Visvesvaraya Technological University

Belgaum, Karnataka-590 018

A Project Report on

"Automatic Accident Detection and Ambulance Rescue System"

Project Report submitted in partial fulfillment of the requirement for the award of the degree of

Bachelor of Engineering
In
Electrical & Electronics Engineering

Submitted by

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2019-2020

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Certificate

Certified that the project work entitled **"Automatic Accident Detection and Ambulance Rescue System"** carried out by Ms. SPURTHI RAJ N, USN 1CR16EE082;Ms. RAJYALAKSHMI M, USN 1CR16EE057; Ms. SIRISHA S, USN 1CR16EE079; Ms. TEJASWINI M N , USN 1CR16EE086 are bonafied students of CMR Institute of Technology, Bengaluru, in partial fulfillment for the award of Bachelor of Engineering in Electrical & Electronics Engineering of the Visvesvaraya Technological University, Belgaum, during the year 2019-2020. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the Report deposited in the departmental library.

The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said Degree.

Signature of the Guide	*Signature of the HOD*	*Signature of the Principal*
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DECLARATION

We, [**Ms. Spurthi Raj N(1CR16EE082), Ms. Rajyalaksmi M (1CR16EE057), Ms. Sirisha S (1CR16EE079), Ms. Tejaswini M N(1CR16EE086)],** hereby declare that the report entitled **"Automatic Accident Detection and Ambulance Rescue System"** has been carried out by us under the guidance of **Dr. Ratna Rahul T,** Assistant professor, Department of Electrical & Electronics Engineering, CMR Institute of Technology, Bengaluru, in partial fulfillment of the requirement for the degree of **BACHELOR OF ENGINEERING in ELECTRICAL & ELECTRONICS ENGINEERING**, of Visveswaraya Technological University, Belgaum during the academic year 2019-20. The work done in this report is original and it has not been submitted for any other degree in any university.

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Abstract

The rapid growth of technology and infrastructure has made our lives easier. The advent of technology has also increased the traffic hazards and the road accidents take place frequently which causes huge loss of life and property because of the poor emergency facilities. Our project will provide an optimum solution to this draw back. According to this project when a vehicle meets with an accident immediately Vibration sensor will detect the signal and sends it to Microcontroller. Microcontroller find the location coordinates of accident spot using GPS and sends the alert message including geographic allocation coordinates through the GSM Module to ambulance unit. So, the rescue team in the ambulance can immediately trace the location by putting geographical location coordinates in Google maps. After conforming the location of accident spot the ambulance unit will starts its rescue operation. This system also controls the traffic signals in the path of ambulance and helps ambulance to reach hospital in minimum time.

Acknowledgement

The satisfaction and euphoria that accompany the successful completion of any task would be incomplete without the mention of people, who are responsible for the completion of the project and who made it possible, because success is outcome of hard work and perseverance, but stead fast of all is encouraging guidance. So with gratitude we acknowledge all those whose guidance and encouragement served us to motivate towards the success of the project work.

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We are thankful to all the faculties and laboratory staffs of ***Electrical and Electronics Engineering Department, CMR Institute of Technology, Bengaluru*** *for helping us in all possible manners during the entire period.*

Finally, we acknowledge the people who mean a lot to us, our parents, for their inspiration, unconditional love, support, and faith for carrying out this work to the finishing line. We want to give special thanks to all our friends who went through hard times together, cheered us on, helped us a lot, and celebrated each accomplishment.

Lastly, to the ***Almighty****, for showering His Blessings and to many more, whom we didn't mention here.*

CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS AND SYMBOLS

GPS - Global Positioning System

GSM - Global System for Mobile Communication

LCD – Liquid Crystal Display

CHAPTER 1

INTRODUCTION

With the urbanization on the rise, the number of accidents that are happening every day is on the rise. According to the Global Status Report on Road Safety by WHO, about 1.24 million deaths occur annually and "Indian economy takes a 3% hit every year in its GDP due to road accidents", said the UN study.

People in India consider road accidents to be the most often a thing to happen and call it an unfortunate event or destiny rather than reacting towards it. There are several causes associated with road accidents and a few of them include – over speeding, drunken driving, red light jumping, avoiding driving safety measures such as helmets and seat belts, using mobile phones, lack of traffic sense, etc. On the other hand, issues pertaining to the lack of infrastructural facilities are something that are not in the control of the person driving such as poor pedestrian space, undivided roads, potholes, narrow roads, sharp road curvatures, etc.

Under such circumstances, security in travel becomes a primary concern for everyone. Due to the lack of the best emergency facilities available in our country, the lives of the people are under high risk.

1.1 Existing System

Currently there is no technology for accident detection. As it is done manually there is loss of life in golden hours. The accident victim is dependent on the mercy of others to rush him to hospital. Many a times an accident goes unnoticed for hours before help comes in. Due to all these factors there is a high rate of mortality of the accident victims. In addition to this there is delay in the ambulance reaching the hospital due to the traffic congestion between accident location and hospital which increases the chances of the death of victim.

1.2 Objective

To provide an effective solution to this, here we are proposing a system that aims at tracking the vehicles involved in an accident and send an alert message to rescue teams in significantly less time which will help reduce the mortality rate of the accident victim.

CHAPTER 2

LITERATURE REVIEW

2.1) INTELLIGENT ACCIDENT DETECTION SYSTEM AND AMBULANCE RESCUE SYSTEM

by Bhandari Prachi, Dalvi Kasturi, Chopade Priyanka

(INTERNATIONAL JOURNAL OF SCIENTIFIC & TECHNOLOGY RESEARCH VOLUME 3, ISSUE 6, JUNE 2014 ISSN 2277-8616)

Road accidents and traffic congestion are the major problems in urban areas. Currently there is no technology for accident detection. Also due to the delay in reaching of the ambulance to the accident location and the traffic congestion in between accident location and hospital increases the chances of the death of victim. There is a need of introducing a system to reduce the loss of life due to accidents and the time taken by the ambulance to reach the hospital. To overcome the drawback of existing system we will implement the new system in which there is an automatic detection of accident through sensors provided in the vehicle. A main server unit houses the database of all hospitals in the city. A GPS and GSM module in the concerned vehicle will send the location of the accident to the main server which will rush an ambulance from a nearest hospital to the accident spot. Along with this there would be control of traffic light signals in the path of the ambulance using RF communication. This will minimize the time of ambulance to reach the hospital. A patient monitoring system in the ambulance will send the vital parameters of the patient to the concerned hospital. This system is fully automated; thus, it finds the accident spot, controls the traffic lights, helping to reach the hospital in time.

2.2) AUTOMATIC ACCIDENT DETECTION AND AMBULANCE RESCUE WITH INTELLIGENT TRAFFIC LIGHT SYSTEM

By Mr. S. Iyyappan, Mr. V. Nandagopal, P.G Scholar, Dept. of EEE, Ganadipathy Tulis's Jain Engineering College, Vellore, India1 Assistant Professor, Dept. of EEE, Ganadipathy Tulis's Jain Engineering College, Vellore, India.

(International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 2, Issue 4, April 2013 Copyright to IJAREEIE www.ijareeie.com 1319)

Traffic congestion and tidal flow are major facts that cause delay to ambulance. To bar loss of human life due to accidents we introduce a scheme called ITLS (Intelligent Traffic Light system). The main theme behind this scheme is to provide a smooth flow for the emergency vehicles like ambulance to reach the hospitals in time and thus minimizing the delay caused by traffic congestion. The idea behind this scheme is to implement ITLS which would control mechanically the traffic lights in the path of the ambulance. The ambulance is controlled by the control unit which furnishes adequate route to the ambulance and controls the traffic light according to the ambulance location and thus reaching the hospital in time.

2.3) "AUTOMATIC ROAD ACCIDENT DETECTION TECHNIQUES"

by Usman Khalil, Tariq Javid, Adnan Nasir (Conference: 2017 International Symposium on Wireless Systems and Networks (ISWSN))

Many precious lives are lost due to road traffic accidents every day. The common reasons are the driver's mistake and late response from emergency services. There is a need to have an effective road accident detection and information communication system in place to save injured persons. A system that sends information messages to nearby emergency services about the accident location for timely response is absolutely in need. In the research literature, several automatic accident detection systems are proposed by numerous researchers. These include accident detection using smartphones, GSM and GPS technologies, vehicular ad-hoc networks (VANET) and mobile applications. The implementation of an automatic road accident detection and information communication system in every vehicle is very crucial. This paper presents a brief review of automatic road accident detection techniques used to save affected persons. An automatic road accident detection technique based on low-cost ultrasonic sensors is also proposed.

2.4) AUTOMATIC ACCIDENT DTECTION AND RESCUE WITH AMBULANCE

by Hrishikesh Market, Fazal Patil, Vishal Yadav, Meghana Deshpande (*International journals of electronics and communication engineering (IJECE) 2 (6), 2015)*

The rapid growth of technology and infrastructure has made our lives easier. The advent of technology has also increased the traffic hazards and the road accidents take place frequently which causes huge loss of life and property because of the poor emergency facilities. Our project will provide an optimum solution to this draw back. According to this project when a vehicle meets with an accident immediately Vibration sensor will detect the signal and sends it to Microcontroller. Microcontroller find the location coordinates of accident spot using GPS and sends the alert message including geographic allocation coordinates through the GSM Module to ambulance unit. So the rescue team in the ambulance can immediately trace the location by putting geographical location coordinates in Google earth application or any other Geographic location finder application. After conforming the location of accident spot the ambulance unit will starts its rescue operation. This system also controls the traffic signals in the path of ambulance and helps ambulance to reach hospital in minimum time.

CHAPTER 3

PROPOSED MODEL

3.1) BLOCK DIAGRAM

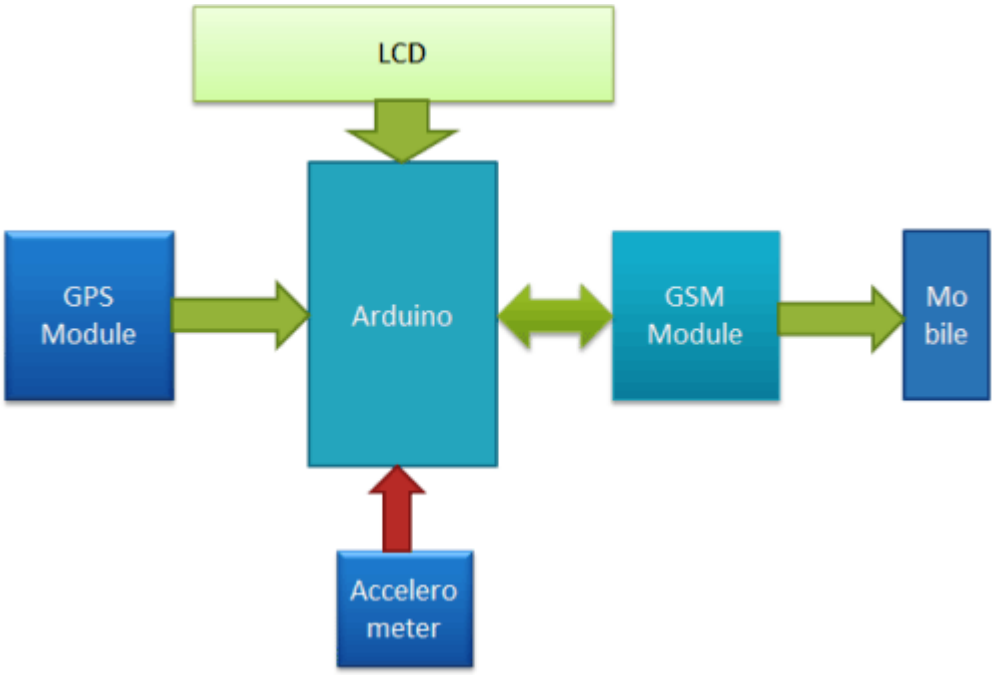

Fig:1

3.2) METHODOLOGY

In this project, Arduino is used for controlling whole the process with a GPS Receiver and GSM module. GPS Receiver is used for detecting coordinates of the vehicle, GSM module is used for sending the alert SMS with the coordinates and the link to Google Map. Accelerometer namely ADXL335 is used for detecting accident or sudden change in any axis. And an optional 16x2 LCD is also used for displaying status messages or coordinates. We have used GPS Module SIM28ML and GSM Module SIM900A.

When we are ready with our hardware after programming, we can install it in our vehicle and power it up. Now whenever there is an accident, the car gets tilt and accelerometer changes his axis values. These values read by Arduino and checks if any change occurs in any axis. If any change occurs then Arduino reads coordinates by extracting $GPGGA

String from GPS module data (GPS working explained above) and send SMS to the predefined number to the police or ambulance or family member with the location coordinates of accident place. The message also contains a Google Map link to the accident location, so that location can be easily tracked. When we receive the message then we only

need to click the link and we will redirect to the Google map and then we can see the exact location of the vehicle. Speed of Vehicle, in knots (1.852 KPH), is also sent in the SMS and displayed on the LCD pane

CHAPTER 4

DESIGN PROCESS

4.1) COMPONENTS REQUIRED

- Arduino Uno
- GSM Module (SIM900A)
- GPS Module (SIM28ML)
- Accelerometer (ADXL335)
- 16x2 LCD
- Power Supply
- Connecting Wires
- 10 K-POT
- Breadboard or PCB
- Power supply 12v 1amp

GPS MODEL

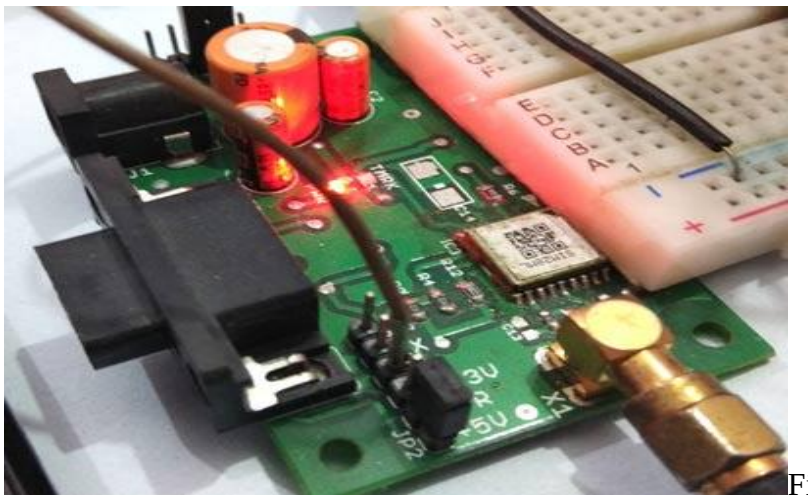

Fig:2

GPS stands for Global Positioning System and used to detect the Latitude and Longitude of any location on the Earth, with exact UTC time (Universal Time Coordinated). GPS module is used to track the location of accident in our project. This device receives the coordinates from the satellite for every second, with time and date. We have previously extracted $GPGGA string in Vehicle Tracking System to find the Latitude and Longitude Coordinate

GSM

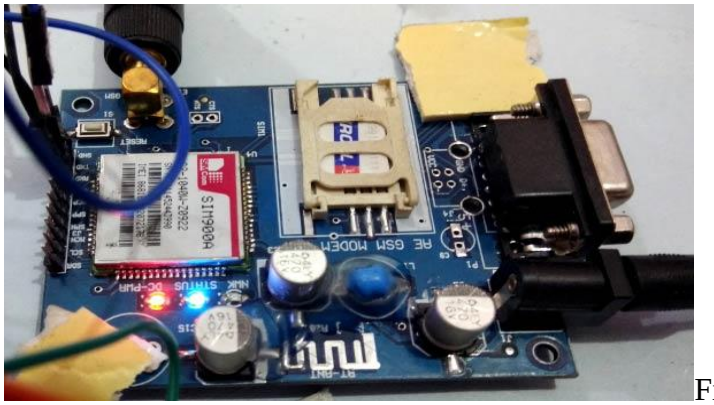

Fig:3

The SIM900 is a complete Quad-band GSM/GPRS Module which can be embedded easily used by customer or hobbyist. SIM900 GSM Module provides an industry-standard interface. SIM900 delivers GSM/GPRS 850/900/1800/1900MHz performance for voice, SMS, Data with low power consumption. It is easily available in the market.

ACCELEROMETER

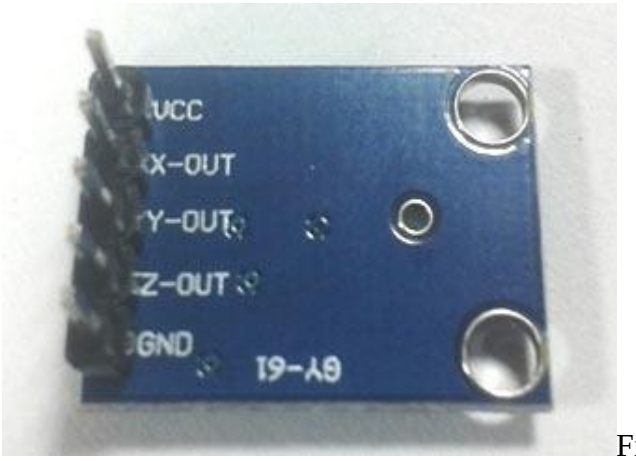

Fig:4

An accelerometer is an electromechanical device used to measure acceleration forces. Such forces may be static, like the continuous force of gravity or, as is the case with many mobile devices, dynamic to sense movement or vibrations. Acceleration is the measurement of the change in velocity, or speed divided by time.

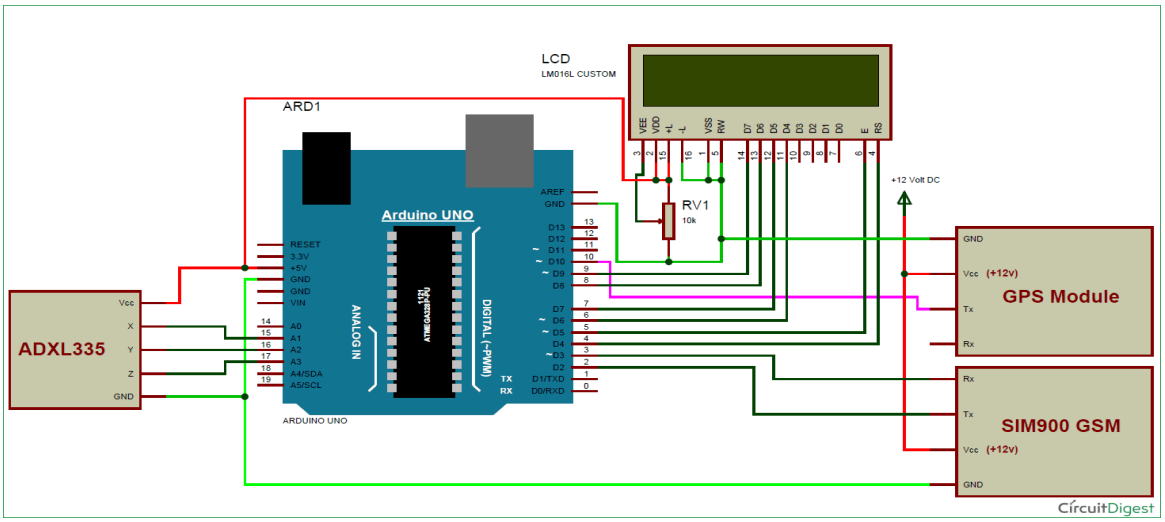

Fig:5

4.2) CIRCUIT DIAGRAM

Circuit Connections of this Vehicle Accident Alert System Project is simple. Here Tx pin

of GPS module is directly connected to digital pin number 10 of Arduino. By using Software serial Library here, we have allowed serial communication on pin 10 and 11 and made them Rx and Tx respectively and left the Rx pin of GPS Module open. By default, Pin 0 and 1 of Arduino are used for serial communication but by using the Software Serial library, we can allow serial communication on other digital pins of the Arduino. 12 Volt supply is used to power the GPS Module.

GSM module's Tx and Rx pins of are directly connected to pin D2 and D3 of Arduino. For GSM interfacing, here we have also used software serial library. GSM module is also powered by 12v supply. An optional LCD's data pins D4, D5, D6, and D7 are connected to pin number 6, 7, 8, and 9 of Arduino. Command pin RS and EN of LCD are connected with pin number 4 and 5 of Arduino and RW pin is directly connected with ground. A Potentiometer is also used for setting contrast or brightness of LCD.

An Accelerometer is added in this system for detecting an accident and its x, y, and z-axis ADC output pins are directly connected to Arduino ADC pin A1, A2, and A3

CODE

```
#include<SoftwareSerial.h>

SoftwareSerial Serial1(2,3); //make RX arduino line is pin 2, make TX arduino line is pin 3

SoftwareSerial gps(10,11);

#include<LiquidCrystal.h>

LiquidCrystal lcd(4,5,6,7,8,9);

#define x A1

#define y A2

#define z A3

int xsample=0;

int ysample=0;

int zsample=0;

#define samples 10

#define minVal -50

#define MaxVal 50

int i=0,k=0;

int gps_status=0;

float latitude=0;

float longitude=0;

String Speed="";
```

```
String gpsSpeed="";
char*test="$GPRMC"



void initModule(String cmd,char*res,int t)
{
  while(1)

  {
    Serial.println(cmd);
    Serial1.println(cmd);
    delay(100);
    while(Serial1.available()>0)
    {
      if(Serial1.find(res))
      {
        Serial.println(res);
        delay(t);
        return;
        }
```

```
else
        {
          Serial.println("Error"):
        }
    }
    delay(t);
  }
}
void setup()
{
  Serial.begin(9600);
  lcd.begin(16,2);
  lcd.print("accident alert");
  lcd.setCursor(0,1);
lcd.print(" System ");
  delay(2000);
  lcd.clear();
  lcd.print("Initializing");
  lcd.setCursor(0,1);
lcd.print("Please wait....");
delay(1000);
Serial.println("Initializing....");
initModule("AT","OK",1000);
```

```
initModule("ATE1","OK",1000);

initModule("AT+CPIN?","READY",1000);

initModule("AT+CMGF=1","OK",1000);

initModule("AT+CNMI=2,2,0,0,0","OK",1000);

Serial.println("Initialized Successfully")


lcd.clear();

lcd.print("Initialised");

lcd.setCursor(0,1);

lcd.print("Successfully");

delay(2000);

lcd.clear();

lcd.print("Callibrating");

lcd.setCursor(0,1);

lcd.print("Accelerometer");

for(int i=0;i<samples;i++)
```

```
{
  xsample+=analogRead(x);
  ysample+=analogRead(y);
  zsample+=analogRead(z);
}
xsample/=samples;
ysample/=samples;
zsample/=samples;
Serial.println(xsample);
Serial.println(ysample);
Serial.println(zsample);
delay(1000);


lcd.clear();
lcd.print("Waiting for GPS");
lcd.setCursor(0,1);
delay(2000);
gps.begin(9600);
get_gps();
show_coordinate();
delay(2000);
lcd.clear();
lcd.print("GPS is Ready");
```

```
delay(1000);
lcd.clear();
lcd.print("System Ready");
Serial.println("System Ready..");
}
void loop()
{
  int value1=analogRead(x);
  int value2=analogRead(y);
  int value3=analogRead(z);
  int xValue=xsample-value1;
  int yValue=ysample-value2;

  int zValue=zsample-value3;
 Serial.print("x=");
 Serial.println(xValue);
  Serial.print("y=");
  Serial.println(yValue);
  Serial.print("z=");
  Serial.println(zValue);
if(xValue<minVal||xValue>MaxVal||yValue<minVal||yValue>MaxVal||zValu
e<minVal||zValue>MaxVal)
  {
```

```
  get_gps();
  show_coordinate();
  lcd.clear();
  lcd.print("Sending SMS");
  Serial.println("Sending SMS");
  Send();
  Serial.println("SMS sent");
  delay(2000);
  lcd.clear();
  lcd.print("System Ready");
}


}

void gpsEvent()
{
 gpsString="";
 while(1)
 {
  while(gps.available()>0)  //Serial incoming data from GPS
 {
  char inChar = (char)gps.read();
  gpsString+=inChar; //store incoming data from GPS to temporary string str[]
```

```
i++;
Serial.print(inChar);
 if(i<7)
 {
  if(gpsString[i-1]!=test[i-1]) //check for right string
  {
   i=0;
   gpsString="";
  }

 }

 if(inChar=='\r')

 {
  if(i>60)
  {
   gps_status=1;
   break;
  }
  else
  {
   i=0;
```

```
}
    }
  }
  if(gps_status)
  break;
}

}
void ger_gps()
{
  lcd.clear();
  lcd.print("Getting GPS Data");

  lcd.setCursor(0,1);
  lcd.print("Please Wait....");
  gps_status=0;
  int x=0;
  while(gps_status==0)
  {
    gpsEvent();
    int str_length=i;
    coordinate2dec();
    i=0;x=0;
```

```
str_length=0;
  }
}
void show_coordinate()
{
  lcd.clear();
  lcd.print("Lat:");
  lcd.print(latitude);
  lcd.setCursor(0,1);
  lcd.print("Log:");
  lcd.print(longitude);
  Serial.print("Latitude:");

  Serial.println(latitude);
  Serial.print("Longitude:");
  Serial.println(longitude);
  Serial.print(""Speed(in knots)=");
  Serial.println(Speed);
  delay(2000);
  lcd.clear();
  lcd.print("Speed(Knots):");
  lcd.setCursor(0,1);
  lcd.print(Speed);
```

```
}
void coordinate2dec()
{
  String lat_degree="";
  for(i=20;i<21;i++)
  lat_degree+=gpsString[i];
  String lat_minut="";
  for(i=22;i<28;i++)
  lat_minut="";
  for(i=22;i<=28;i++)
  lat_minut+=gpsString[i];
  String lat_minut="";

  for(i=22;i<=28;i++)
  lat_minut+=gpsString[i];
  String log_degree="";
  for(i=32;i<=32;i++)
  log_degree+=gpsString[i];
  String log_minut="";
  for(i=35;i<=41;i++)
  log_minut+=gpsString[i];
        }
```

```
}

void coordinate2dec()

{

  String lat_degree="";

  for(i=20;i<21;i++)

  lat_degree+=gpsString[i];

  String lat_minut="";

  for(i=22;i<28;i++)

  lat_minut="";

  for(i=22;i<=28;i++)

  lat_minut+=gpsString[i];

  String lat_minut="";


  for(i=22;i<=28;i++)

  lat_minut+=gpsString[i];

  String log_degree="";

  for(i=32;i<=32;i++)

  log_degree+=gpsString[i];

  String log_minut="";

  for(i=35;i<=41;i++)

  log_minut+=gpsString[i];

        }
```

```
      }
    }
  }
void setup() {
  // put your setup code here, to run once:
}
```

CHAPTER 5

ADVANTAGES AND DISADVANTAGES

5.1 ADVANTAGES

- This system is an immediate aid system.
- Monitors hazards and threats.
- Alert messages regarding an accident will be automatically sent to the nearby hospitals and police stations. Alerts police and medical units about accidents.
- It is an affordable system.
- Can be used in any kind of vehicle.
- This system can be used for social cause.
- It does not need any operation manually.
- Provides security against theft.
- Simple design and can be interfaced with other systems.
- Reliable system.
- Isolates both GSM and GPS.

5.1 DISADVANTAGES

- If any major accident takes place, then the device will be destroyed. It has to be replaced i.e. It cannot be use multiple times.
- The live system ‘Crash Alert’ will not work if there is insufficient cellular signal to upload crash details i.e. Network is must.

CHAPTER 6

APPLICATIONS

The applications for this are in military, navigation, automobiles, aircrafts, fleet management, remote monitoring, remote control, remote control, security systems, tele services, Accident analysis, Geo-fencing geo-coding etc.

- **Tracking of Asset**- Tracking the vehicles in a real time environment is a big advantage.
- **Tracking of on transition device** - When the vehicle is transported from one place to another track will be active.
- It can be used in school buses for quicker access to an ambulance.
- **Stolen Vehicle Recovery** - In case of theft, the vehicle can be tracked by using vehicle positioning system. The GPS system allows the tracking of vehicle from anywhere.
- **Fleet Management** - When managing a fleet of vehicles, knowing the real time location of all drivers allows management to meet customer needs more efficiently. Whether it is delivery, services or other multi-vehicle enterprises, drivers now only need a mobile phone with telephony or internet connection to be inexpensively tracked by and dispatched efficiently.

CHAPTER 8

CONCLUSION AND FUTURE DIRECTIONS

The proposed model can prove to be an important aid in saving lives, because many a times an accident goes unnoticed for hours before help comes in. As the use of GPS and GSM modems is made for accident detection system, it will be helpful. Beside other purposes, GPS is used to monitor the speed and detect an accident. The alert service centres are notified due to which the rescue measures are taken in time. Thus, it can be concluded that the proposed system can serve the humanity by a great deal.

In the future an android app can be developed for this in which instead of just receiving the coordinates of the location, it can be exactly pinpointed on the map.

Also, the heart rate can also be continuously monitored by the app to determine the driver's condition till the medical help arrives.

REFERENCE

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- Automatic Accident Detection and Ambulance Rescue with Intelligent Traffic Light System by Mr. S. Iyyappan, Mr. V. Nandagopal, P.G Scholar, Dept. of EEE, Ganadipathy Tulis's Jain Engineering College, Vellore, India
  (International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering Vol. 2, Issue 4, April 2013 Copyright to IJAREEIE www.ijareeie.com 1319)

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- Automatic accident detection and rescue with ambulance by Hrishikesh Market, Fazal Patil, Vishal Yadav, Meghana Deshpande (*International journals of electronics and communication engineering (IJECE) 2 (6), 2015)*