MONITORING VEHICLE SPEED AND TRACKING USING GPS AND GSM TECHNOLOGIES

A PROJECT REPORT

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ABSTRACT

A vehicle tracking system is an electronic device installed in a vehicle to enable the owner or a third party to track the vehicle's location. This project proposed to design a vehicle tracking system that works using GPS and GSM technology, which would be the cheapest source of vehicle tracking and it would work as anti-theft system. It is an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System (GPS) and Global system for mobile communication (GSM). The GPS modem will continuously give the

data i.e. the latitude and longitude indicating the position of the vehicle. The same data is sent to the mobile at the other end from where the position of the vehicle is demanded. The speed of the vehicle is monitored and controlled using Embedded Microcontroller. In case of accident to the vehicle, the same is alerted to the insurance company. Using this data, insurance company can provide the insurance amount for the vehicle to its owner.

I

LIST OF FIGURES

II

CHAPTER 1

INTRODUCTION

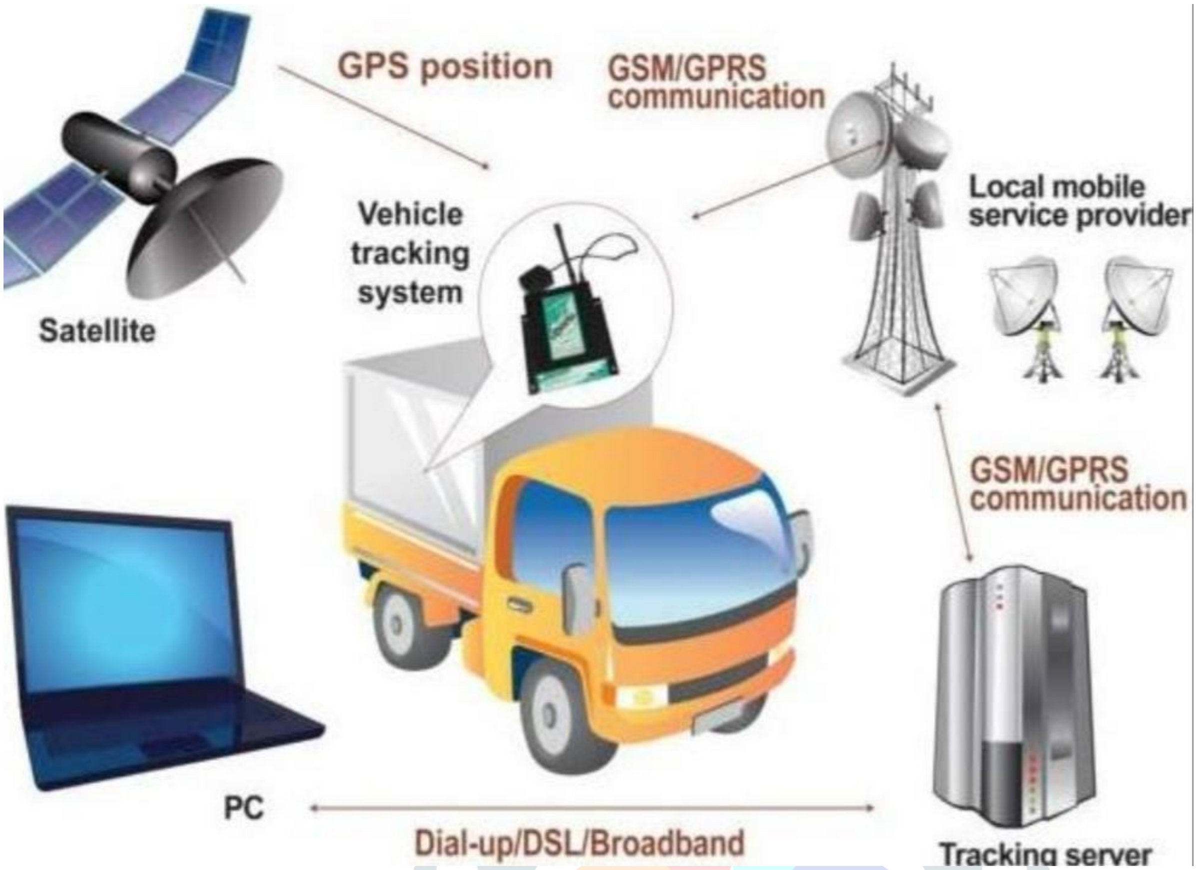
A vehicle tracking system is the technology used to determine the location of a vehicle using different methods like GPS and other radio navigation systems operating through satellites and ground based stations. By following triangulation or trilateration methods the tracking system enables to calculate easy and accurate location of the vehicle. Vehicle information like location details, speed, distance traveled etc. can be viewed on a digital mapping with the help of a software via Internet. Even data can be stored and downloaded to a computer from the GPS unit at a base station and that can later be used for analysis. This system is an important tool for tracking each vehicle at a given period of time and now it is becoming increasingly popular for people having expensive cars and hence as a security prevention and retrieval device.

The system consists of modern hardware and software components enabling one to track their vehicle online or offline. Any vehicle tracking system consists of mainly three parts mobile vehicle unit, fixed based station and, database and software system.

Vehicle Unit: It is the hardware component attached to the vehicle either a GPS/GSM modem. The unit is configured around a primary modem that functions with the tracking software by receiving signals from GPS satellites or radio station points with the help of antenna. The controller modem converts the data and sends the vehicle location data to the server.

Fixed Based Station: Consists of a wireless network to receive and forward the data to the data center. Base stations are equipped with tracking software and geographic map useful for determining the vehicle location. Maps of every city and landmarks are available in the based station that has an in-built Web Server.

Database and Software: The position information or the coordinates of each visiting points are stored in a database, which later can be viewed in a display screen using digital maps. However, the users have to connect themselves to the web server with the respective vehicle ID stored in the database and only then s/he can view the location of vehicle traveled.



AIM OF THE PROJECT:

The main objective of developing this project is to monitoring the vehicle speed and track the location in case of accident, the same is altered to the Insurance company to claim the Insurance.

SCOPE OF THE PROECT:

The idea of developing this project comes to do good things towards the society. The vehicle tracking and monitoring the system will provide better security for the vehicle. The same data are sent to the Insurance company and alter them to make the further measurements.

OBJECTIVES:

1. To collect and store the vehicle's Identity number. We use GPS to trace the location of the vehicle. The GPS modem will continuously give the data i.e. the latitude and longitude indicating the position of the vehicle.

2. This system proves highly effective in detection of over speed driving. To overcome this problem and decrease death rate due to accidents, the speed of the vehicle is monitored by driver if he crosses the threshold limit i.e. 75 kmph the alert message will sent to driver or user.
3. Incase of accident occurs the alarm fixed in device, makes a indication sound. The data about vehicle will be sent to insurance company. They make use of the data during the time of claiming the insurance.

CHAPTER 2

LITERATURE SURVEY

1. Implementation of Internet- based Land Vehicle Tracking System using Java[1]
   A land vehicle tracking system, which can efficiently monitor and control vehicles, has been researched and developed continuously in the area of commercial vehicle operations. Such a system should be able to satisfy users, who want to track a vehicle or a cargo, by providing its position on a digital map in real time. So far, several GIS strategies have been devised and adopted to develop a land vehicle tracking system, but there is no proper solution suitable for the Internet environment. As a new solution to develop such a system, this paper introduces and describes the Internet-based hybrid client-server methodology using Java.

2. A Novel Map-matching Algorithm to Improve Vehicle Tracking System Accuracy[2]
   The satellite-based vehicle tracking system accuracy can be improved by augmenting the positional information using road network data, in a process known as map-matching. The paper presents a new similarity metric for curve-to-curve map-matching technique, combined with the ability to maintain many possible road hypotheses and picks the most likely hypothesis at a time, enabling future corrections if necessary, therefore providing intelligent guesses with considerable accuracy.

3. IMMPDA Vehicle Tracking System using Asynchronous Sensor Fusion Of Radar and Vision[3]
   This paper focuses on recognition and tracking of maneuvering vehicles in dense traffic situations. We present an asynchronous multi obstacle multi sensor tracking method that fuses information from radar and monocular vision. A low level fusion method is integrated into the framework of an IMMPDA Kalman filter.

LIMITATIONS OF THE EXISTING SYSTEM:

A GPS device is helpful at many points of times but when it comes to be at the hilly areas or at mountain areas, covering your vehicle's direct contact to the sky, you might lose the network connectivity. Since tracking systems have a sim card inside them, they may be unreachable in areas with poor connectivity. It easily get affected by the weather, GPS signals may drop while in a vehicle.

PROPOSED WORK:

This project is a vehicle tracking system that works using GPS and GSM technology, which would be the cheapest source of vehicle tracking. It is an embedded system which is used for tracking and positioning of any vehicle by using Global Positioning System GPS and Global system for mobile communication (GSM). This design will continuously monitor a moving Vehicle and report the status of the Vehicle on demand. A GSM modem is used to send the position (Latitude and Longitude) of the vehicle from a remote place. The GPS receiver will continuously give the data i.e. the latitude and longitude indicating the position of the vehicle. The same data is sent to the mobile at the other end from where the position of the vehicle is demanded. If the vehicle crosses the threshold speed limit of 75 kmph, the same is messaged to the respective vehicle owner via GSM modem. And if the vehicle met with an accident, that will be informed to the insurance company to claim the recovery amount. The live information data will be displayed locally in the 16x2 LCD.

CHAPTER 3

SYSTEM REQUIREMENTS

3.1 HARDWARE REQUIREMENTS

1. Microcontroller(AT89S52)
2. Speed Sensor
3. GPS Receiver
4. GSM Modem
5. Vibration Sensor

6. LCD Display 16x2
7. DC buzzer
8. 12v DC Power Supply

3.2 SOFTWARE REQUIREMENTS

1. Windows 7 or Higher
2. Embedded C using KEIL IDE uVision3

CHAPTER 4

SOFTWARE DESIGNS

4.1 SYSTEM ARCHITECTURE

Architecture diagram is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structures and behaviors of the system.

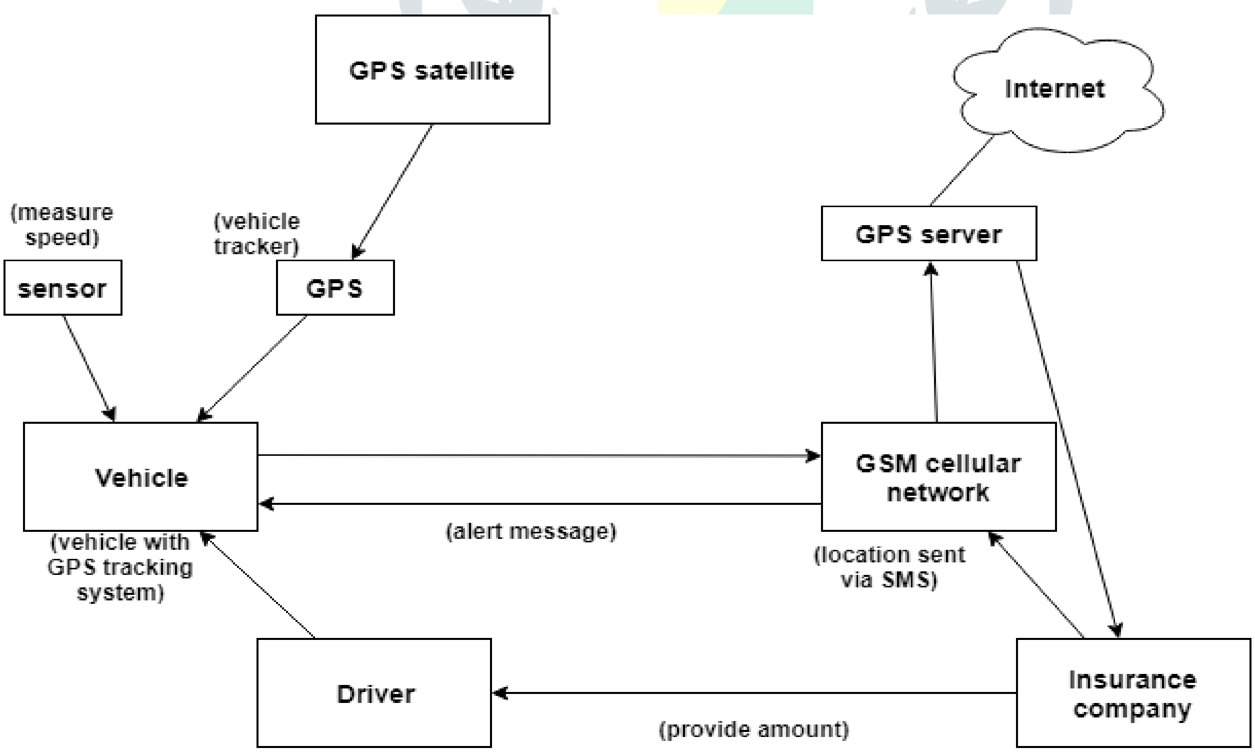


FIG 4.1 System Architecture diagram

4.2 DATA FLOW DIAGRAM

A data flow diagram (DFD) is a graphical representation of the "flow" of data through an information system, modeling its process aspects. A DFD is often used as a preliminary step to create an overview of the system without going into great detail, which can later be elaborated.

4.2.1 DFD LEVEL 0

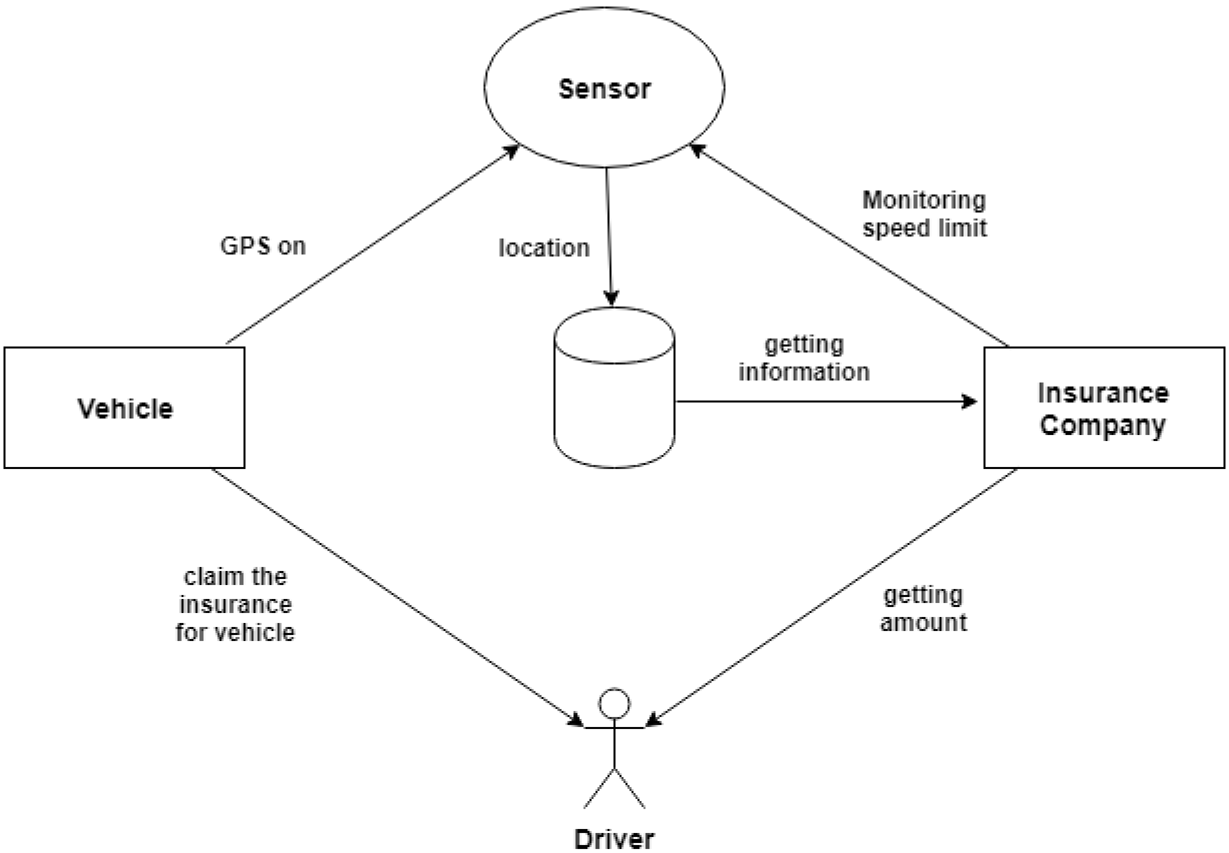


FIG 4.2.1 DFD LEVEL 0

4.2.2 DFD LEVEL 1

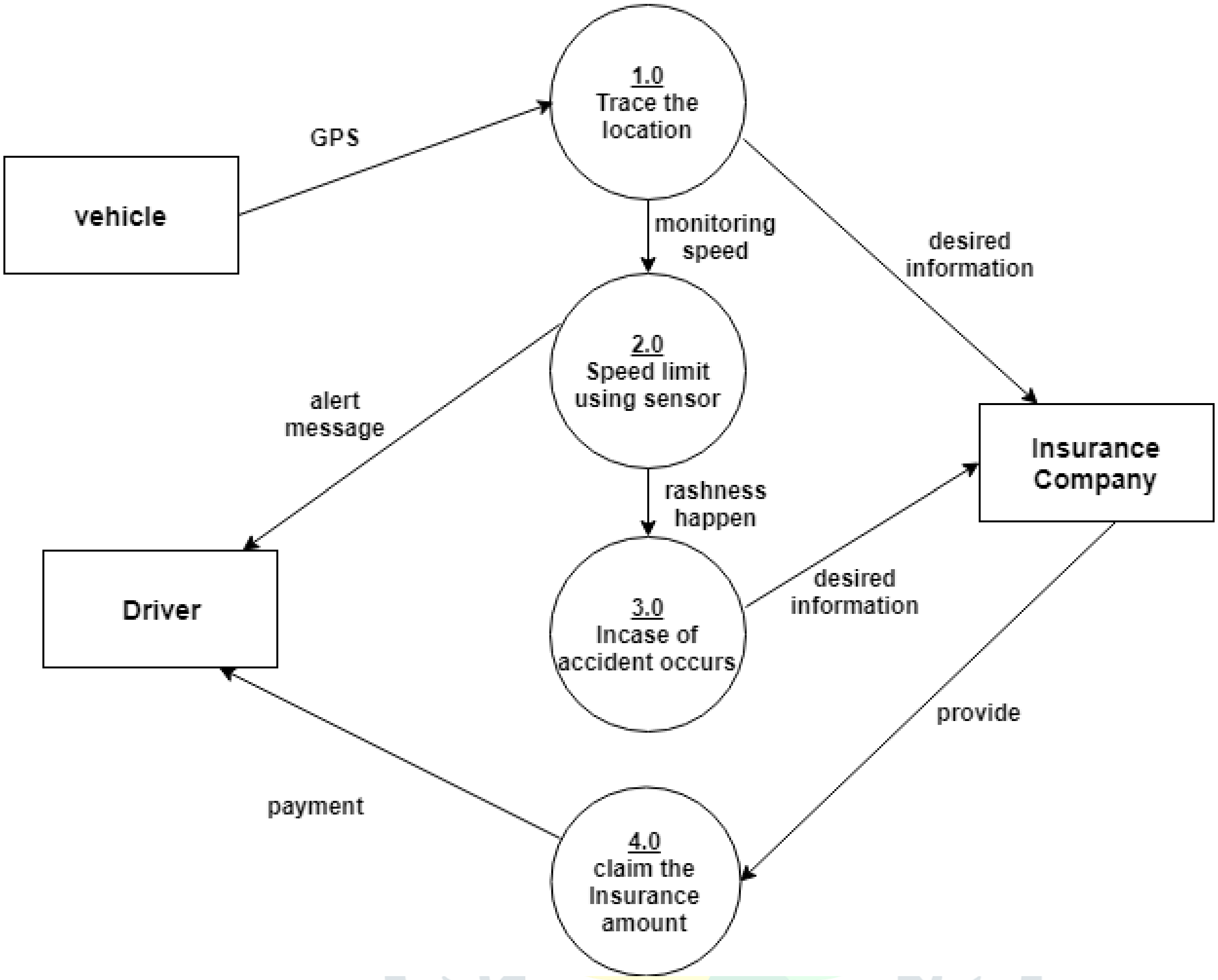


FIG 4.2.2 DFD LEVEL 1

4.3 UML DIAGRAMS

4.3.1 USECASE DIAGRAM

Use case diagram at its simplest is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved.

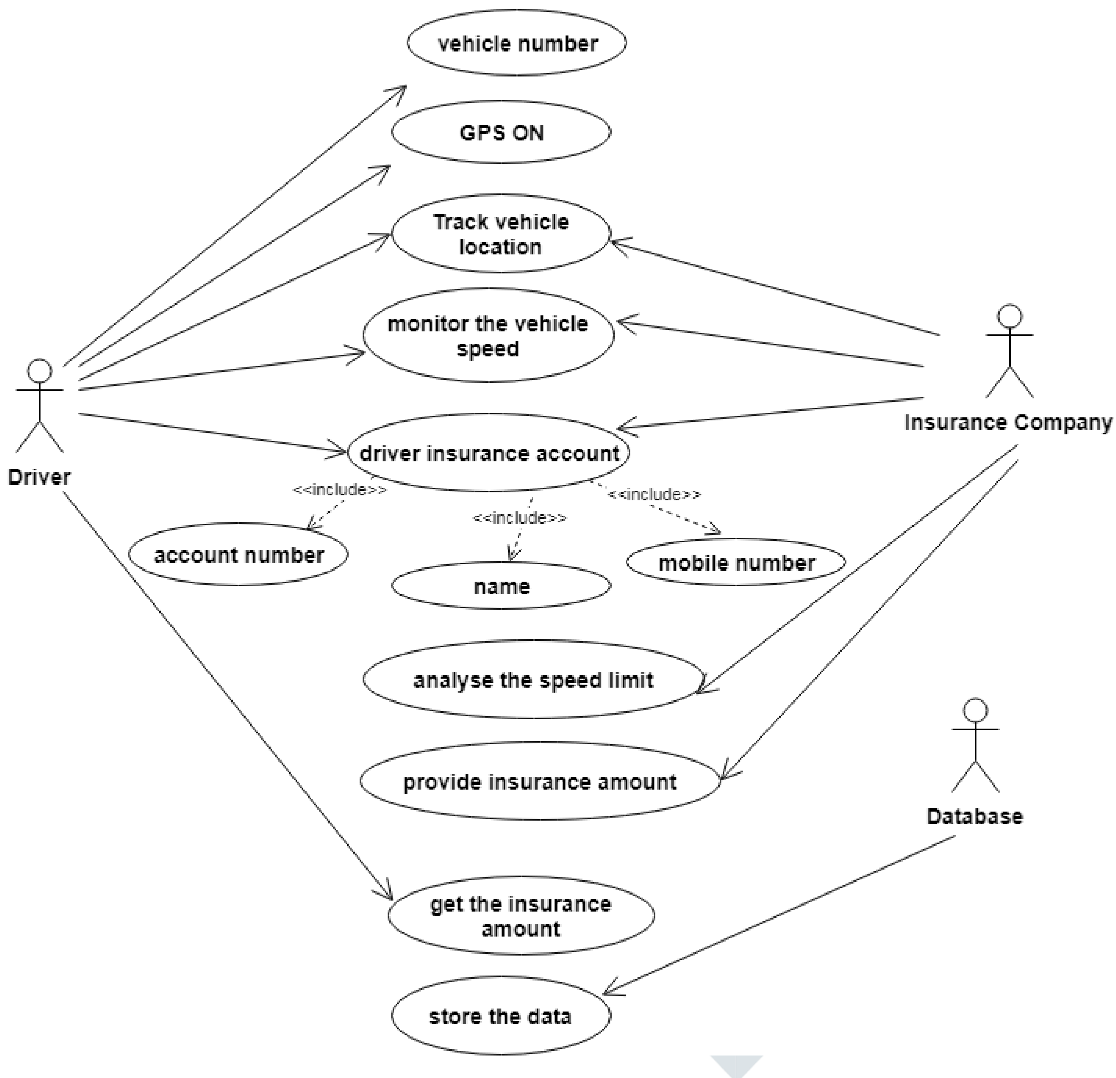


FIG 4.3.1 Use case Diagram

4.3.2 CLASS DIAGRAM

A class diagram is an illustration of the relationships and source code dependencies among classes in the Unified Modeling Language (UML). In this context, a class defines the methods and variables in an object, which is a specific entity in a program or the unit of code representing that entity.

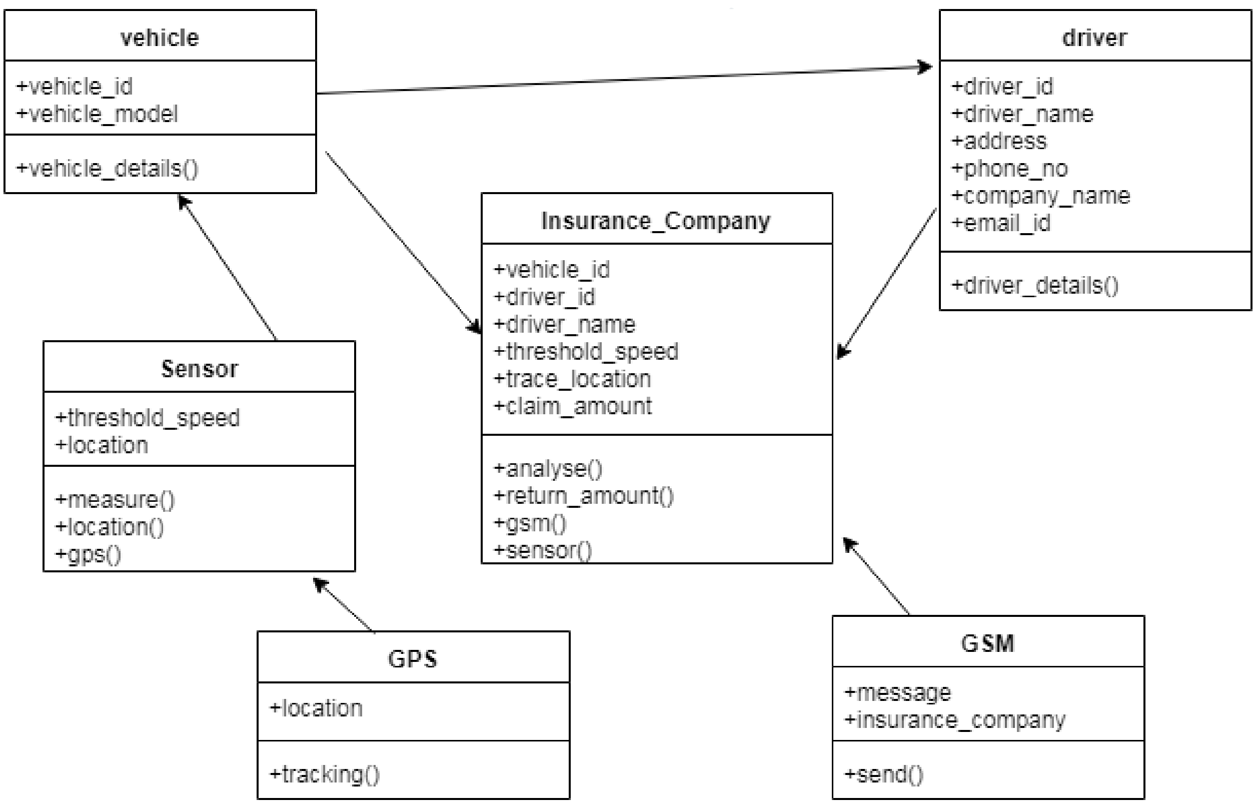


FIG 4.3.2 Class diagram

4.3.3 ACTIVITY DIAGRAM

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency.

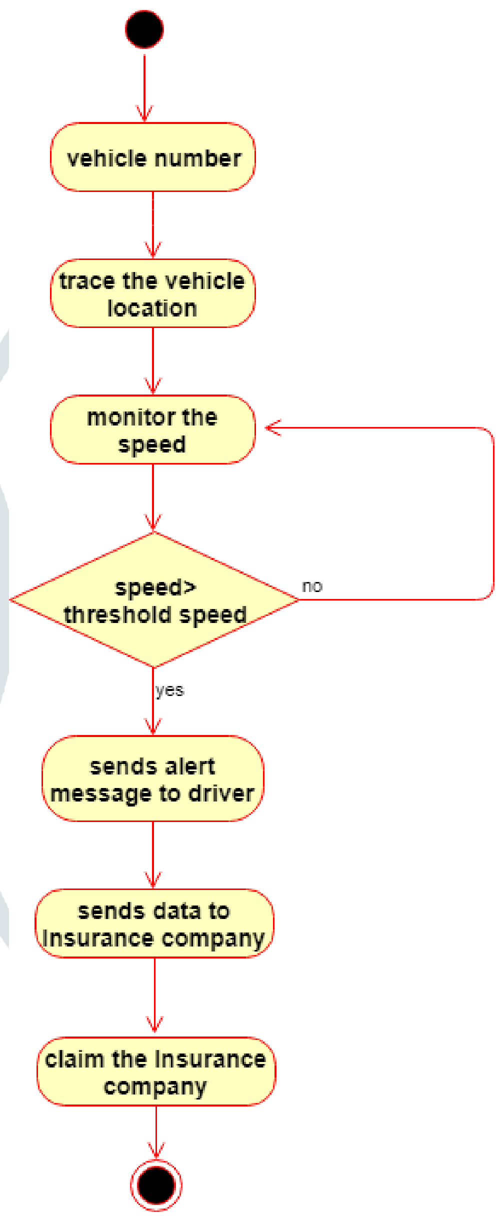


FIG 4.3.3 Activity diagram

CHAPTER 5

MODULE DESCRIPTION

Modules & Descriptions:

1) Speed Sensor Module
2) Vibration Sensor Module
3) GSM and GPS Module

SPEED SENSOR MODULE

Microcontroller (AT89S52) is the heart in the project design. A microcontroller is needed to interface the speed sensor, vibration sensor, GPS, GSM, LCD and Buzzer. Commands are executed by the microcontroller and passed to its peripheral devices. The microcontroller is programmed using Embedded C in KEIL compiler (uvision 3).

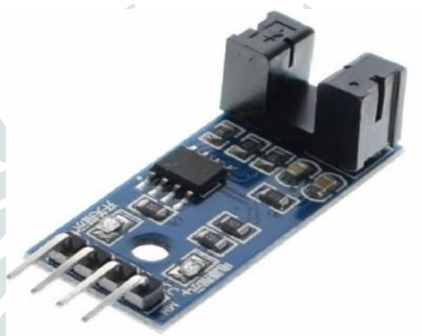


Fig 5.1

Accelerometer sensor is used to measure speed of the vehicle. An accelerometer is a device that measures proper acceleration. The sensor is attached to the Microcontroller, which monitors the speed of the vehicle. If the speed of the vehicle crosses the allowed limit of 75 kmph, the same is alerted to the respective owner as “Over Speed”.

VIBRATION SENSOR MODULE

Vibration sensor is fixed in front of the vehicle. If the vehicle met with an accident the same is informed to the insurance company so as to avail 50% of the vehicle amount as claim. Vibration sensors, also known as piezoelectric sensors, are versatile tools for the measurement of various processes. These sensors use the piezoelectric effect, which measure changes in pressure, acceleration, temperature, strain or force by converting them to an electrical charge.

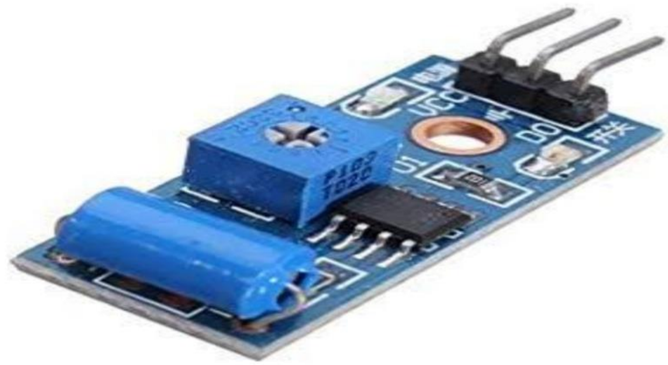


Fig 5.2

A vibration sensor can also be used to determine aromas in the air by simultaneously measuring resonance and capacitance. A DC buzzer is interfaced to the microcontroller through its I/O port. Buzzer is used to alert the outsiders whenever the vehicle‘s meet with an accident. Buzzer helps to alert the outsiders to rescue people in the vehicle.

GSM AND GPS MODULE

GSM modem is used to alert the vehicle owner about overspeeding of the vehicle and also if the vehicle met with an accident. If the speed of the vehicle crosses 80 kmph, the same will be alerted to the vehicle owner. Accelerometer sensor interfaced to the microcontroller measures the speed of the vehicle. GSM modem interfaced to the microcontroller through serial port sends the vehicle owner about overspeeding. The system also sends message to the insurance company about the accident to help claim the insurance amount. With the help of location tracking, the vehicle can be monitored.

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. When a GSM modem is connected to a computer, this allows the computer to use the GSM modem to communicate over the mobile network. GSM modem can be interfaced to the AT89S52 via the serial port. The modem sends alert messages whenever AT89S52 commands the device to do so.

GPS transceiver is used to locate the vehicle. GPS is interfaced to the microcontroller through its serial port. GPS data is sent through GSM modem to the vehicle owner about the accident. The vibration sensor interfaced to the microcontroller detects the accident and sends data to the microcontroller. Microcontroller collects GPS data, geographical coordinates and sends those data along with the accident intimation to the vehicle owner. The vehicle owner could easily trace the vehicle through the location sent to him.

CHAPTER 6

RESULTS AND DISCUSSION

SCREENSHOTS:

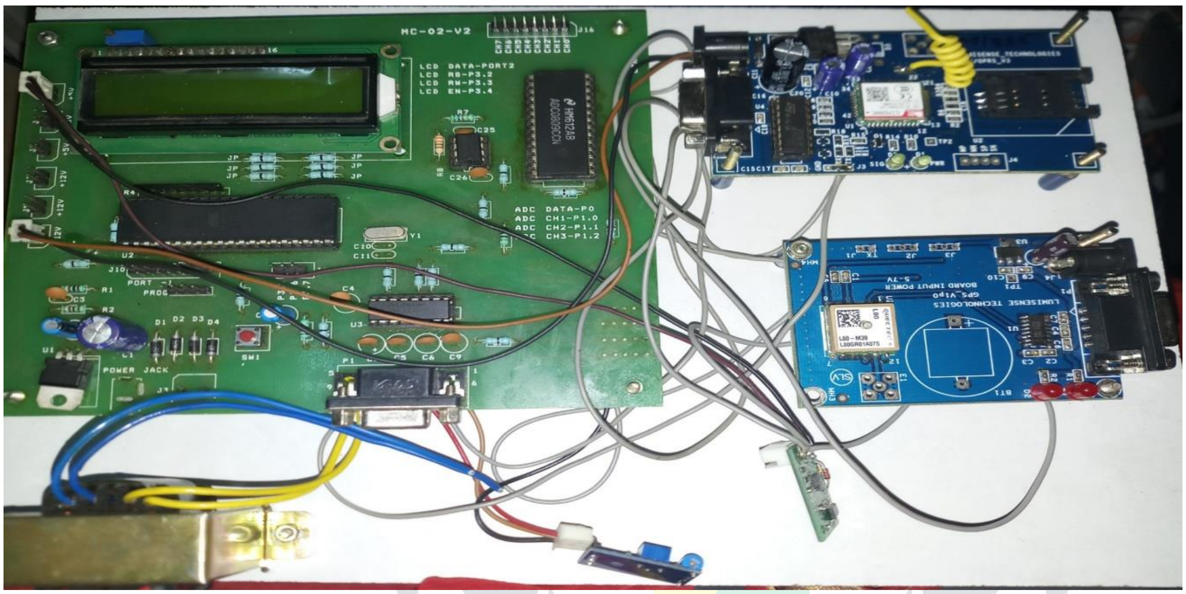


Fig 6.1

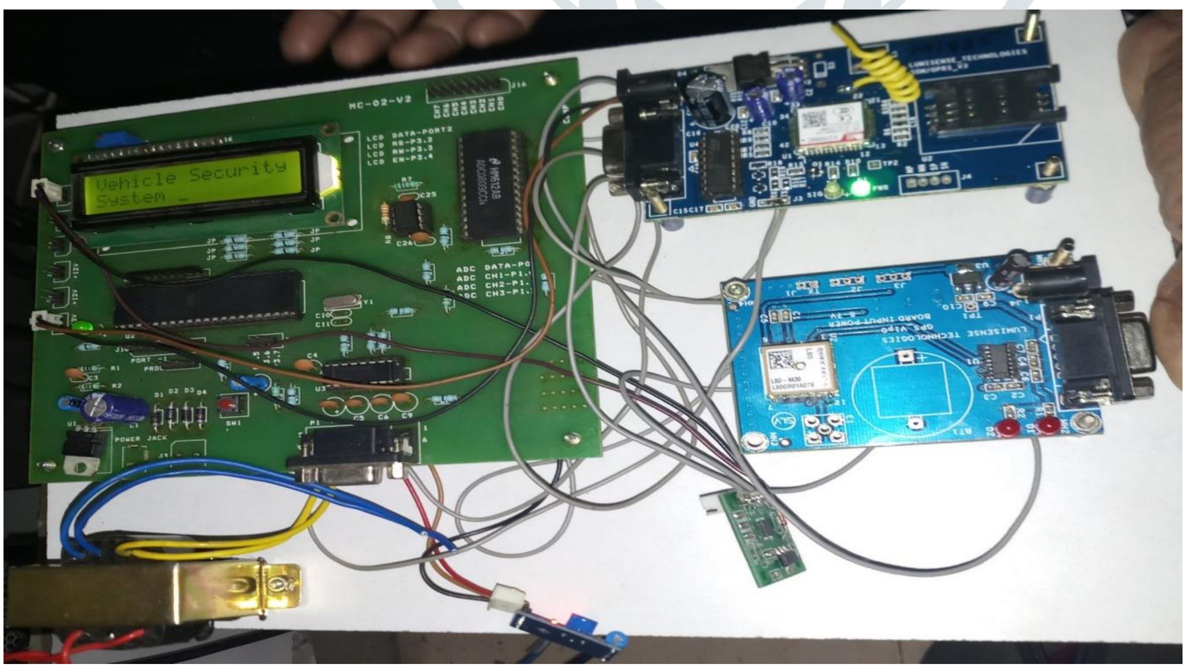


Fig 6.2

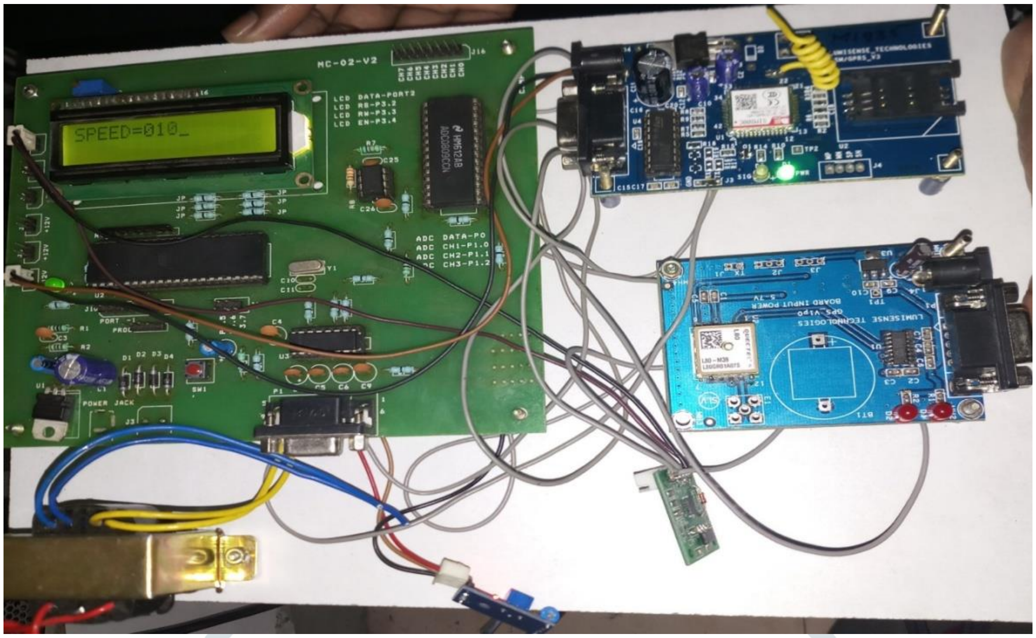


Fig 6.3

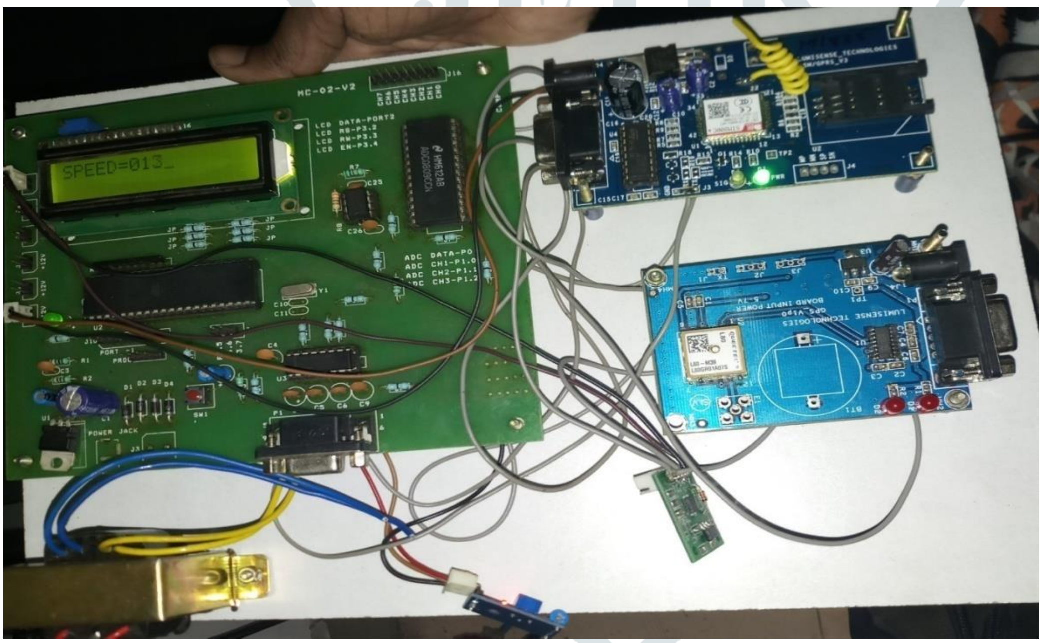


Fig 6.4

Above figures 6.3 and figure 6.4 shows the speed of the vehicle in the LCD display.

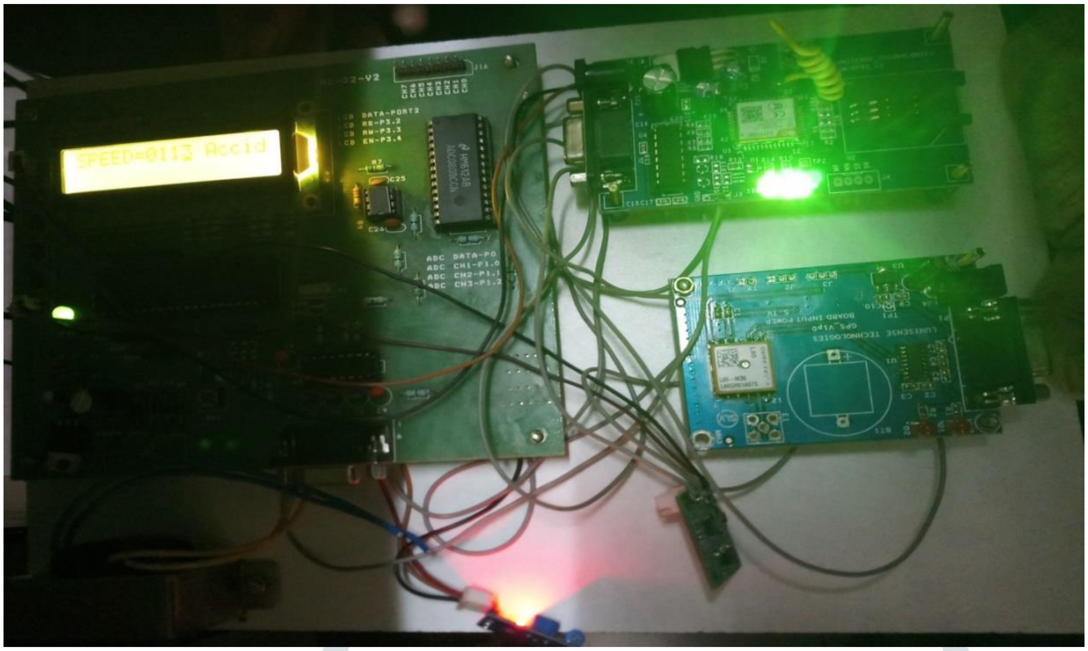


Fig 6.5

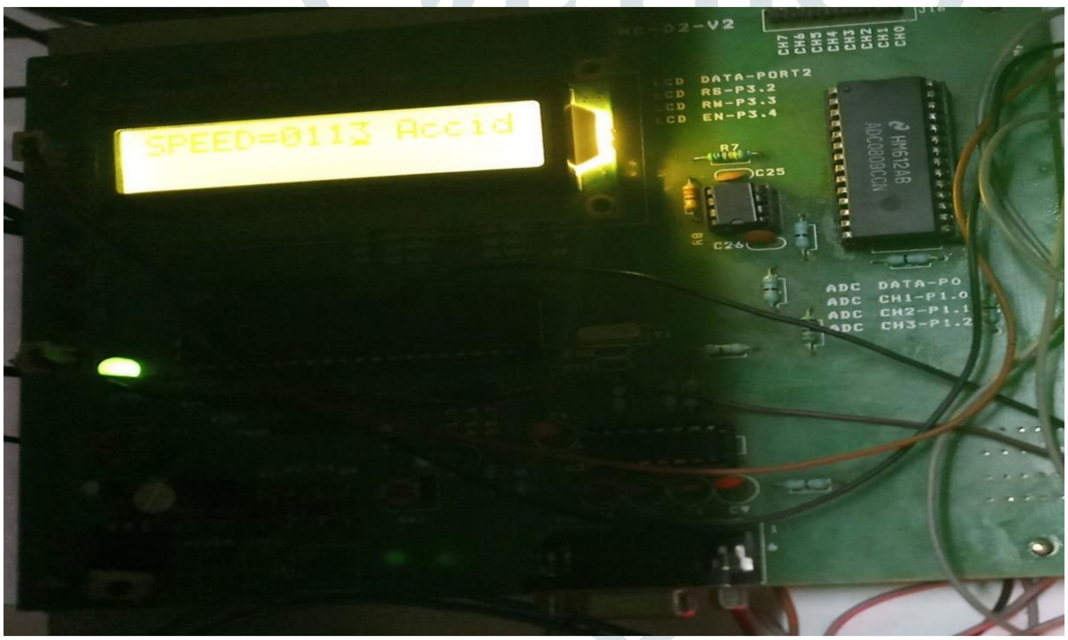


Fig 6.6

In figure 6.5 and figure 6.6 displays the message as “Overspeed (OS)” when the speed of the vehicle crosses the threshold limit i.e 75kmph.

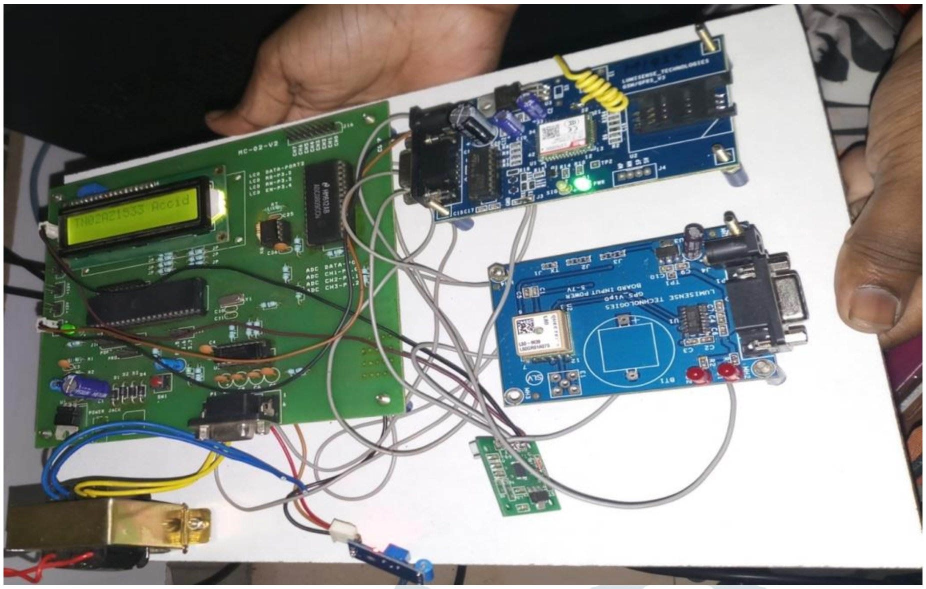


Fig 6.7

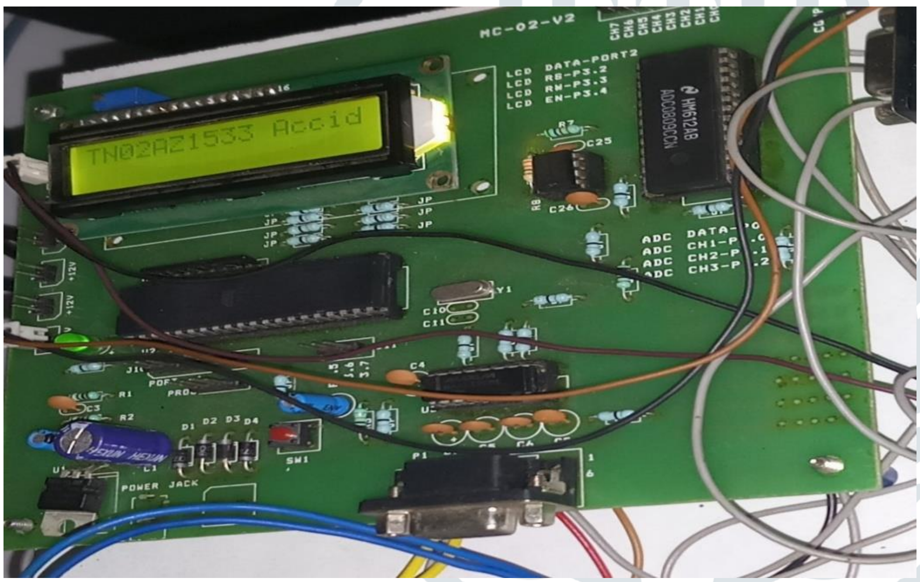


Fig 6.8

In figure 6.7 and figure 6.8 displays the vehicle number whenever the vehicle met with an accident and buzzer gets alerted to rescue them.

CHAPTER 7

CONCLUSION

Main motto of the project is to incorporate different types of sensors so that they help in decrease the chance of losing life in such accident which we can't stop from occurring. This way motor insurance companies have the potential to provide customized solutions to their clients. Vehicle tracking system makes better fleet management and which in turns brings large profits.

It is both in case of personal as well as business purpose improves safety and security, performance monitoring and increase productivity. It also minimizes the difficulties of traffic police department and make ease to control the rash driving on highways. The police can perform their duties while sitting in control room and can provide their service with more ease and accuracy. This concept can be extended in future by integrating a camera with the system which could capture the image of the number plate of the vehicle to sends that to the traffic authorities.

CHAPTER 8

APPENDIX

```
#include <REGX52.H>
#define lcd P2
#define rs P3_2
#define rw P3_3
#define     en P3_4
#define     ADCDATA P0
#define     chs0 P1_0
#define     chs1 P1_1
#define     chs2 P1_2
#define     vib P1_7
#define     relay P1_5
#define     buz P3_7
unsigned int i;
unsigned int x,y,z,a;
void lcdinit();
void lcdcmd(unsigned char comm);
void lcddata(unsigned char dat);
void delay(unsigned int del);
void st(unsigned char a[]);
void uartinit();
void txs(unsigned char trans);
void delay(unsigned int del)
{
unsigned int i;
for(i=0;i<=del;i++);
}
void lcdcmd(unsigned char comm)
{
```

```
rs=0;
rw=0;
lcd=comm;
```

A1

```
en=1;
delay(100);
en=0;
}
void lcddata(unsigned char dat)
{
rs=1;
rw=0;
lcd=dat;
en=1;
delay(100);
en=0;
}
void lcdinit()
{
lcdcmd(0x38);
lcdcmd(0x38);
lcdcmd(0x38);
lcdcmd(0x0e);
lcdcmd(0x01);
lcdcmd(0x06);
}
void uartinit()
{
SCON=0X50;
TMOD=0X20;
TH1=0XF4;
TR1=1;
}
void txs(unsigned char x)
{
 int i;
TI=0;
SBUF=x;
```

A2

```
while(TI==0);
```

```
for(i=0;i<3000;i++);
}
void st(unsigned char a[])
{
unsigned char b;
{
for(b=0;a[b]!='\0';b++)
lcddata(a[b]);
}
}
long ll;
void sms1()
        {
                //int i;
txs('A');txs('T');txs('+');txs('C');txs('M');txs('G');
          txs('F');txs('=');
          txs('1');
txs(13); txs(10);
delay(20000);delay(20000);
          txs('A');txs('T');txs('+');txs('C');txs('M');txs('G');
          txs('S');txs('=');
          txs('"');
          txs('7');txs('6');txs('3');txs('9');
          txs('3');txs('8');txs('4');txs('6');txs('8');txs('9');
          txs('"');
          txs(13); txs(10);delay(20000);delay(20000);
          txs('O');txs('V');txs('e');txs('r');txs('s');txs('p');txs('e');txs('e');txs('d');
          txs(' ');
        //for(i=1;i<23;i++)
                //txs(val2[i]);
 //txs('E');
          txs(13); txs(10);             delay(20000);        delay(20000);
          txs(26);
```

A3

```
}
                void sms2()
        {
txs('A');txs('T');txs('+');txs('C');txs('M');txs('G');
          txs('F');txs('=');
          txs('1');
```

```
txs(13); txs(10);
delay(20000);delay(20000);
        txs('A');txs('T');txs('+');txs('C');txs('M');txs('G');
        txs('S');txs('=');
        txs('"');
        txs('7');txs('6');txs('3');txs('9');
        txs('3');txs('8');txs('4');txs('6');txs('8');txs('9');
        txs('"');
        txs(13); txs(10);delay(20000);delay(20000);
            txs('L');txs('a');txs('t');      txs(':');txs('1'); txs('2');
            txs('9');txs('8');txs('.');
            txs((ll%9)+0x30);
            txs((ll%8)+0x30);
            txs((ll%3)+0x30);
            txs('L');txs('o');txs('n');      txs(':');txs('8'); txs('0');
            txs('2');txs('0');txs('.');
            txs((ll%7)+0x30);
            txs((ll%6)+0x30);
            txs((ll%5)+0x30);
      //for(i=1;i<23;i++)
            //txs(val2[i]);
        txs(13); txs(10);           delay(20000);      delay(20000);
        txs(26);
      }
      void sms3()
      {
            int i;
txs('A');txs('T');txs('+');txs('C');txs('M');txs('G');
```

A4

```
txs('F');txs('=');
        txs('1');
txs(13); txs(10);
delay(20000);delay(20000);
        txs('A');txs('T');txs('+');txs('C');txs('M');txs('G');
        txs('S');txs('=');
        txs('"');
        txs('7');txs('6');txs('3');txs('9');
        txs('3');txs('8');txs('4');txs('6');txs('8');txs('9');
        txs('"');
        txs(13); txs(10);delay(20000);delay(20000);
```

```
  txs('7');txs('5');txs('P');txs('e');txs('r');txs('c');txs('l');txs('a');txs('i');txs('m');
  txs(' ');
//for(i=1;i<23;i++)
//txs(val2[i]);
 //txs('E');
  txs(13); txs(10);            delay(20000);       delay(20000);
  txs(26);
}
void main()
{
lcdinit();
uartinit();
P1=0xFF;
lcdcmd(0x80);
st("Vehicle Security");
lcdcmd(0xc0);
st("System ");
delay(60000);
delay(60000);
delay(60000);
lcdcmd(0x01);
while(1)
```

A5

```
if(vib==1)
{
 lcdcmd(0xC0);
  st("TN02AZ1533 Accident");
 delay(10000);
   buz=0;
   delay(10000);
  sms2();
  delay(10000);
sms3();
}
chs0=0;    // for accelerometer
chs1=0;
chs2=0;
delay(10000);
a=ADCDATA;
```

```
lcdcmd(0x80);
lcddata('S');
lcddata('P');
lcddata('E');
lcddata('E');
lcddata('D');
lcddata('=');
lcddata((a/100)+0x30);
lcddata(((a/10)%10)+0x30);
lcddata((a%10)+0x30);
 if(a>90)
{
lcdcmd(0x8C);
st("OS  ");
sms1();
}
}
}
```

A6

CHAPTER 9

ACKNOWLEDGEMENT

We extend our gratitude to our Chairperson **Dr.(Mrs.) THANGAM MEGANATHAN M.A., M.Phil., Ph.D.,** for providing us with all the necessary resources and the other facilities for doing this project.

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