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Ultrasonic Sensor Utilization to Prevent Road Safety for Public

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Abstract: *Today We Have Seen Many Accidents In Our Travel Even Though People Are Drives Their Vehicles Carefully,So For That Purpose Preventing Road Accident And Safety Drive We Are Travel On Road Without Dashing We Have Design Ultrasonic Sensor Based Accident Prevent System For Public And We Wish To Keep Our Environment Accident Free. A Normal Man May Meet Accident When They Are Sometimes Careless. A Human Brain Not Work Us An Artificial Device Always It May Lose Sometimes Control That Time Accident Occur, Even A Normal Man Not Succeed Preventing Accident Then A Disable Person How To Do It? In Order To Make Comfort All Types Of People Either Normal /Disable This Sensor Is Supposed To Guide The Person Travel On Road By Giving Prior Warning Of The Traveller Crossing Opposite Also It Tells The Status Of Speed Breaker And Inform The Object Crossing The Road During Travel Such As Dog, Goat, Human Or Any Vehicle Etc.,. For This Kind Of Support We Wish To Give The Public Hence We Incorporate A Voice Sensor In This Hardware It Always Announces The Opposite Traveller Status. A Vibration Sensor Fixed In The Seat Of Our Vehicle Monitor The Person Status They Are Seated Or Not, If The Person Fell Down From Their Vehicle On Road The Vibration Sensor Sends Signal To The Microcontroller Which Is The Heart Of The Circuit To Control All Units Build Inside Next We Fitted One Gsm Module In The Hardware Which Send Sms Immediately After Accident And When The Person Not Seated To The Nearest Police Station, Relatives Of The Traveller And Nearest Hospital. This Is The Performance Of The Circuit We Newly Designed*

Keywords: *Arm Microcontroller Lpc2148, Gsm Module, Pic Microcontroller 16f877a, Specially Abled Persons, Vibration Sensor, Voice Board.*

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I. Introduction

In Recent Years Specially Abled Persons (Disable) Suffered Lot To Do Their Daily Works They May Need A Support Of Other Persons Always, So The Economic Status Of Their Family Is Questionable, If The Disable Not Able To Work They May Need A Other Support Hence The Other Of The Same Family Cannot Able To Do A Job, Always Take Care Of The Disable, Due To This Critical Situation Two Persons Of The Same Family Are Simply Sitting Without Job They May Need Money To Satisfied Their Needs So They Always Depends Upon The Third Person Of The Same Family. If The Third Person Not In The Family They Lack A Lot Of Needs Some Times They Get Insufficient Food, Cloth Etc., Keep In Mind This Situation A Care Taking And Security Device Developed Using Vibration Sensor, Voice Sensor And GSM Module To Render Support The Disable To Move Away From Their House And Tried To Do Some Job Like A Normal Man And Forget Their Disability And Enjoy Their Life Like Other Persons And To Be A Free Bird Always Hence The Other Person Who Is Always With The Disable Now Went Away To Do Job And The Disable Also, So The Economic Status Of The Family Is Also Improved Much Better Their Need Also Satisfied, During Travel If The Disable Met Accident Like Threat Or Sudden Slip On Road During Their Driving Of Their Special Vehicle The Family Member Get SMS Alert For The Threat And Immediate Support Also Render To The Disable By Some Other Traveler On Road For The Purpose Make Attraction Of Somebody We Include A Buzzer Unit To Alarm Bring The Attention Of Public To Help. This Device May Applicable For Normal Man Also By Travel On Road To Prevent Accident.

II. System Requirements

2.1Voice Board:

When There Is An Accident / Fell Down Event Happened On Road By The Person That Time This Voice Board Play The Recorded Voice And Attracted The Traveller For Support

2.2Vibration Sensor:

It Monitors The Seating Of The Person In Special Vehicle If They Got Sudden Shock Due To The Crossing Of Vehicle Opposite On Road They Shake, Sometimes They Can't Balance They Fell Down That Time This Sensor Generate Alarm This Indicates An Emergency Support Need For The Person By The Persons Who Are Crossing The Road At The Moment.

2.3GSM/GPRS Module:

GPS: Global Positioning Service Gives The Location Of Wherever There Is An Accidental Threat Happens This Unit Send SMS Of Latitude And Latitude To Particular Registered Number Using GPRS Technology
GPRS: General Packet Radio Service Sent MMS Of The Captured Image To Particular Registered Number Using GPRS Technology Or Using Further Evidence About The Crime.

2.4 Ultrasonic HC-SR04:

This Module Has 4 Pins- Vcc (5V), Trig, Echo, GND. Trig (Trigger) Is Used To Send Out An Ultrasonic High Level Pulse For At Least 10µs And The Echo Pin Then Automatically Detects The Returning Pulse.

RSSI Unit:

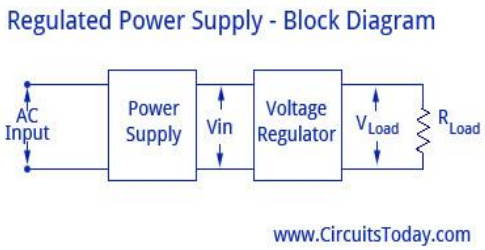
RSSI Or Received Signal Strength Indicator Is The Name For The Signal Strength Of A Wireless Network Environment. It Is Not Noticeable To A User Of A Receiving Device, However The IEEE 802.11 Devices Provide Their Users With Signal Measurement Data, Because In Fact The Signal Strength Can Vary Dramatically Thus Affecting The Functionality In Wireless Networking.

Universal Asynchronous Receiver-Transmitter

A Universal Asynchronous Receiver-Transmitter (UART /ˈJuːɑːRt/) Is A Computer Hardware Device For Asynchronous Serial Communication In Which The Data Format And Transmission Speeds Are Configurable. The Electric Signaling Levels And Methods Are Handled By A Driver Circuit External To The UART. A UART Is Usually An Individual (Or Part Of An) Integrated Circuit (IC) Used For Serial Communications Over A Computer Or Peripheral Device Serial Port. Uarts Are Now Commonly Included In Microcontrollers. A Related Device, The Universal Synchronous And Asynchronous Receiver-Transmitter (USART) Also Supports Synchronous Operation.

Regulated Power Supply

Regulated Power Supply Is An Electronic Circuit That Is Designed To Provide A Constant Dc Voltage Of Predetermined Value Across Load Terminals Irrespective Of Ac Mains Fluctuations Or Load Variations.



System Architecture

The Below Fig.1 Shows The Prior Research Of Ultrasonic Sensors Use For Prevention And Distance Measurement From The Literature Review

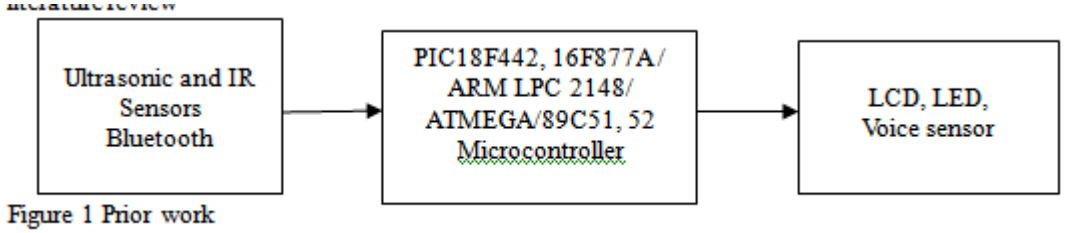


Figure 1 Prior Work

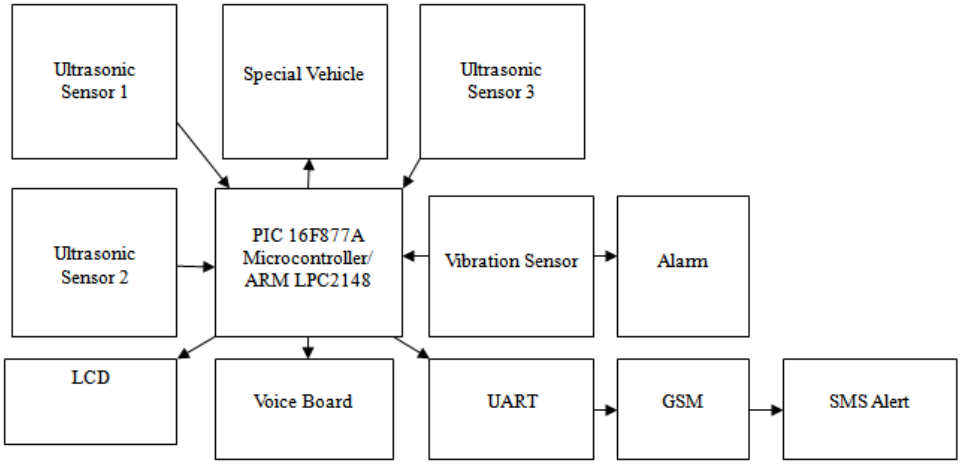


Figure 2 Proposed Model

Figure 2 Proposed Model

Here In Fig.2 We Designed The Hardware Both For Specially Abled Persons And Normal Persons When They Travel On Road To Help Them For Their Safety, In This Proposed Work We Added The Facility Of Sending SMS Alert Immediate To The Notable Persons, The Same Circuit Is Compatible To Work With Two Controller IC's Example PIC 16F877A And ARM LPC2148, We Cover Three Separate Sensors For Total Visible Area By Front And Back On The Vehicle On Road Hence If One Sensor Missed To Monitor The Road Due To Problem That Time The Other Take Care. Vibration Sensor Monitors The Persons Seating On Vehicle From Their Fixed Position. Alarm Ignited During Critical Condition To Attacks The Traveller On Road For The Support Of The Disable/Normal Man When They Fell Down So First Aid First Given And People Relaxes Then They Go To Hospital For Treatment. The Voice Board Makes A Sound For Accident Continuously For Somebody To Help The Affected Person.

III. System Hardware

Voice Board:

The APR9600 Experimental Board Is An Assembled PCB Board Consisting Of An APR9600 IC Shown In Fig.3, An Electret Microphone, Support Components And Necessary Switches To Allow Users To Explore All Functions Of The APR9600 Chip. The Oscillation Resistor Is Chosen So That The Total Recording Period Is 60 Seconds With A Sampling Rate Of 4.2 Khz.

During Sound Recording, Sound Is Picked Up By The Microphone. A Microphone Pre-Amplifier Amplifies The Voltage Signal From The Microphone. An AGC Circuit Is Included In The Pre-Amplifier, Controlled By An External Capacitor And Resistor. If The Voltage Level Of A Sound Signal Is Around 100 Mv Peak To-Peak, The Signal Can Be Fed Directly Into The IC Through ANA IN Pin. Analogue Circuit Controlled By An External Capacitor And Resistor. This Device Offers True Single-Chip Voice Recording, Non- Volatile Storage, And Playback Capability For 40 To 60 Seconds. Advanced Flash Non-Volatile Memory Process, Where Each Memory Cell Can Store 256 Voltage Levels. This Technology Enables The APR9600 Device To Reproduce Voice Signals In Their Natural Form. It Eliminates The Need For Encoding And Compression, Which Often Introduce Distortion.

Fig.3 Voice Board

APR9600 Experimental board

Vibration Sensor:

Sensor SW-420 Single-Roller Type Full Induction Trigger Switch Shown In Fig.4 When No Vibration Or Tilt, The Product Is ON Conduction State, And In The Steady State, When A Vibration Or Tilt, The Switch Will Be Rendered Instantly Disconnect The Conductive Resistance Increases, Generating A Current Pulse Signal, Thereby Triggering Circuit. These Products Are Completely Sealed Package, Waterproof, Dustproof. Principle Usually At Any

Angle Switch Is ON State, By The Vibration Or Movement, The Rollers Of The Conduction Current In The Switch Will Produce A Movement Or Vibration, Causing The Current Through The Disconnect Or The Rise Of The Resistance And Trigger Circuit. The Characteristics Of This Switch Is Usually General In The Conduction State Briefly Disconnected Resistant To Vibration, So It's High Sensitivity Settings By IC, Customers According To Their Sensitivity Requirements For Adjustments.

Fig.4 Vibration Sensor Board

GSM Module:

GSM (Global System For Mobile) / GPRS (General Packet Radio Service) TTL -Modem Is SIM900 Quad-Band GSM / GPRS Device, Works On Frequencies 850 MHZ, 900 MHZ, 1800 MHZ And 1900 MHZ. It Is Very Compact In Size And Easy To Use As Plug In GSM Modem. The

Modem Is Designed With 3V3 And 5V DC TTL Interfacing Circuitry , Which Allows User To Directly Interface With 5V Microcontrollers (PIC, AVR, Arduino, 8051, Etc.) As Well As 3V3 Microcontrollers (ARM, ARM Cortex XX, Etc.). The Baud Rate Can Be Configurable From 9600-115200 Bps Through AT (Attention) Commands. This GSM/GPRS TTL Modem Has Internal TCP/IP Stack To Enable User To Connect With Internet Through GPRS Feature. It Is Suitable For SMS As Well As DA T A Transfer Application In Mobile Phone To Mobile Phone Interface. The Modem Can Be Interfaced With A Microcontroller Using USART (Universal Synchronous Asynchronous Receiver And Transmitter) Feature (Serial Communication).

Ultrasonic HC-SR04:

The Ultrasonic Sensor HC-SR04 Is One Of The Most Commonly Used Distance Measuring Ultrasonic Sensors As Shown In Fig.5 And Fig. 6

Measuring Distance:

The Time It Takes The Sound Wave To Be Sent, Hit The Object And Return Back To The Sensor Is Measured. This Time Is Then Multiplied By The Speed Of Sound (343m/Sec = 0.0343cm/Ms = [1/29.1] Cm/Ms Approx.) To Give The Total Distance Traveled By The Ultrasonic Wave, Which Is Then Divided By 2 (To Account For The Fact That The Wave Was Sent, Hit The Object, And Then Returned Back To The Sensor, Hence Covering Twice The Distance To The Object)

Distance = (Time For Wave To Return * Speed Of Sound) / 2.

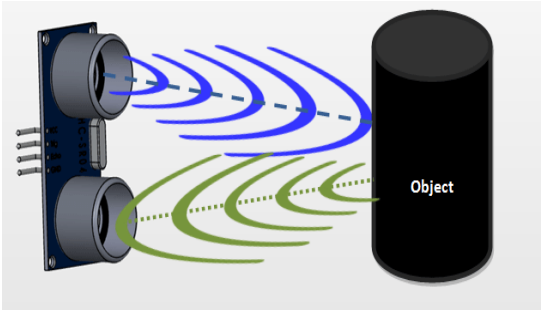


Fig.5 Ultrasonic Sensor Detection Principle Using Echo

Fig.6 Ultrasonic Sensor

RSSI Measurements Represent The Relative Quality Of A Received Signal On A Device. RSSI Indicates The Power Level Being Received After Any Possible Loss At The Antenna And Cable Level. The Higher The RSSI Value, The Stronger The Signal. When Measured In Negative Numbers, The Number That Is Closer To Zero Usually Means Better Signal. As An Example -50 Is A Pretty Good Signal, -75 Is Fairly Reasonable, And -100 Is No Signal At All. Fig.7 Showhs The RSSI Signal Strength

Regulated Power Supply:

Fig.8 A Regulated Power Supply Essentially Consists Of An Ordinary Power Supply And A Voltage Regulating Device, As Illustrated In The Figure. The Output From An Ordinary Power Supply Is Fed To The Voltage Regulating Device That Provides The Final Output. The Output Voltage Remains Constant Irrespective Of Variations In The Ac Input Voltage Or Variations In Output (Or Load) Current. The Voltage Derived From Power Supply Rectified By Bridge Rectifiers AC Converted Into DC And Power Given To All The Components In Built On The PCB Board Of This Circuit.

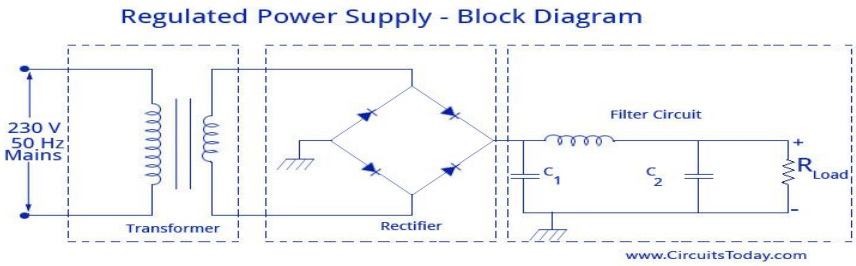


Fig.8 Regulated Power Supply – Diagram

The PIC Micro Controller

Fig.9 Shows The PIC Microcontroller PCB Board And Fig.10Pin Configuration Of PIC

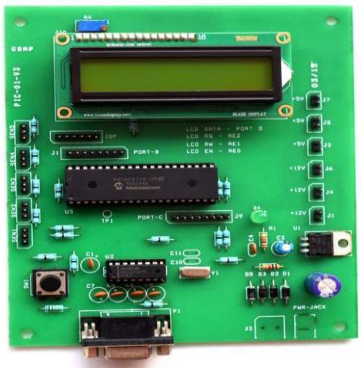


Fig.9 PCB Board Of PIC

Features:

High-Performance RISC CPU:

- Only 35 Single-Word Instructions To Learn
- All Single-Cycle Instructions Except For Program Branches, Which Are Two-Cycle
- Operating Speed: DC – 20 Mhz Clock Input DC – 200 Ns Instruction Cycle
- Up To 8K X 14 Words Of Flash Program Memory, Up To 368 X 8 Bytes Of Data Memory (RAM), Up To 256 X 8 Bytes Of EEPROM Data Memory
- Pin Out Compatible To Other 28-Pin Or 40/44-Pin
- PIC16CXXX And PIC16FXXX Microcontrollers

Peripheral Features:

- Timer0: 8-Bit Timer/Counter With 8-Bit Prescaler
- Timer1: 16-Bit Timer/Counter With Prescaler, Can Be Incremented During Sleep Via External Crystal/Clock
- Timer2: 8-Bit Timer/Counter With 8-Bit Period Register, Prescaler And Postscaler
  - Two Capture, Compare, PWM Modules
  - Capture Is 16-Bit, Max. Resolution Is 12.5 Ns

- Compare Is 16-Bit, Max. Resolution Is 200 Ns
- PWM Max. Resolution Is 10-Bit
- Synchronous Serial Port (SSP) With SPI™ (Master Mode) And I2C™ (Master/Slave)
- Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) With 9-Bit Address Detection
- Parallel Slave Port (PSP) – 8 Bits Wide With External RD, WR And CS Controls (40/44-Pin Only)
- Brown-Out Detection Circuitry For Brown-Out Reset (BOR)

Analog Features:

- 10-Bit, Up To 8-Channel Analog-To-Digital Converter (A/D)
- Brown-Out Reset (BOR)
- Analog Comparator Module With:
  - Two Analog Comparators
  - Programmable On-Chip Voltage Reference (VREF) Module
  - Programmable Input Multiplexing From Device Inputs And Internal Voltage Reference
  - Comparator Outputs Are Externally Accessible

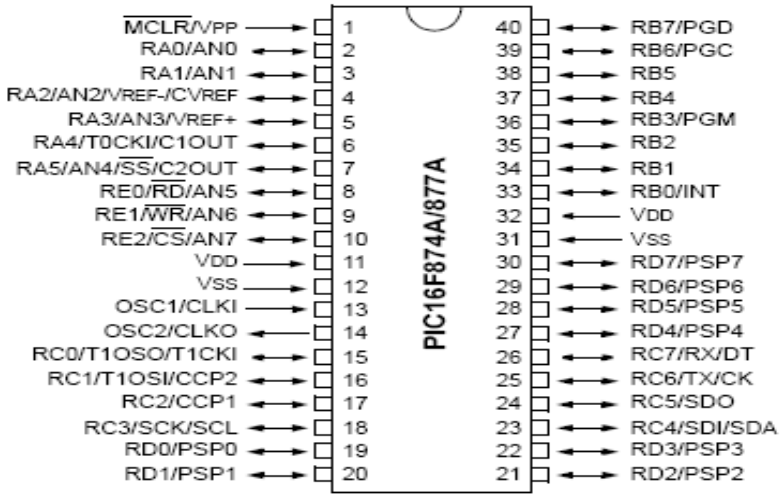
Special Microcontroller Features:

- 100,000 Erase/Write Cycle Enhanced Flash Program Memory Typical
- 1,000,000 Erase/Write Cycle Data EEPROM Memory Typical
- Data EEPROM Retention > 40 Years
- Self-Reprogrammable Under Software Control
- In-Circuit Serial Programming™ (ICSP™) Via Two Pins
- Single-Supply 5V In-Circuit Serial Programming
- Watchdog Timer (WDT) With Its Own On-Chip RC Oscillator For Reliable Operation
- Programmable Code Protection
- Power Saving Sleep Mode
- Selectable Oscillator Options
- In-Circuit Debug (ICD) Via Two Pins

CMOS Technology:

- Low-Power, High-Speed Flash/EEPROM Technology
- Fully Static Design
- Wide Operating Voltage Range (2.0V To 5.5V)
- Commercial And Industrial Temperature Ranges
- Low-Power Consumption

Fig 10.Pin Diagram Of PIC:



IV. Circuit Diagram

Description:

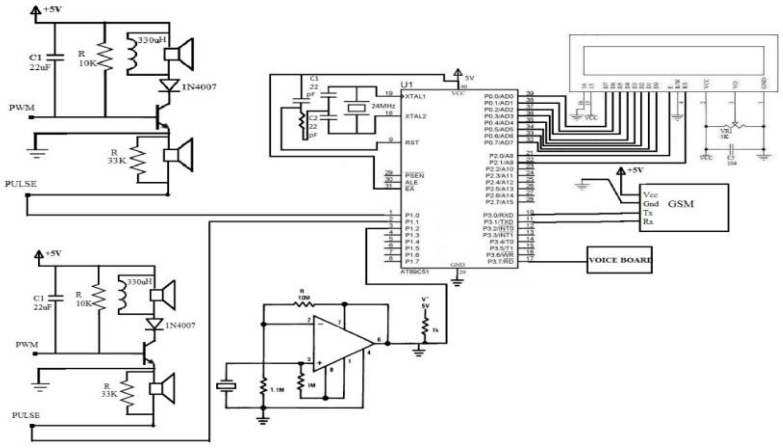


Fig.11 Shows The Circuit Diagram Of Proposed Model

In This Work Three Ultrasonic Sensors Is Fixed To The Vehicles Front And Back Side, Which Is Used To Monitoring The Opposite Objects Any Abstract Crossing Or Coming To The Vehicle The Ultrasonic Sensor Detected The Object And Intimated To The Users At The Same Time This Can Displayed In LCD Also. The Voice Sensor Announces The Nature Of The Automobile Opposite Side Crossing The Road And Back Of The Disabled Vehicle. The Ultrasonic Sensor Working With The Concept Of Echo For Object Detection.

Vibration Sensor Is Also Fixed The Vehicle. It Has Monitoring Vibration Of The Vehicle. The Accidents Suppose Occurred It Has Produced On The Vibrating Intimation And Also Providing Message To The Hospital By Using RSSI. Then It Has Providing An Output Into UART By Sending A SMS Alert Shown In Fig.11 And Fig. 12 Show The Program Of Our Own Model

V. Conclusion

Our Proposed Model Is Programmed In MPLAB, Proteus Software Used For Running The Designed Circuit And Verified Its Operation Physically, We Write The Program For PIC Microcontroller PIC16F877A And Using Down Loader Kit The Same Program Burned In The Memory Of The PIC IC By Embedded System, The Circuit Operation As Our Wish We Designed Work Properly Shown In Fig.13, Fig.14, Fig.15 The Kit Board Interface With PC And Simulations Verified By Measuring The Distance From The Sensors, The Voice Board Tell Us The Object Detection When It Was Found An Object And SMS Send To The Programmed Number When The Vibration Sensor Activated The Device Identified The Person Fell On Road.

Fig. 13 Output Verified In Laptop By Measuring The Distance Of Object

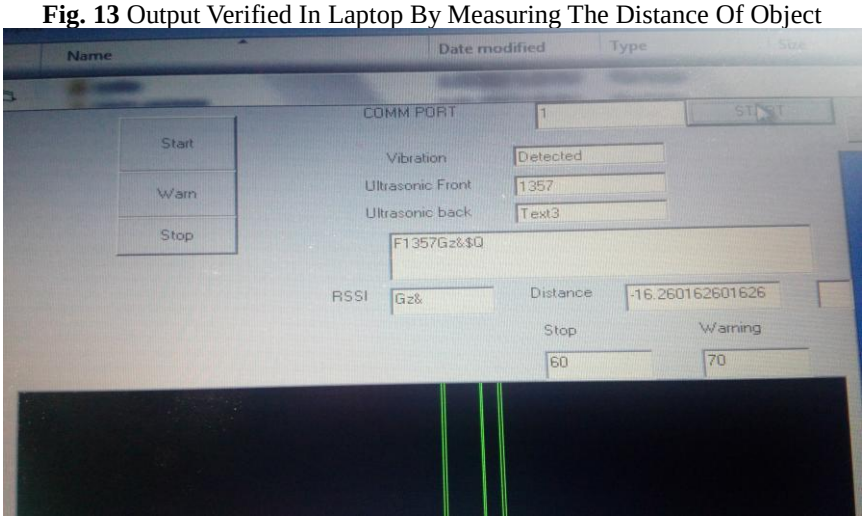


Fig. 14 Operation Of Our Kit

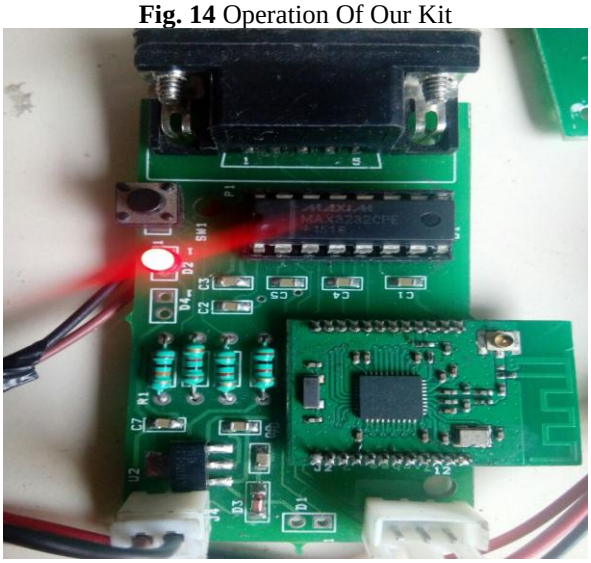


Fig.15 Our Kit Connected To Laptop/PC For Output

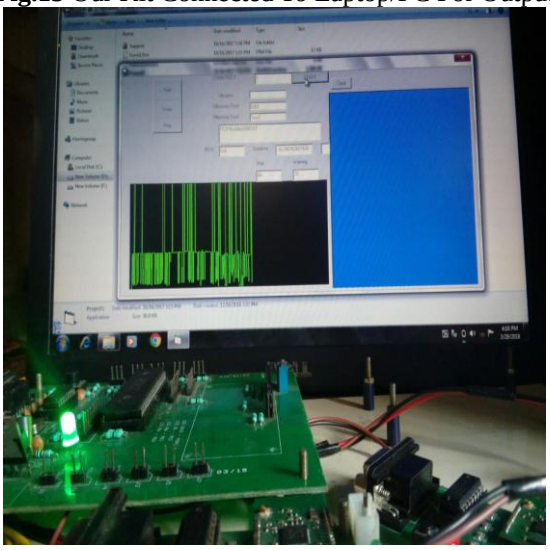


Fig.12 Program For The Circuit:

```
#Include <Htc.H>
#Define MYDATA PORTB
        Sbit Rs=RE0;
        Sbit Rw=RE1;
        Sbit En=RE2;
        Sfr Datas=0xa0;
       Sbit A1=RC0;
       Sbit A2=RC1;
       Sbit A3=EC2;
        Void Lcdinit(Void);
        Void Lcdcmd(Unsigned Char );
        Void Delay(Unsigned Int Del);
        Void Lcddata(Unsigned Char Ldat);
        Sbit Trig1=RC3;
        Sbit Ultrasonic1=RC4;
       Sbit Trig1=RC5;
        Sbit Ultrasonic1=RC6;
        Void Lcdinit(Void)
        {
        Lcdcmd(0x38);
```

```
            Lcdcmd(0x38);
            Lcdcmd(0x38);
            Lcdcmd(0x06);
            Lcdcmd(0x0e);
            Lcdcmd(0x01);
            Lcdcmd(0x0c);
            Lcdcmd(0x80);
            }
           Void Lcdcmd(Unsigned Char Lcmd)
           {
            Datas=Lcmd;
            Rs=0;
            Rw=0;
            En=1;
            Delay(100);
            En=0;
           }
           Void Delay(Unsigned Int Del)
           {
           While(Del--);
           }
           Void Lcddata(Unsigned Char Ldat)
           {
            Datas=Ldat;
            Rs=1;
            Rw=0;
            En=1;
            Delay(100);
            En=0;
           }
Void Delay();
Void Init()
  {
   SCON=0x50;
   TMOD=0X20;
   TH1=0XFD;
   TR1=1;
  }
Void Txs(Unsigned Char Value)
 {
 Int I;
  TI=0;
  SBUF=Value;
    For(I=0;I<1500;I++);
 // While(TI==0);
 }
Unsigned Char Val1[85],Ii,J=0;
Unsigned Int Cnt,I;
 Unsigned Char Hb=0,Hbtt=0,Hbt=0;
Void Putchar(Unsigned Char Val[16],Char Len)
           {
            Char I;
            For(I=0;I<Len;I++)
                     {
                     Lcddata(Val[I]);
                     }
           }
Void Main()
  {
```

```
 Unsigned Char Oc=0,Val=0;
        Unsigned Int D=0,E=0,Fg=0,F1=0;
 Init();
 Lcdinit();
   //Lcdcmd(0x80);
 //Putchar("Welcome          ",16);
// Delay();
// Delay();
P3_7=1;
  While(1)
  {
        While(RI==0)
        {

              If(P1_2==0)
              {
                    Lcdcmd(0xc0);
                    Putchar("Vibration        ",15);
                    Txs('Q');
                    P1_5=0;
                    P1_6=0;
                    P1_7=0;
                    Delay(20000);
                    P1_7=1;
              }
              Else
              {
                    Lcdcmd(0xc0);
                    Putchar("                 ",15);
                    Txs('Q');
              }
        Trig1=0;
        For(E=0;E<30;E++);
        Trig1=1;
        For(E=0;E<30;E++);
        Trig1=0;
        While(Ultrasonic1==0);
        If(Ultrasonic1==1)
        {
        While(Ultrasonic1==1)
              {
              D++;
                    If(D>8000)
                    Break;

              }
               E=D;
              Lcdcmd(0x80);
              Putchar("F            ",8);
               Txs('D');
               Txs((D%10000)/1000+0x30);
               Txs((D%1000)/100+0x30);
               Txs((D%100)/10+0x30);
               Txs((D%10)+0x30);
               Txs('E');
               Lcdcmd(0x8b);
               Lcddata((E%10000)/1000+0x30);
               Lcddata((E%1000)/100+0x30);
               Lcddata((E%100)/10+0x30);
```

```
 Lcddata((E%10)+0x30);
While(Ultrasonic2==1)
{
D++;
        If(F>8000)
        Break;
}
 E=F;
Lcdcmd(0x80);
Putchar("B          ",8);
 Txs('D')
 Txs((D%10000)/1000+0x30);
 Txs((D%1000)/100+0x30);
 Txs((D%100)/10+0x30);
 Txs((D%10)+0x30);
 Txs('E');
 Lcdcmd(0x8b);
 Lcddata((E%10000)/1000+0x30);
 Lcddata((E%1000)/100+0x30);
 Lcddata((E%100)/10+0x30);
 Lcddata((E%10)+0x30);
        If(F<200)
                {
        P1_5=1;
        P1_6=0;
        P1_7=0;
        Delay(20000);
        P1_7=1;
                }
    D=0;
        If(F<200)
                {
        P1_5=1;
        P1_6=1;
        P1_7=0;
        Delay(20000);
        P1_7=1;
                }
 D=0;
}

If(P0_0==0)
{
        Txs('Z');
}
Else
{
        Txs('Z');
}
Txs('&');
Txs('$');
}
Val=SBUF;
RI=0;
Lcdcmd(0xcf);
Lcddata(Val);
If(Val=='A')
        {
        P0_7=1;
```

```
                P3_5=0;
                P3_6=1;
                P3_7=1;
                }
                Else If(Val=='B')
                {
                P0_7=0;
                P3_5=1;
                P3_6=0;
                P3_7=1;
                }
          Else If(Val=='C')
                {
                P3_5=1;
                P3_6=1;
                P3_7=0;
                P1_5=1;
                P1_6=1;
                P1_7=0;
                Delay (20000);
                P1_7=1;
                }
          }
 }

Void Delay()
{
   Int I;
   For(I=0;I<20000;I++)
                {
                }
}
```

Future Implementation:

The RSSI Used To Providing Signal Strength Which Has A Transmitter And Receiver Section Convey Information To Remote Area By Wireless If A Person Met An Accident When Signal Problem Arise In GSM Module That Time The Receiver To Get The Information From The Sensors And Transmit The Data To The Controller It Has Connected To The Hospitals Controller Room And The Emergency Vehicle Come To The Accidental Spot For First Aid And Help.

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