A

Project Report

On

ACCIDENT DETECTION AND ALERTING SYSTEM USING GPS,GSM MODULE AND ACCELEROMETER

Submitted to

RAJIV GANDHI UNIVERSITY OF KNOWLEDGE TECHNOLOGIES,RK VALLEY

in partial fulfillment of the requirements for the award of the Degree of

BACHELOR OF TECHNOLOGY

IN

ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted by

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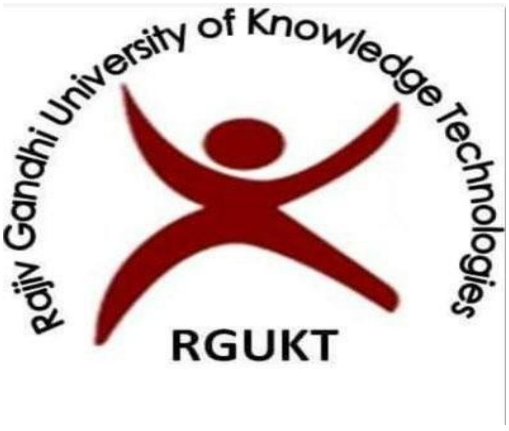

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

RAJIV GANDHI UNIVERSITY OF KNOWLEDGE TECHNOLOGIES

(approved by UGC, AICTE)Idupulapaya, VEMPALLI – 516330

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CERTIFICATE

This is to certify that the project report entitled **"ACCIDENT DETECTION AND ALERTING SYSTEM USING GPS,GSM MODULE AND ACCELEROMETER"** a bonafide record of the project work done and submitted by

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for the partial fulfillment of the requirements for the award of B.Tech. Degree in **ELECTRONICS AND COMMUNICATION ENGINEERING, Rajiv Gandhi University of Knowlegde Technologies,Rk Valley.**

GUIDE **Head of the Department**

External Viva-Voce Exam Held on _____

INTERNAL EXAMINER **EXTERNAL EXAMINER**

DECLARATION

We hereby declare that the project report entitled **"ACCIDENT DETECTION AND ALERTING SYSTEM USING GPS,GSM MODULE AND ACCELEROMETER "** submitted to the Department of **ELECTRONICS AND COMMUNICATION ENGINEERING** in partial fulfillment of requirements for the award of the degree of **BACHELOR OF TECHNOLOGY**. This project is the result of our own effort and that it has not been submitted to any other University or Institution for the award of any degree or diploma other than specified above.

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We would like to thank our parents and friends, who have the greatest contributions in all our achievements, for the great care and blessings in making us successful in all our endeavors.

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ABSTRACT:

Road accidents rates are very high nowadays, especially two wheelers. Timely medical aid can help in saving lives. This system aims to alert the nearby medical center about the accident to provide immediate medical aid. The attached accelerometer in the vehicle senses the tilt of the vehicle and the a heartbeat sensor on the user's body senses the abnormality of the heartbeat to understand the seriousness of the accident. Thus the systems will make the decision and sends the information to the smartphone, connected to the accelerometer through gsm and gps modules .The Android application in the mobile phone will send text messages to the nearest medical center and friends. Application also shares the exact location of the accident and it can save time.

Keywords- Accident detection, alert system, GPS, GSM, Accelerometer, Android application.

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1 . INTRODUCTION:

Nowadays, the rate of accidents has increased rapidly. Due to employment, the usage of vehicles like cars, bikes have increased, because of this reason the accidents can happen due to over speed. People are going under risk because of their over speed, due to unavailability of advanced techniques, the rate of accidents can't be decreased. To reduce the accident rate in the country this paper introduces a solution. Automatic accident detection and alert systems are introduced. The main objective is to control the accidents by sending a message to the registered mobile, hospital and police station using wireless communications techniques. When an accident occurs in a city or any place, the message is sent to the registered mobile through GSM module in less time. Arduino is the heart of the system which helps in transferring the message to different devices in the system. Vibration sensor will be activated when the accident occurs and the information is transferred to the registered number through the GSM module. The GPS system will help in finding the location of the accident spot. The proposed system will check whether an accident has occurred and notify nearest medical centers and registered mobile numbers about the place of accident using GSM and GPS modules. The location can be sent through a tracking system to cover the geographical coordinates over the area. The accident can be detected by a vibration sensor which is used as a major module in the system.

2 . OBJECTIVES AND SCOPE:

The main objective of this project is to prevent casualties which happen due to lack of medical assistance in time. Certainly, if the accident happens due to other cases, the used electronic devices will be able to provide the spontaneous message and exact location to police and ambulance in order to recover victims. Avoiding casualties caused by road accidents is the main goal of this paper, with the help of Accelerometer and GPS present in the mobile phones. Based on the data collected from these sensors, which are present in most mobile phones, the location of the accident is sent at the same time of the accident to the friends and relatives which the user allowed and stored, and also to the rescue and emergency services.

3 . EXISTING SYSTEM:

This idea proposal has been introduced at the start of the modern age of mobile phones. With the introduction of GPS sensors in the mobile, security applications based on GPS were proposed. Then they proposed special hardware devices which can be linked with mobile phones. Though, it had the disadvantage of actually buying extra hardware with more money.With the massive development of mobile phones in the last decade and new sensors added with the development, the extra hardware can be avoided. The present application of this paper is present in a very few countries and providing the information with the relatives and friends with the emergency services the efficiency of the application can be increased massively.

3.1 Drawbacks of the Existing System:

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

1.Automatic or phone is disconnected or damaged.

2.No GPS signal at the time of the crash.

3.Insufficient cellular signal to upload crash details.

4 . PROBLEM STATEMENT:

The use of vehicles increases in the proportion of the population. Due to the traffic congestion, the accidents are also increasing day by day. This causes the loss of life due to the delay in the arrival of ambulances to the accident spot or from the accident spot to the hospital. So, it is necessary to take the accident victim to the hospital as soon as possible. Whenever an accident occurs, it has to be informed to the investigation unit. So, it is also beneficial if the intimation is reached to the enquiry section so that the time for the investigation can be minimized.

5 . PROPOSED METHOD:

The main idea of this paper is to build an application that makes use of the sensors present inmobile phones like GPS and Accelerometer and detect any collision if there is a sudden external disturbance in the speed with the help of the Sensor Fusion Based Algorithm. With the help of the data obtained from the Accelerometer sensor, when there is a sudden disturbance to the mobile phone, the user is notified with an alert message before sending the request help signal. If no emergency is required, they can cancel it within 10 seconds. But, if they press the "Call Help" button or if the alert message is unattended for more than 10 seconds, the "request for help" message will be sent to the emergency services as well as the family members, the users provided.

6 . BLOCK DIAGRAM:

In this system, the external disturbance is detected by the accident detection module and when it is detected, a function is called to find the current location of the user with the help of GPS in the Location Detection Module. The location data obtained from the GPS is sent to the emergency services to request help.

Fig 1.1

Vehicle unit consists of an accelerometer which keeps on informing the coordinate of vehicle position to the microcontroller. If it is found at random, the GPS location tracker tracks and informs the emergency number with values of latitude, longitude and google map position using the GSM SIM module.Vehicle unit sends the information to the emergency contacts like police control room and an ambulance unit.

In this system at first, we worked on the prevention of vehicle accident and even after all the preventive measures applied if the accident occurs the system detects it. After the detection of vehicle accident, the system automatically reports to the ambulance service and police station without any time loss so that the casualty might not loss his/her life due to lack of medical assistance in time. The system is installed in the vehicle..For the detection of vehicle accidents accelerometers are installed and for reporting ,GPS module and GSM module are used. Motor (control switch) is used for engine control and buzzer, led lights etc. are used for warning during prevention. All these devices are interfaced with the central microcontroller(ArduinoUno)unit. Accelerometer detects the occurrence of accident and sends signal to the microcontroller for further functioning. The GPS module provides the location, speed, time and date of the certain place where the vehicle is in the real time. If an accident occurs, the accelerometer detects it and location of accident is obtained using GPS, and finally sends the information to the ambulance service and police by the help of a GSM module. The message obtained in mobile phone consists of the location of the accidental place in the form of google map link which will help the emergency units like ambulance service and police station to reach the casualty in time and rescue the lives.

1. The Arduino setup is installed in a vehicle's crash guard or in bumpers of the vehicle on each side.
2. When collision occurs it triggers the push button and it sends a notification to the Arduino Board.
3. Arduino will take this input and will convert to the SIM808.
4. The coordinates are shared through GSM.
5. Through GSM the notification is passed to the saved mobile number.
6. It contains the exact GPS location.
7. The application is used to know the route and location.
8. If the accident is not severe the person can turn off the buzzer and the device will come back to normal.

7 . COMPONENTS AND ITS WORKING:

Components used:

7.1 Arduino uno

7.2 GSM module

7.3 GPS module

7.4 LCD module

7.5 Accelerometer

7.6 Jumper wires

7.1 ARDUINO UNO:

Arduino Uno:

Arduino UNO board is used for interfacing the input-output elements to construct a project.It is an open-source microcontroller board that can be programmed according to user requirements.
f

Fig 1.2

The first and basic necessity for the Arduino or any board to work is the Power supply. The power to the Arduino board can be supplied in two ways.
This is the most basic and widely used configuration of the Arduino board. It contains al the pins and components as described above:

14 input/output pins (6 PWM pins).
6 Analog Input pins.
USB port.
Power jack.
Reset Button.
It has a flash memory of 32kB.

Arduino board

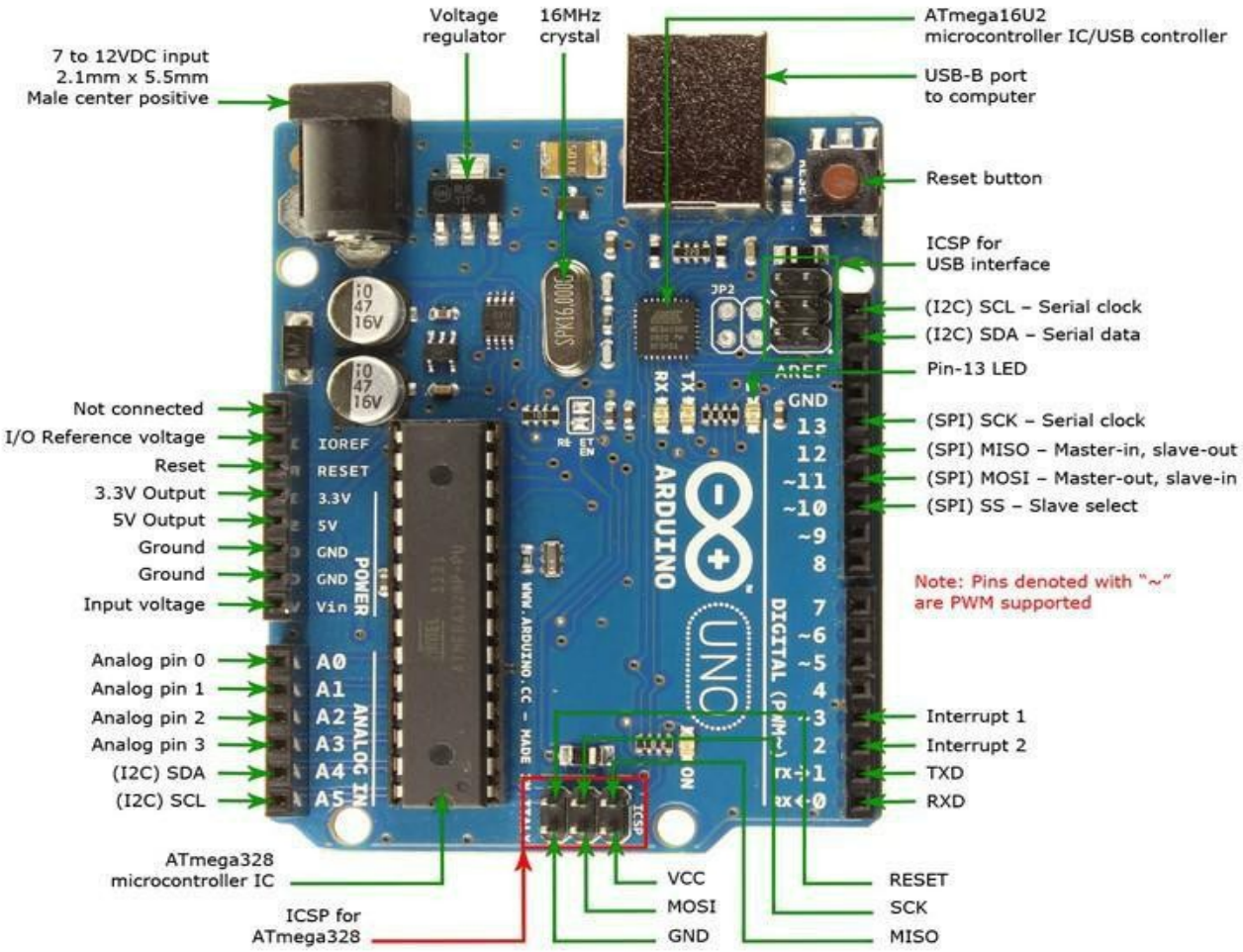


Fig 1.3

The first and basic necessity for the Arduino or any board to work is the Power supply. The power to the Arduino board can be supplied in two ways.

Through USB

The USB cable is used to connect the system and the Arduino Board USB port. Power will be supplied to the board through the system itself and interfacing of hardware and software will happen.

Through DC connection

The port parallelly present on the board next to the USB port is the DC input port. The input range is 7-12V. This port is also called a **barrel jack** through which DC power can be supplied directly from the wall supply.

Ground pin(GND)

The Arduino Board contains more than one GND pins that can be connected to the ground of the circuit.

5V pin:

As the name of the pin goes, 5V power is supplied from the board 3.3V Power is supplied from the board through this pin. Any of the voltage supply pins can be used based on the necessity of the circuit.

Analog Pins:

Pins numbered A0 to A5 are analog pins that provide digital values as the output even when they can read analog values from the sensors.

Digital pins:

Digital pins can be used for both input and output to a device (values 0 or 1). The pins numbered 0 - 13 are digital pins.

PWM pins (Pulse Width Modulation):

In pulse width modulation, analog output can be simulated. The pins having a tilde symbol (~) next to the PINs are the PWM pins. The pins numbered 3, 5, 6, 9, 10, and 11 can be used as #PWM pins in Arduino Uno. These pins can be used to simulate analog outputs.

AREF pin

The Analog Reference pin is used to set the value limit for external reference voltage (0V - 5V). It is rarely used.

RESET button

This button is used to erase the stored or present values of input/output based on the code.Pressing this button, the code can be run from the beginning.

Power LED

This LED is an onboard indicator of the proper functioning of the circuit. This LED usually glows when the device is interfaced and the code is checked and ready to execute. If the LED remains off, either the circuit, the code, or the board itself might be having a problem.

TX, RX

Transmitting and Receiving are shortly denoted by TX and RX respectively.These are LEDs that indicate when the information is being transmitted or received based on the circuit and the code. There are two sets of TX, RX pins. One set in line with the DIgital pins and the other set next to the TX, RX LEDs.

IC (Integrated Circuit)

One of the biggest advantages of the Arduino board is that it has a Main #IC embedded on the board. An external connection to the IC is not required.There are various ICs with different functions.Each IC description and working can be known from their respective datasheets.

Arduino boards also differ based on the ICs as they are the Brain of the Arduino board. It is manufactured by the ATMEL company.

Voltage Regulator

When we design a circuit using components of our own, we use a resistor to limit the amount of current passing through the circuit and the components which are sensitive to protect the components from damage. A similar function is done by the voltage regulator, which keeps a limit over the voltage passed to the board and protects it from any damage. It is not used to interact with the board.

I/O reference

The input/output reference pin is rarely used. It is used when the circuit needs to have a limit or range of values for the input and output.

Vin

The voltage-in pin is used to supply a particular value of the input to the board.

ICSP

The set of pins or components embedded next to the IC are the In- Circuit Serial Programming pins. This method of communication is mostly used in #microcontrollers to send data to a particular memory area (Flash, RAM, etc.).

7.2 GSM MODULE:

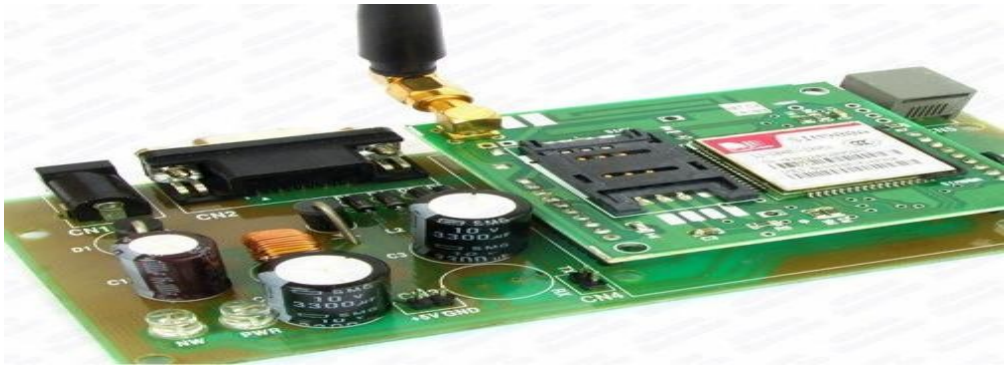


Fig 1.4

For providing communication between the GPS, GSM and the allocated mobile number GSM SIM900 module is preferred. The name SIM900 says that, it is a tri band work ranging a frequency of 900MHz to 1900 MHz such as EGSM900 MHz, PCS 190 MHz and DSC 100 MHz Receiving pin of GSM module and transmitting pin of GPS module are used for communication between the modules and the mobile phone.

What is GSM Technology?

GSM is a mobile communication modem; it stands for global system for mobile communication (GSM). The idea of GSM was developed at Bell Laboratories in 1970. It is a widely used mobile communication system in the world. GSM is an open and digital cellular technology used for transmitting mobile voice and data services operate at the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands.

GSM technology was developed as a digital system using the time division multiple access (TDMA) technique for communication purposes. A GSM digitizes and reduces the data, then sends it down through a channel with two different streams of client data, each in its own particular time slot. The digital system has the ability to carry 64 kbps to 120 Mbps of data rates.

There are various cell sizes in a GSM system such as macro, micro, pico, and umbrella cells. Each cell varies as per the implementation domain. There are five different cell sizes in a GSM network macro, micro, pico, and umbrella cells. The coverage area of each cell varies according to the implementation environment.

The time division multiple access (TDMA) technique relies on assigning different time slots to each user on the same frequency. It can easily adapt to data transmission and voice communication and can carry 64kbps to 120Mbps of data rate.

7.3 GPS MODULE:

Fig 1.5

To find the location on the earth the whole is divided into some coordinates where the location can be easily captured by a module called GPS module. Here the GPS used is SIM28ML. This GPS module will find the location of the vehicle and the information fetched by the GPS receiver is received through the coordinates and the received data is first send to arduino and the information is transmitted to the saved contact through GSM module.The frequency is operated in the range of 1575.42 MHz and the output of the GPS module is in NMEA format which includes data like location in real time.

The detailed description of pins given below

VCC : Power Supply 3.3 – 6 V

GND : Groun

TX : Transmit data serially which gives information about location, time, etc.

RX : Receive Data serially. It is required when we want to configure the GPS receiver.

7.4 LCD MODULE:

To display the numbers, alphabets and special characters an LCD module with 16x2 alphanumeric types is used. Using the higher bit data lines of LCD pins such as pin 11,12,13 and 14 are interfaced to digital pins of Arduino such as pin 8,9,10 in 4 bit mode as shown in the below figure. RS and E pins of LCD are connected to pin 12 and 13. To perform the write operation on LCD the read/write pin is connected to ground.

7.5 ACCELEROMETER:

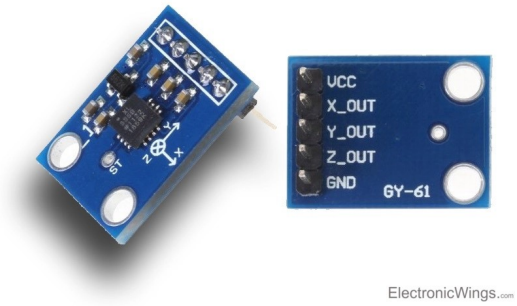


Fig 1.6

An accelerometer is an electromechanical device that will measure acceleration force. It shows acceleration, only due to cause of gravity i.e. g force. It measures acceleration in g unit.

On the earth, 1g means acceleration of 9.8 m/s2 is present. On moon, it is 1/6th of earth and on mars it is 1/3rd of earth.

Accelerometer can be used for tilt-sensing applications as well as dynamic acceleration resulting from motion, shock, or vibration.

-The ADXL335 gives complete 3-axis acceleration measurement.

-This module measures acceleration within range ±3 g in the x, y and z axis.

-The output signals of this module are analog voltages that are proportional to the acceleration.

-It contains a polysilicon surface-micro machined sensor and signal conditioning circuitry.

The pin description of accelerometer is given below

VCC: Power supply pin i.e. connect 5V here.

X_OUT:X axis analog output.

Y_OUT:Y axis analog output.

Z_OUT:Z axis analog output.

GND: Ground pin i.e. connect ground here.

ADXL335 accelerometer provides analog voltage at the output X, Y, Z pins; which is proportional to the acceleration in respective directions i.e. X, Y, Z.

7.6 JUMPER WIRES:

Generally, jumpers are tiny metal connectors used to close or open a circuit part. They have two or more connection points, which regulate an electrical circuit board.

Their function is to configure the settings for computer peripherals, like the motherboard. Suppose your motherboard supported intrusion detection. A jumper can be set to enable or disable it.

Jumper wires are electrical wires with connector pins at each end. They are used to connect two points in a circuit without soldering.

You can use jumper wires to modify a circuit or diagnose problems in a circuit. Further, they are best used to bypass a part of the circuit that does not contain a resistor and is suspected to be bad.

This includes a stretch of wire or a switch. Suppose all the fuses are good and the component is not receiving power; find the circuit switch. Then, bypass the switch with the jumper wire.

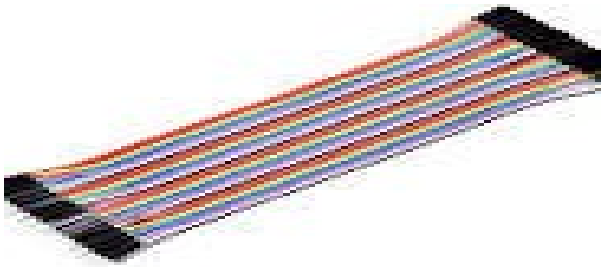
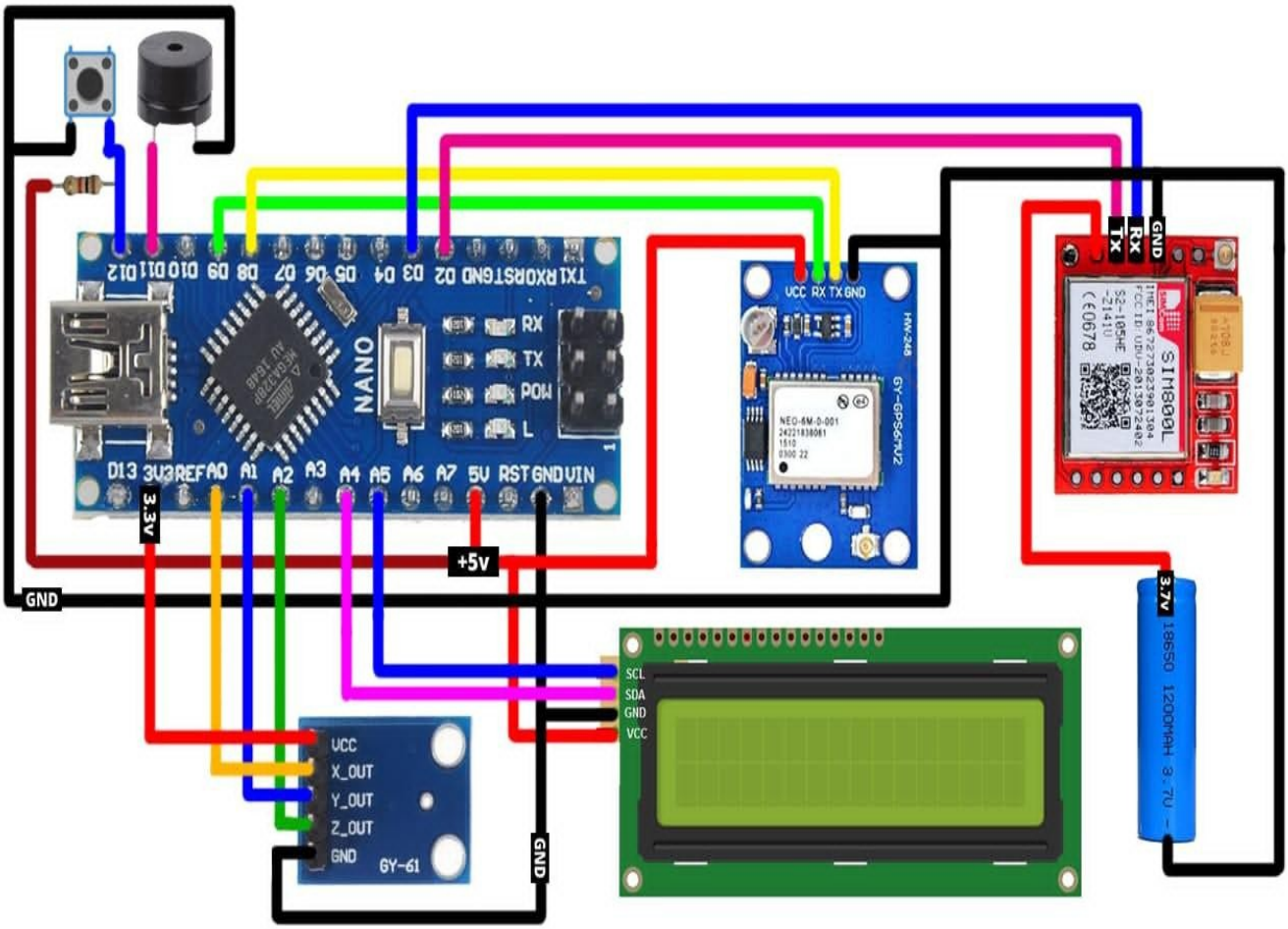


fig 1.7

8 . WORKING MODULE OF ACCIDENT DETECTION AND ALERT SYSTEM:



The controller used in this project is Arduino which is used for controlling all the modules in the circuit. The two The major parts other than the controller is the GPS module which is used as a receiver and other module is GSM. To receive the coordinates of the vehicle GPS module is used and GSM will send the received coordinates to the user through SMS. There is an additional LCD which is used for displaying status message or coordinates. When a person is driving the vehicle met with an accident then the vibrations of the vehicle is received by the vibration sensor and the sensor acts as a accident detection module which further send the information to the micro controller and the location of the vehicle is received through GPS module and the coordinates The vehicle is sent to the GSM module. The received information is sent to arduino uno. The received coordinate information is collected and is send to the respected person,hospitals and police station through SMS.

9 . OUTPUT:

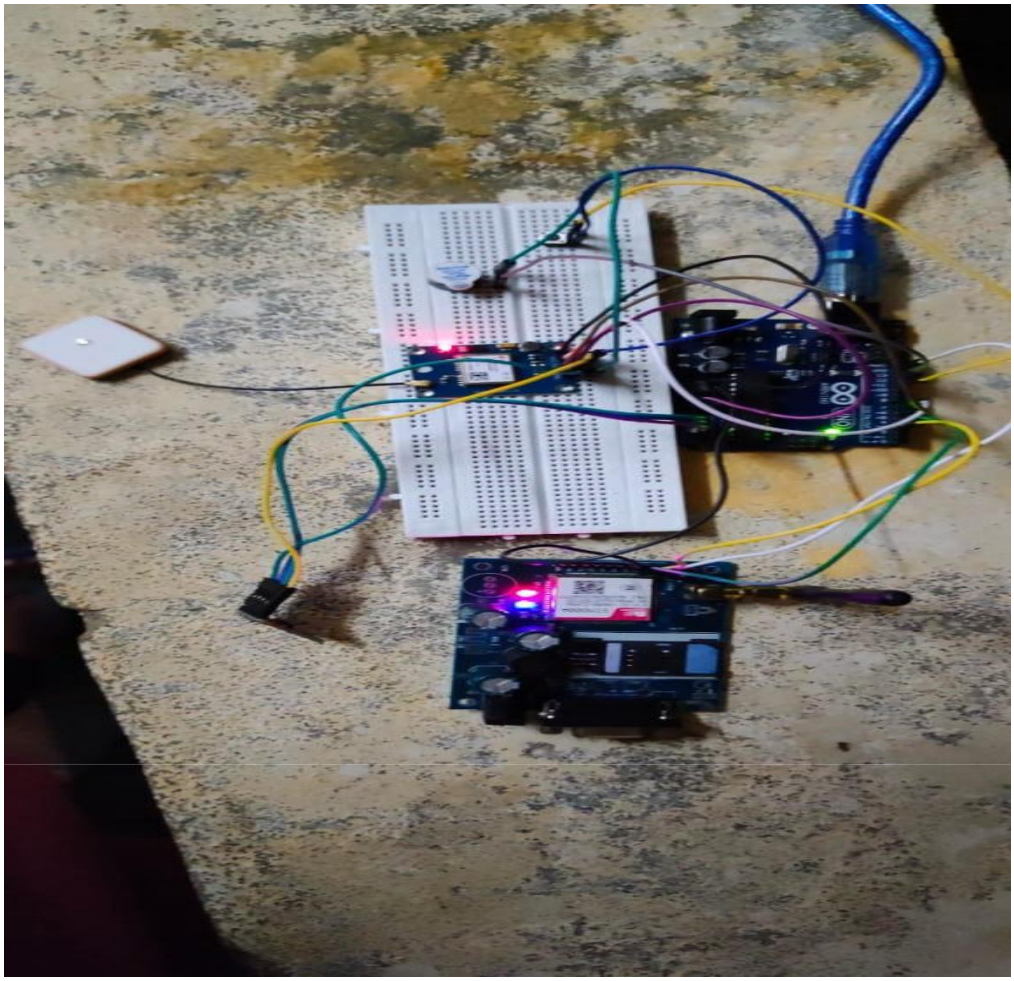
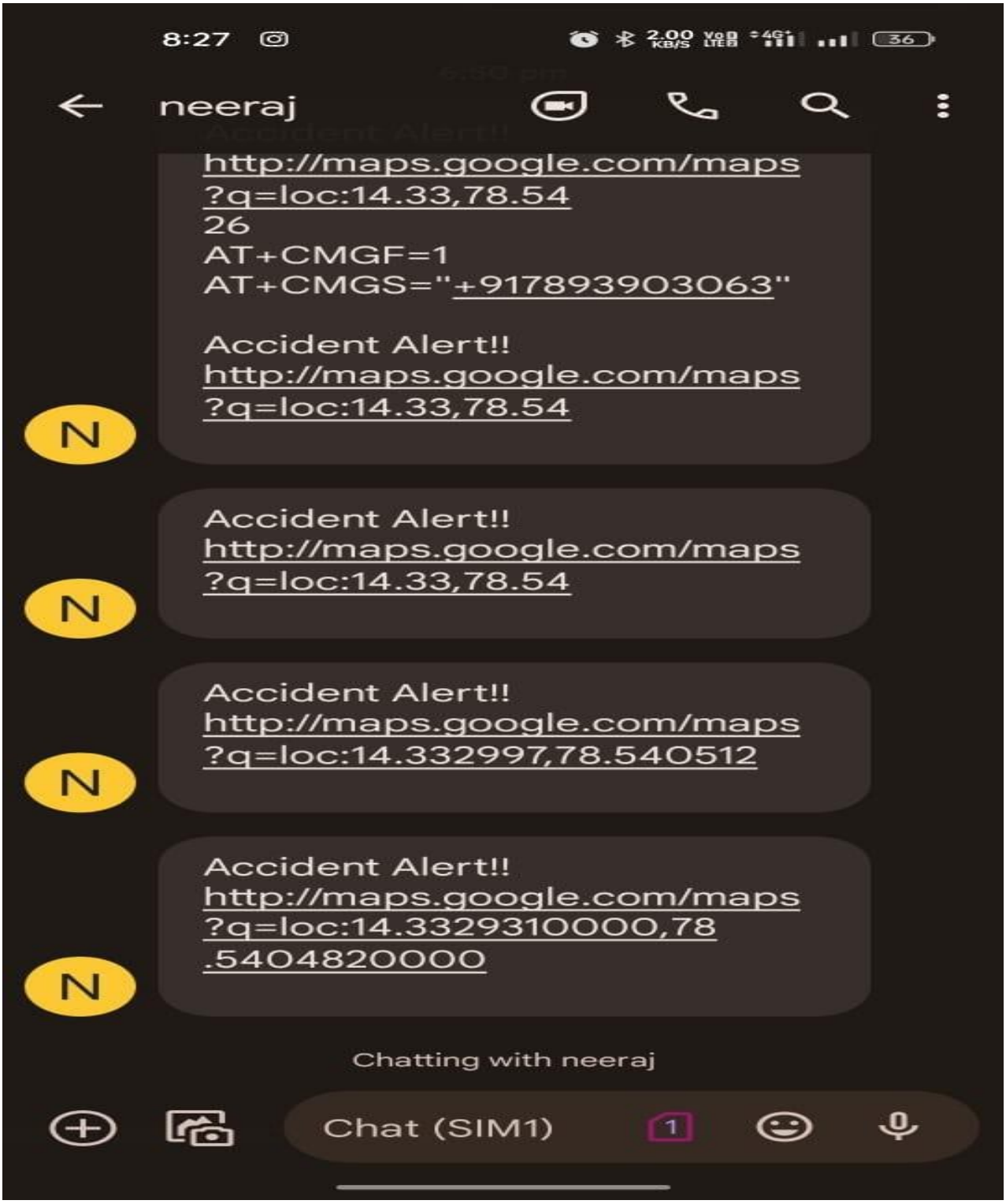


fig 1.8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N
Accident Alert!!
http://maps.google.com/maps
?q=loc:14.3329310000,78
.5404820000
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Chatting with neeraj
Chat (SIM1)

Fig 1.9

10 . ADVANTAGES:

Low power Consumption.

Easy to implement in any vehicle.

Low cost and Reliable.

It saves the time to reach the accident location. Mobile

Number can be changed at any time.

The Vehicle Which has underogone to an accident can be identified by using tracking technology without any time delay.

11 . DISADVANTAGES:

In some places where there is no provision of GSM network it difficult for communication.

Sometimes false alarms are observed to the ill maintained by roads and speed breakers.

12 . RESULTS:

The overall result of this project is an application that provides help to people who require help but can't ask for it. With the help of the application, their request for help is sent at the time of the accident with their location which helps emergency services provide support as early and effective as possible. All this is done with only the sensors available at low cost.

13 . FUTURE ENHANCEMENT:

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 alerts systems that can stop the vehicle to overcome the accidents.

14 . CONCLUSION:

The proposed programmed accident detection system can be a rescuer of life for the people who met with accidents. The proposed system is exceptionally easy to understand and even a non-specialized Person can use it without any problem. The system consists of equipment and programming segments. The equipment unit includes accident detection sensors that are constrained by an Arduino board and is fitted in the vehicle. Then again, the programming part is an Android application introduced in drivers Smartphones which is used to get the point by point map. In general, the benefits of this system are low cost, secure and simple to use. The system introduced in this work reduces the casualties due to accidents.

15 . CODE :

```
#include <TinyGPS++.h>
#include <SoftwareSerial.h>
#include <math.h>

static const int RXPin = 6, TXPin = 7;
static const uint32_t GPSBaud = 9600;

/  The TinyGPS++ object
TinyGPSPlus gps;

/  The serial connection to the GPS device
SoftwareSerial ss(RXPin, TXPin); SoftwareSerial
mySerial(3,4);
#define    BUZZER    12
#define BUTTON 11



#define xPin A1
#define yPin A2
#define zPin A3
int vibration = 2, devibrate = 75;
int xaxis = 0, yaxis = 0, zaxis = 0;
int deltx = 0, delty = 0, deltz = 0;
String latitude, longitude;
byte updateflag;
int magnitude = 0;
int sensitivity = 200;
double angle;
boolean impact_detected = false;
//Used to run impact routine every 2mS.
unsigned long time1;
unsigned long impact_time;
unsigned long alert_delay = 15000;


void setup(){
  Serial.begin(9600);
  ss.begin(GPSBaud);
  mySerial.begin(19200);
  pinMode(BUTTON,INPUT);
  pinMode(BUZZER,OUTPUT);


  time1 = micros();
  xaxis = analogRead(xPin);
  yaxis = analogRead(yPin);
  zaxis = analogRead(zPin);
}
```

```
void loop(){
    /    This sketch displays information every time a new sentence is correctly encoded.
   ss.listen();
   while (ss.available() > 0)
      { gps.encode(ss.read());
      //Serial.println("Available"); if
      (gps.location.isUpdated()){
        //Serial.print("Latitude= ");
        //Serial.print(gps.location.lat(), 6);
        //Serial.print(" Longitude= ");
        //Serial.println(gps.location.lng(), 6);


        if (micros() - time1 > 1999) Impact();
        Serial.print("Magnitude:"); Serial.println(magnitude);

        if(updateflag > 0)
        {
          updateflag=0;
          Serial.println("Impact detected!!");
          Serial.print("Magnitude:"); Serial.println(magnitude);
          //getGps();

          digitalWrite(BUZZER, HIGH);
          impact_detected = true;
          impact_time = millis();

          if(impact_detected == true)
          {
            Serial.print("Latitude= ");
            Serial.print(gps.location.lat(), 6); Serial.print("
            Longitude= "); Serial.println(gps.location.lng(),
            6); while(millis() - impact_time <= alert_delay) {
              Serial.println(millis() - impact_time);
              if(digitalRead(BUTTON)==HIGH){
                 digitalWrite(BUZZER, LOW);
                 return;
              }
            }
              /    makeCall();
                //delay(1000);
            sendAlert();
            impact_detected = false;
            impact_time = 0;
            digitalWrite(BUZZER,LOW);
          }
         }
        }
       }
     }
```

```
void Impact()
{
  //------------------------------------------------------------
  time1 = micros(); // resets time value
  //------------------------------------------------------------
  int oldx = xaxis; //store previous axis readings for comparison
  int oldy = yaxis;
  int oldz = zaxis;


  xaxis = analogRead(xPin);
  yaxis = analogRead(yPin);
  zaxis = analogRead(zPin);

  //------------------------------------------------------------
    //loop counter prevents false triggering. Vibration resets if there is an impact.
Don't detect new changes until that "time" has passed.
  vibration--;
  //Serial.print("Vibration = "); Serial.println(vibration);
  if(vibration < 0) vibration = 0; //Serial.println("Vibration
  Reset!");

  if(vibration > 0) return;

  deltx = xaxis - oldx;
  delty = yaxis - oldy;
  deltz = zaxis - oldz;

  //Magnitude to calculate force of impact. magnitude =
  sqrt(sq(deltx) + sq(delty) + sq(deltz)); if (magnitude >=
  sensitivity) //impact detected {

    updateflag=1;
    /   reset anti-vibration counter
    vibration = devibrate;
  }

  else
  {
    //if (magnitude > 15)
      //Serial.println(magnitude);
      //reset magnitude of impact to 0
      magnitude=0;
   }
}
```

```
void sendAlert()
{
  String sms_data;
  sms_data = "Accident Alert!!\r";
  sms_data += "http://maps.google.com/maps?q=loc:";
  sms_data += String(gps.location.lat(),6) + "," + String(gps.location.lng(),6);
  //Serial.println(String(gps.location.lat())); //Serial.println(sms_data);
  SendTextMessage(sms_data);
}




void SendTextMessage(String text)
{
  Serial.println("Sending Message");
 // Serial.println(text);
  mySerial.println("AT+CMGF=1"); //To send SMS in Text Mode
  delay(1000);
     mySerial.println("AT+CMGS=\"+917893903063\"\r"); // change to the phone number you
using
  delay(1000);
  mySerial.println(text);
  delay(200);
  //mySerial.println(0x1A);//the stopping character
  mySerial.println((char)26);//the stopping character
  delay(1000);
  Serial.println("SMS Sent Successfully");
}
```