A Smart Accident Detection Using Sensor

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Abstract- *Vehicular accidents take place at every time and everywhere and many people lose their life because of delayed emergency care given to them. This project is all about detecting the accident in smart way by using sensor and sending the information about the accident to the nearby police station and hospitals as soon as accident take place. We are using MEMS (Micro Electro Mechanical Sensor) accelerometer for detecting accident, GPS (Global Positioning System) L10 module for finding location of the accident and GSM (Global System for Mobile Communication) SIM800C module for sending information about the accident to the nearby police station and hospital. We are connecting all these three hardware components to Arduino UNO board which has microcontroller Atmega 328 embedded in it. We are uploading program into microcontroller, where this Ardunio UNO board functions based on stored instructions.*

Keywords- MEMS Accelerometer, GPS, GSM, arduino UNO board, Atmega 328 microcontroller.

I. INTRODUCTION

This project lays on accident detection and clearing the traffic over there by informing nearby police station and hospitals. By sending information to nearby hospitals people's life can be saved as soon as the accident happens. So, there are two parts in this project first, detecting accident and the second one is sending information. For detecting accident we are using MEMS sensor (Micro Electro Mechanical Sensor) and for sending the information we are using GPS (Global Positioning System) for finding the location of the accident and GSM (Global System for Mobile Communication) for sending messages. By this project we are detecting the accident in a smart way and saving the life of many people.

II. PREVIOUS WORK

In [8], a vision-based traffic accident detection algorithm and developed a system for automatically detecting, recording, and reporting traffic accidents at intersections is done. In [4], a novel algorithm as well as architecture for the fall accident detection and corresponding wide area rescue system based on a smart phone and the third generation (3G) networks. To realize the fall detection algorithm, the angles acquired by the electronic compass (ecompass) and the waveform sequence of the tri axial accelerometer on the smart phone are used as the system inputs. In [2], they have developed an algorithm, referred to as spatio-temporal Markov random field, for traffic images at intersections. This algorithm models a tracking problem by determining the state of each pixel in an image and its transit, and how such states transit along both the x-y image axes as well as the time axes. In [3] sound-based accident detection is done.

III. PROPOSED WORK

In existing system, accident is detected using vision-based, sound-based but we detecting the accident using sensor which is efficient method than others and it is cost efficient. Here we use

A. Ardunio UNO board

Arduino is a computer hardware and software company, project and user community that designs and manufactures microcontroller kits for building digital devices and interactive objects that can sense and control objects.

- Arduino is open source hardware.
- Arduino programs may be written in any programming language with a compiler that produces binary machine code.

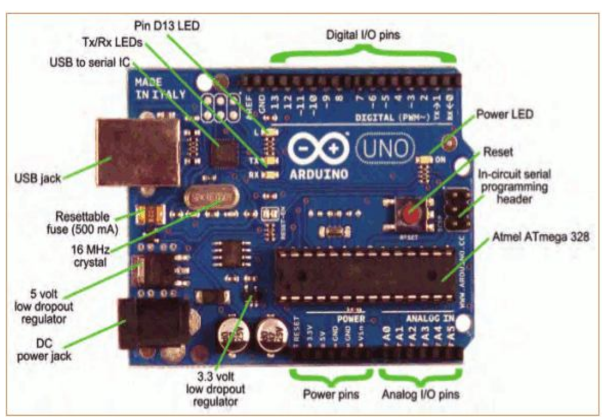

Fig 3.1 Arduino UNO board

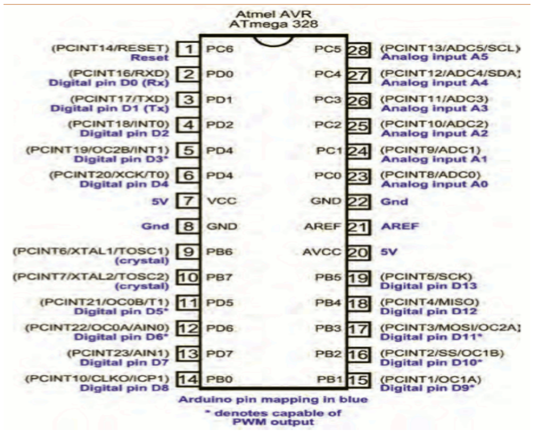

Fig 3.2 The Arduino Microcontroller: Atmel ARV Atmega 3

Arduino-Atmega 328

- High Performance, Low Power Atmel® AVR® 8-Bit Microcontroller Family
- Advanced RISC Architecture
- 131 Powerful Instructions – Most Single Clock Cycle Execution
- 1KBytes EEPROM
- 2KBytes Internal SRAM
- 6-channel 10-bit ADC in PDIP Package
- Programmable Serial USART

B. MEMS Accelerometer

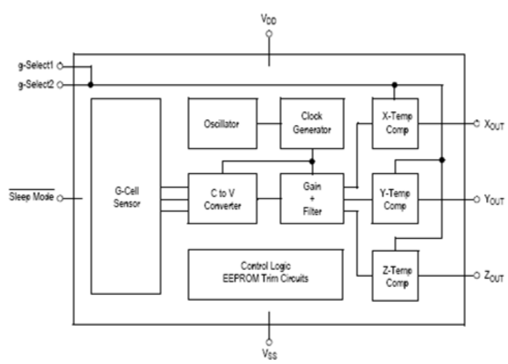

Figure 2. Simplified Accelerometer Functional Block Diagram

Fig 3.3 Three Axis Low-g Micro machined Accelerometer

Features

- Selectable Sensitivity (1.5g/2g/4g/6g)
- Low Current Consumption: 500 ìA
- Sleep Mode: 3 ìA
- Low Voltage Operation: 2.2 V – 3.6 V
- 6mm x 6mm x 1.45mm QFN
- High Sensitivity (800 mV/g @ 1.5g)
- Fast Turn On Time
- Integral Signal Conditioning with Low Pass Filter
- Robust Design, High Shocks Survivability
- Pb-Free Terminations
- Environmentally Preferred Package
- Low Cost

Typical Applications

- HDD MP3 Player: Freefall Detection
- Laptop PC: Freefall Detection, Anti-Theft
- Cell Phone: Image Stability, Text Scroll, Motion Dialing, E-Compass
- Pedometer: Motion Sensing
- PDA: Text Scroll
- Navigation and Dead Reckoning: E-Compass Tilt Compensation
- Gaming: Tilt and Motion Sensing, Event Recorder
- Robotics: Motion Sensing

C. GPS L10Module

GPS Click L10 is an accessory board in microbus™ form factor. It’s a compact solution for adding GPS functionality to your device. It features Quectel® L10, high performance MTK positioning engine. Board can be interfaced with a microcontroller through UART or I2C connection, or data can be acquired using PC application through USB connection. Board features connector compatible with active and passive antennas. It can operate on 3.3V power supply only.

The GPS module L10 brings the high performance of the MTK positioning engine to the industrial standard. The L10 supports 210 PRN channels. With 66 search channels and 22 simultaneous tracking channels, it acquires and tracks satellites in the shortest time even at indoor signal level. This versatile, stand-alone receiver combines an extensive array of features with flexible connectivity options.

Figure 3.4 GPS L10 module

Key Applications

GPS click is ideal for asset tracking, road navigation devices, public transportation vehicle information systems and more.

Features

- -165dBm tracking sensitivity
- Embedded with one 4Mbits flash memory
- Jamming Up to 5Hz update rate
- Low tracking power consumption, 38mA.
- 210 PRN channels, with 66 search channels and 22 simultaneous
- Tracking channels.
- Microbus™ form factor enables easy integration.
- Supports active and passive antennas.
- Ready-to-use examples save development time.
- Supported in all microelectronics compilers.

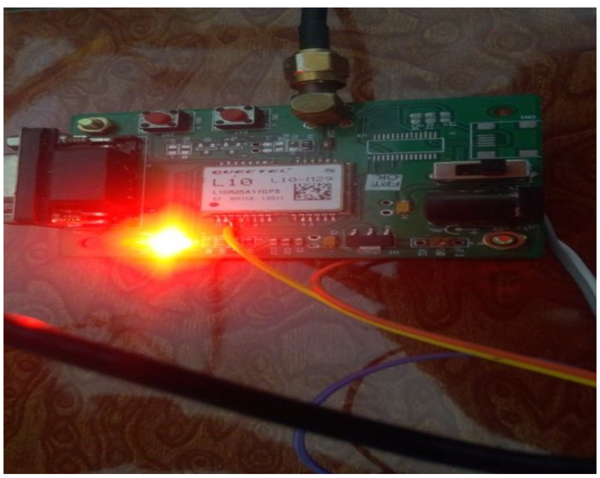

Fig 3.5 GPS L10 module

D. GSM SIM800C module

SIM 800C Module is a complete Quad-band GSM/GPRS solution in a SMT type, which can be embedded in the customer applications. These modules are sub-system of the Internet-of-everything hardware. SIM800C supports Quad-band 850/900/1800/1900 MHz; it can transmit Voice, SMS and data information with low power consumption. With tiny size of 17.6*15.7*2.3mm, it can smoothly fit into slim and compact demands of customer design.

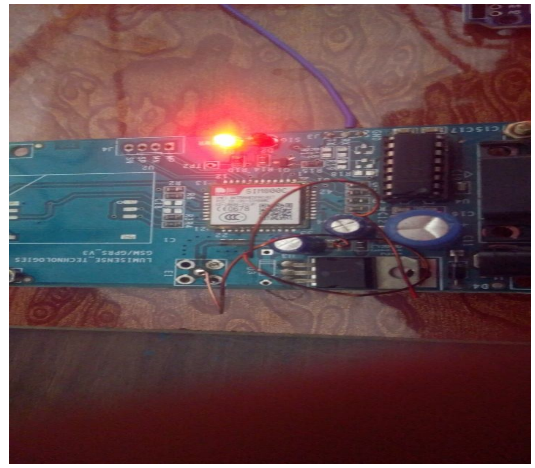

Fig 3.6 GSM SIM800C module

IV. SYSTEM IMPLEMENTATION

A. System Architecture

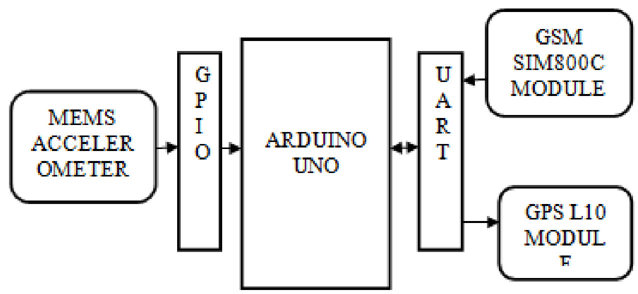

Fig 4.1 System architecture

Figure 4.1 illustrates that the data sensed from the MEMS Accelerometer is sent to arduino UNO board using General Purpose Input /Output (GPIO), from the GPS L10 module data is transmitted to arduino UNO board receiver, from the arduino UNO transmitter data is sent to GSM SIM800C module.

B. Uploading program into Arduino board

Program is uploaded into the arduino board by connecting arduino board with computer by USB cable .Program is developed in Arduino software Integrated Development Environment.

Fig 4.2 Screenshot of uploaded program

C. Connection of MEMS Accelerometer, GSM SIM800C module and GPS L10 module with Arduino UNO

Connecting all these three hardware components into the arduino UNO board with copper wires. First the sensor data is given to arduino. Accident detection is checked by the sensor value

Depending on the program instructions, after accident detection arduino UNO collects latitude and longitude value from GPS module, after collecting information. Arduino sends this information to GSM SIM800C module which will send the information about the accident to respective family members, nearby hospital and police station.

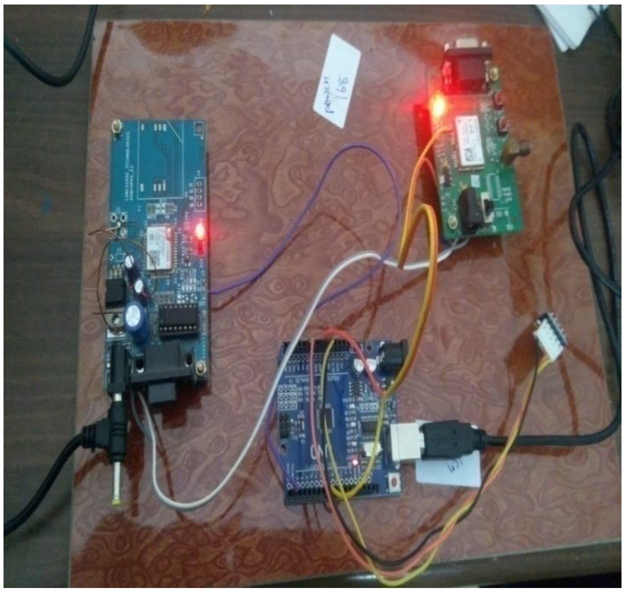

Fig 4.3 Screenshot of connected hardware components

V. EXPERIMENTAL RESULTS

Latitude and longitude is sent as a message from SIM800C module transmitter SIM card to receiver SIM card numbers. The contact numbers which should be given in the coding in arduino software.

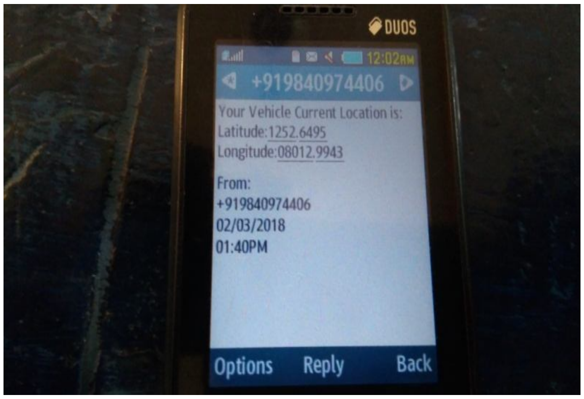

Fig 5.1 Screenshot of output message

VI. CONCLUSION

This project is all about the vehicular accident detection and reporting about the accident to the nearby police station, hospital and family occurs by sending the location of the accident to the nearby police station, hospital and family members through message. By this method, the transportation department can track the vehicle which got accident and take necessary actions. Accident occurance is detected using MEMS accelrometer. The whole project lays on the arduino UNO microcontroller loaded instructions. Program instructions lays path to this project which controls the entire accident detection and reporting.

APPENDIX

Coding

```
#include <SoftwareSerial.h>
SoftwareSerial gps(8,9); // RX, TX
char str[70];
String gpsString="";
char *test="$GPGGA";
String latitude="No Range      ";
String longitude="No Range     ";
int temp=0,i;
boolean gps_status=0;
void setup()
{
  Serial.begin(9600);
  gps.begin(9600);
  get_gps();
  pinMode(10,INPUT);
  pinMode(A0,INPUT);
```

```
  pinMode(11,OUTPUT);
  digitalWrite(11,LOW);
}
void loop()
{
  int mems_value = analogRead(A0);
//  Serial.println(mems_value);
  delay(200);
  if(mems_value > 380)
  {
    tracking1();
    delay(4000);
    tracking2();
    delay(4000);
  }
}
void gpsEvent()
{
  gpsString="";
  while(1)
  {
   while (gps.available()>0)            //checking serial data from
GPS
   {
    char inChar = (char)gps.read();
     gpsString+= inChar;                  //store data from GPS into
gpsString
     i++;
     if (i < 7)
     {
      if(gpsString[i-1] != test[i-1])        //checking for $GPGGA
sentence
      {
        i=0;
        gpsString="";
      }
     }
    if(inChar=='\r')
    {
     if(i>65)
     {
       gps_status=1;
       break;
     }
     else
     {
       i=0;
     }
    }
  }
   if(gps_status)
    break;
  }
}
void get_gps()
{
   gps_status=0;
   int x=0;
   while(gps_status==0)
   {
    gpsEvent();
    int str_lenth=i;
    latitude="";
    longitude="";
    int comma=0;
    while(x<str_lenth)
    {
      if(gpsString[x]==',')
      comma++;
      if(comma==2)        //extract latitude from string
      latitude+=gpsString[x+1];
      else if(comma==4)        //extract longitude from string
      longitude+=gpsString[x+1];
      x++;
    }
    int l1=latitude.length();
    latitude[l1-1]=' ';
    l1=longitude.length();
    longitude[l1-1]=' ';
    i=0;x=0;
    str_lenth=0;
    delay(100);
   }
}
void send_data(String message)
{
  Serial.println(message);
  delay(500);
}
void tracking1()
{
    send_data("AT+CMGS=\"+917358008527\"\r");
    send_data("Your Vehicle Current Location is:");
    Serial.print("Latitude:");
    send_data(latitude);
    Serial.print("Longitude:");
    send_data(longitude);
    Serial.write(0x1a);
    delay(500);
}
void tracking2()
{
    send_data("AT+CMGS=\"+919597660671\"\r");
    send_data("Your Vehicle Current Location is:");
```

```
    Serial.print("Latitude:");
    send_data(latitude);
    Serial.print("Longitude:");
    send_data(longitude);
    Serial.write(0x1a);
    delay(500);
}
```

VII. ACKNOWLEDGMENT

We sincerely thank our parents, almighty god, professors, and our college without whom this would not be possible.

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