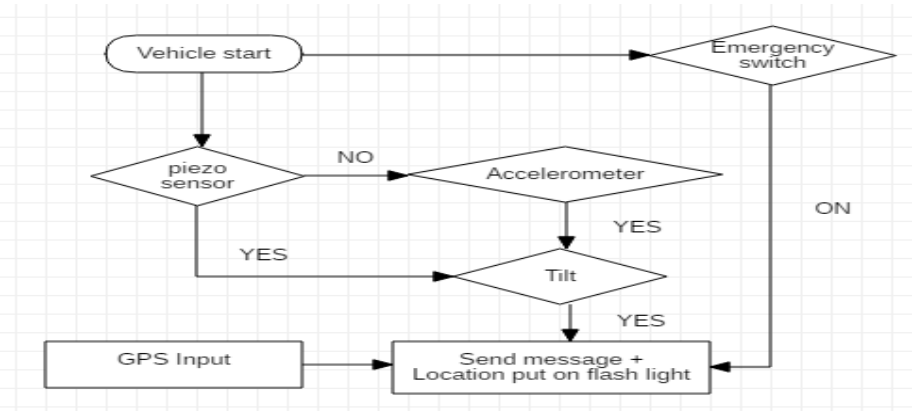


4.2.2 Data Integrity and Constraints

The proposed product includes various sensors like ultrasonic sensor, accelerometer, GPS, etc. and all the readings of these sensors are stored in the cloud every 3 seconds. The user can check the details whenever he wants. Whenever it detects an accident, an interrupt is triggered which immediately sends the location of the car to the nearest hospital, police and the person who's details are given as emergency contact.

4.3 Procedural Design

4.3.1 Logic Diagrams



4.3.2 Algorithm Design

Step 1: Please gather the following items

Computer: This is required to write program and flash program to the controller. Also, you need to install Arduino IDE which is available free on the Arduino website download section.

Controller: I used Arduino micro-controller.

Sensor: I used HR SC-04 ultrasonic sensor.

Piezo Buzzer: I used Piezo buzzer to make the audio warning.

GSM module: A GSM module is a chip or circuit that will be used to establish communication between a mobile device .

GPS module: GPS module can calculate its position and time.

LED: There are two colours of LED I used - red and blue.

Wires: Jumper wires are required to make hardware connections. You need to use all types of jumper wires like male-male, female-female and female-male.

Step 2: Connect all hardware

The hardware you gather in first step, now connect all of them to the controller through wires. Sensor to controller pin information .You have a USB data cable that you get with buying the Arduino. With this data cable, you connect the computer to the Arduino board. Now launch Arduino IDE. After connecting the computer, you must select the board and port from the menu.

Step 3: Write the program

In the previous step, we defined pin information for the hardware. Now, that info we'll use to write program instructions. Launch Arduino IDE and try to write the program by yourself.

Step 4: Flash the Arduino board

After making all the connections, we are ready to upload the program to the Arduino board.

4.4 User Interface Design

4.5 Security Issue

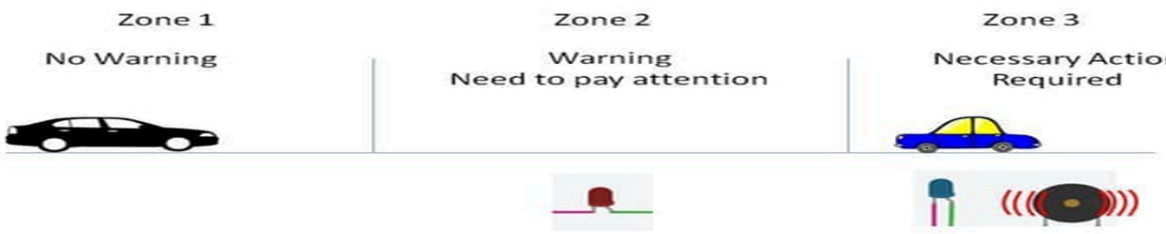
Vehicles are becoming smarter by the combining of greater power to compute connectivity solutions and the improvement in software visions. In modern vehicles automotive designs are interfaced with these features. This particular design includes keyless entry system and immobilizer system as the main weapons to prevent the vehicle theft.

This paper proposes an aim to design efficient security control for auto theft prevention system by adding notable enhancement features such as a fingerprint system, password and OTP generating system. It is also included with some rationalizing security features like GPS fencing, remote engine cut-off, and conveying location of vehicle as a message using GSM module. These features are implemented with the help of fingerprint recognition module, GPS Receiver, GSM cellular modem. Along with these feature accident detection module is also added.

4.6 Test Case Design

Vehicle collision warning system is developed to detect oncoming collisions between vehicle and to provide dangerous information to alert the driver. A collision indicates a conflict or an intersection between two vehicles.

The warning system will provide a warning when the estimated TTC is smaller than the specific threshold under the different operational scenario.


Zone 1
No Warning
Zone 2
Warning
Need to pay attention
Zone 3
Necessary Action
Required


Visual + Audible Warning inside
+

Chapter 5

IMPLEMENTATION AND TESTING

5.1 Implementation Approaches

Arduino Uno: The Arduino microcontroller is used to build the system. It processes the code defined and helps in proper working of system

Fig 5.1: Arduino Uno

Ultrasonic sensor : Ultrasonic sensor is **used** as a range finder or a distance calculator, It generates sound waves and waits for the echo and depending on the timing of the echo It calculates the distance between the **sensor** and the object.

Fig.5.2 Ultrasonic sensor

GSM and GPS Module (SIM 808): The GSM module is used to send SMS to authorized person for better security. GPS module helps to track the location of object in form Latitude and Longitude(GPS Coordinates).

Fig. 5.4 SIM 808 Module

Piezo electric sensor: A piezoelectric sensor is a device that uses the piezoelectric effect to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electric charge.

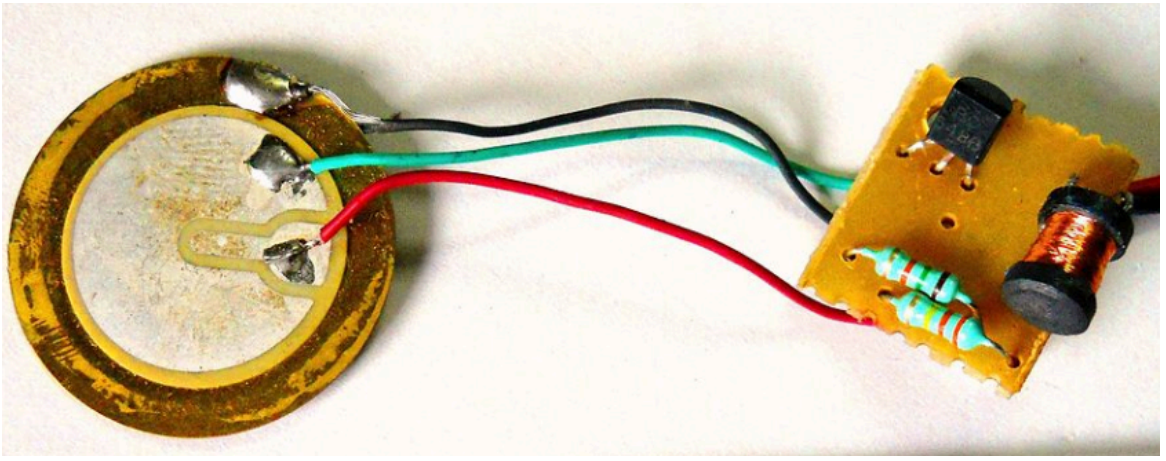


Fig 5.5 Piezo electric sensor

5.2 Coding Details and Code Efficiency

Pin Connections:

Ultrasonic sensor Module:

Ultrasonic sensor	**Arduino UNO**
Trig	PIN 3
Echo	PIN 4
VCC	5V
GND	GND

Buzzer Module:

Buzzer	**Arduino UNO**
I/O	PIN 5
VCC	5V
GND	GND

LCD Module:

LCD	**Arduino UNO**
LED -	GND
LED+	5V

DB 7	POT
DB6	PIN 6
DB5	PIN 7

GSM Module:

GSM	**Arduino UNO**
TX	PIN 8
RX	PIN 9
GND	GND

Piezo electric plate:

Piezo electric plate	**Arduino UNO**
5 V	5 V
Ground	Ground
R1	Pin 2

Code:

```
#include <SoftwareSerial.h>

#include <LiquidCrystal.h> // includes the LiquidCrystal Library

LiquidCrystal lcd(6, 7, 8, 9, 12, 13); // Creates an LC object. Parameters: (rs, enable, d4, d5, d6, d7)

SoftwareSerial mySerial(10, 11); // RX, TX

char dat = 0 ;

char serialData[100], lat[50],lon[50];

unsigned char start_f = 0, all_data_rec = 0, done = 0;

int i = 0, coma=0,k=0,x=0,y=0;


//predefine value

#define buzPWM 20   //0 to 255 fo changing buzzer sound freq

const long dist0= 27;//led ON

const long dist1 =20; // low freq buzz

const long dist2 =15;// mid freq buzz
```

```
const long dist3 =8;// high freq buzz and led on


//pin out
const int vib = 2; //pizo
const int pingPin1 = 3; //ultrasonic o/p
const int echoPin1 = 4; // ultrasonic i/p
const int buz = 5;   //buzzer
const int led = A0; // led


//variable
long duration, inches, cm ,temp;
int count=0,collision,val,c_flag=0,pre_flag=0;
  void beep(unsigned char delayms) { //creating function
  analogWrite(buz, buzPWM); //Setting pin to high
  delay(delayms); //Delaying
  analogWrite(buz ,0); //Setting pin to LOW
  delay(delayms); //Delaying


}


void mySerialRead()
{
  i=0;
  while(mySerial.available()>0)
  {
    serialData[i]=mySerial.read();
```

```
    i++;
  }serialData[i]='\0';
  Serial.print(serialData);
  Serial.println();
}
void readLatLon()
{i=0,x=0,y=0,k=0,coma=0;
  while(serialData[i]!='\0'){
    if(serialData[i] == ',')
    {
      coma++;
    }
    if(coma == 3 && serialData[i]!=',')
    {
      lat[x]=serialData[i];
      x++;
    }
    if(coma == 4 && serialData[i]!=',')
    {
      lon[y]=serialData[i];
      y++;
    }
    if(coma>4)break;
   i++;
  }lat[x]='\0';
  lon[y]='\0';
```

```
}
void setup() {


  ///***********sim808************************************
  Serial.begin(9600);
  mySerial.begin(9600);
  mySerial.print("ATE0\r\n");
  delay(200);
  mySerial.print("AT+CGPSPWR=1\r\n");
  delay(200);
  mySerialRead();
  //*********************************************************************
  lcd.begin(16, 2); // Initializes the interface to the LCD screen, and specifies the dimensions (width and height) of the display }
  lcd.print("Accident Avoidance");
  pinMode(vib, INPUT_PULLUP);
  pinMode(pingPin1, OUTPUT);
  pinMode(echoPin1, INPUT);
  pinMode(buz, OUTPUT);
  pinMode(led, OUTPUT);
  Serial.begin(9600);
  beep(1000);
  digitalWrite(led,LOW);
}
long microsecondsToInches(long microseconds) {
```

```
  return microseconds / 74 / 2;
}

long microsecondsToCentimeters(long microseconds) {
  return microseconds / 29.1 / 2;
}

void getlocation()
{
   mySerial.print("AT+CGPSSTATUS?\r\n");
  delay(200);
  mySerialRead();
  mySerial.print("AT+CGNSINF\r\n");
  delay(200);
  mySerialRead();
  readLatLon();
  Serial.print("lat:");
  Serial.println(lat);
  Serial.print("lon:");
  Serial.println(lon);
}
void sendSMS(){
  //Serial.println("Fire alert");
  mySerial.println("AT+CMGF=1");    //Sets the GSM Module in Text Mode
  delay(1000);  // Delay of 1000 milli seconds or 1 second
  mySerial.println("AT+CMGS=\"+919552775850\"\r");
```

```
  delay(1000);
  mySerial.print("Collision detected for vehical no. MH09AC456 at location\n\n");// The SMS text you want to send
  mySerial.print("Lat: ");
  mySerial.println(lat);
  mySerial.print("Lon: ");
  mySerial.println(lon);


  delay(100);
   mySerial.println((char)26);// ASCII code of CTRL+Z
  delay(1000);
}
void ultrasonic()
{
  digitalWrite(pingPin1, LOW);
  delayMicroseconds(2);
  digitalWrite(pingPin1, HIGH);
  delayMicroseconds(10);
  digitalWrite(pingPin1, LOW);
  duration = pulseIn(echoPin1, HIGH);
  cm = microsecondsToCentimeters(duration);
}
int collIn()
{
    collision = digitalRead(vib);
  //  Serial.println(collision);
```

```
 if(collision == 0){
  c_flag=1;
  return 1;
 }else {
  c_flag=0;
  return 0;
 }
}
void loop() {

 ultrasonic();
 val = collIn();
 //Serial.println(val);
 if(cm < dist0 && cm > dist1){
  digitalWrite(led,HIGH);
  lcd.clear();
 }
 if(cm>dist0){
  digitalWrite(led,LOW);
  lcd.clear();
 }
 if(cm < dist1 && cm > dist2)
  {
   digitalWrite(led,LOW);
   beep(200);
   lcd.clear();
```

```
 }
if(cm < dist2 && cm > dist3)
 {
   digitalWrite(led,LOW);
   beep(100);
   lcd.clear();
 }
if(cm < dist3 || collision == 0)
 {
   digitalWrite(led,HIGH);
   beep(50);
 }
 //Serial.println(c_flag);
if( c_flag == 1 )
 { if(pre_flag == 0){
   lcd.setCursor(0,0);
   lcd.print(" Collision!!!!");
   getlocation();
   lcd.setCursor(0,1);
   lcd.print("Sending SMS");
   sendSMS();
   lcd.setCursor(0,1);
   lcd.print("SMS sent");

   pre_flag = 1;
  }temp=millis();
```

```
  }
}
```

5.2.1 Code Efficiency:

The code is written in such a way that the Ultrasonic sensor detect the object by which they show visual and audio alert to driver. The code uses distance in units to detect the object and give warning to driver LEDs and Buzzer are used to in the system

LEDs and Buzzer are blink and beep as per code defined in the system.

Code for GSM and GPS module sends the SMS when accident happened which is detected by vibration sensor.

GSM and GPS works perfectly by using code defined in sections. The message send perfectly as per mobile number defined in code.

5.3 Testing Approach

In testing phase we tested first the each unit of the system like Arduino with Ultrasonic sensor, LED and Buzzer, GSM and GPS Module(SIM 808) etc. and then tested the whole system by integrating all the units of the system. After testing the system, we introduced the system to our classmates to test the system in live environment.

5.3.1 Unit Testing

In this type of testing all components are tested differently as a single-single module.
Arduino UNO: Arduino tested by uploading simple codes in it.
Ultrasonic sensor: Whether it detect the object in defined range or not.
Piezo buzzer Module: We check the sensor by using Arduino , to check its works or not.

GSM and GPS Module : The module tested by calling and sending SMS to specified mobile number. Also the module was tested using 2G, 3G and 4G SIM cards.

5.3.2 Integrated Testing

In this testing all the components are tested as a whole system.

All the components connected together as per mentioned in pin connections and tested as a whole system. Input was given according to test cases.

5.3.3 Beta Testing

Beta testing means testing the system in live environment.

System was tested by our classmates in the college to check the functionality and to get their opinions about the system.

5.4 Modification and Improvements

As the two different system in project the code is modify such way that it will work on one Arduino.

GSM module was not working with 4G only card (Jio), so we used other cellular networks which provide 2G, 3G and 4G networks in same SIM card.

While using AT commands on GSM module the data displayed on serial monitor

5.5 Test Cases

Test Case 1: Using Arduino checking the range of ultrasonic sensor.

Test Case 2: Connecting components to checking Visual and Audio alert.

Test Case 3: Using 2G, 3G and 4G SIM cards in GSM module.

Test Case 4: Sending SMS using GSM Module.

Test Case 5: Giving inputs repeatedly to check efficiency of system.

Chapter 6

RESULTS AND DISCUSSION

6.1 Test Reports

In case of Ultrasonic sensor , which calculate he distance of object. As per the range of Object we apply the different input in code to find appropriate range by using Arduino. Ultrasonic sensor works perfectly in different inputs , Which helps to Analyze as per our requirement.

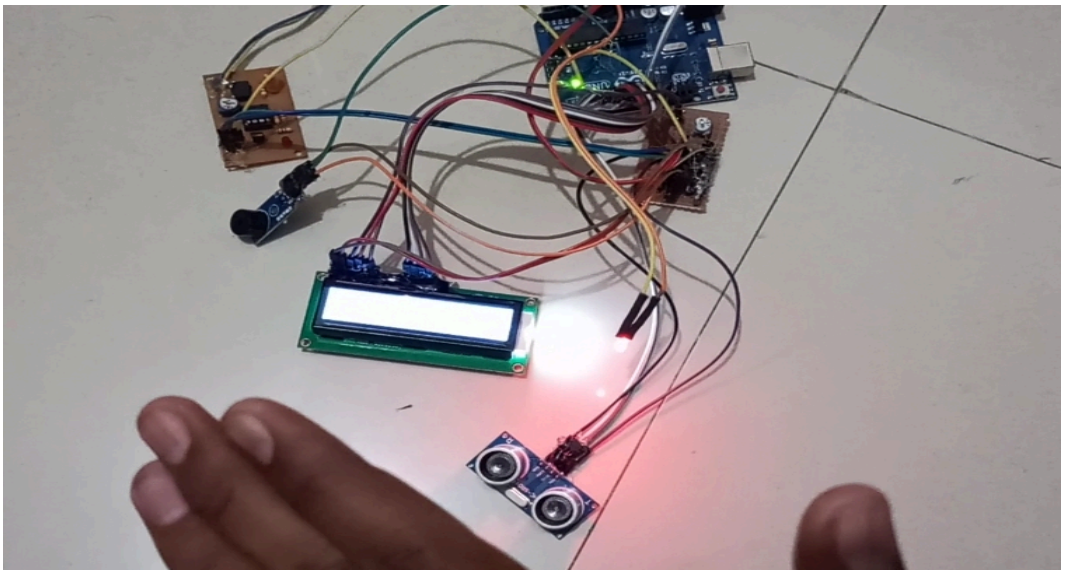


Fig. Ultrasonic sensor to see visual alert

Different electronics components works perfectly fine when connected to circuit. Components gets quickly turn on and off without any delay. Warning system works perfectly as per distance used in code.

GSM module works on 2G and 3G network without any error. We can send SMS using AT commands. All required commands are defined in the code, so system will automatically send SMS.

.

Fig. Accident detection and Sending SMS to person

Commands does not affect the system performance. System works fine and stable in such situations.

6.2 User Documentation

The Working of the system, As per zone which can be detected by ultrasonic sensor. The First Zone it starts with no detection means No warning. In second zone Ultrasonic sensor detect the Object then the System show warning to driver. At the third zone , when object gets closer to Ultrasonic sensor it Show visual and audio alert to driver ,which can using LEDs and Buzzer .They can Blink and beep to show Warning to driver

In the Alert system, if In case Accident is happened by Human mistake then Piezo buzzer can detect

it and send message to person with Its GPS coordinates where accident is happened. The basic Functionality of the system is Detect the object and send message to authorized person.

Chapter 7

CONCLUSIONS

7.1 Conclusions

7.1.1 Significance of the System

This kind of system is the fastest growing safety feature in automotive industries. Such a system enables vehicles to identify the chances of collision and give visual and audio warning to driver so that driver can take necessary action to avoid collision

Automatic alert system for vehicle accidents is introduced the main objective is to control the accidents by sending a message to the registered mobile using wireless communication techniques. When an accident occurs at city, the message is sent to the registered mobile through GSM module in less time.

7.2 Limitations of the System

7.2.1 System cannot work using 4G only SIM card. It will require 2G/3G/4G SIM card.

7.2.2 The SMS part of the system will not work if cellular network is not available.

7.2.3 The SIM card should be recharged over the time to get SMS updates.

7.2.4 High voltage or large fluctuations in electricity may damage the system components.

7.3 Future Scope of the Project

The Collision detection warning system and safety warning system is still a long way to go. However as computing power, sensing capacity and wireless connectivity for vehicle is rapidly increase.

As technology improves a vehicles will become advance. Advanced collision detection system and new sensing technologies can be highly beneficial in Future.

The proposed system deals with the detection of the accidents. But this can be extended by providing medication to the victims at the accident spot. By increasing the technology we can

also avoid accidents by providing alert systems that can stop the vehicles to overcome the accidents

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GLOSSARY

IoT: Internet o Things

GPS: Global positioning System

GSM: Global System for Mobiles

SIM: Subscriber Identification Module

SMS: Short Message Service

LED: Light Emitting Diode