INTRODUCTION TO INNOVATIVE PROJECTS

IIP

COURSE CODE: PHY1999

BATCH – 6

REVIEW 3 – REPORT

REMOTE GAS DETECTION CAR

FACULTY Lt.Dr.RAVI SHANKER BABU

ACKNOWLEDGEMENTS

The success and final outcome of this project required a lot of guidance and assistance from many people and I am extremely privileged to have got this all along the completion of my project. All that I have done is only due to such supervision and assistance and I would not forget to thank them.

I respect and thank Lt. Dr. Ravi Shanker Babu, for providing me an opportunity to do the project work and giving us all support and guidance, which made me complete the project duly. I am extremely thankful to him for providing support and guidance, although he had busy schedules.

I would not forget to remember my batchmates for their encouragement and more over for their timely support and guidance till the completion of our project work.

I am thankful to and fortunate enough to get constant encouragement, support and guidance from all Teaching staffs of SENSE which helped us in successfully completing our project work. Also, I would like to extend our sincere esteems to all staff in laboratory for their timely support.

BATCH – 6

18BIS0014

18BIS0020

18BCE2147

18BEC0550

18BEC0558

18BEC0322

18BEC0642

18BCE0783

18BEC0357

18BEC0914

INDEX

ABSTRACT

In this course we have taken up the challenge of tackling problems and issues we face or witness around us. In our day to day life we come across several problems and difficulties. In this project we try to undertake the task of finding solutions to any of the problems we see around us. We use innovative thinking and creative ideas to obtain a feasible result.

The project encourages innovative thinking "out-of-the-box". We as a group have discussed about various problems that we face or witness. Then we take up the challenge of finding solutions to the problem at hand.

In our project the domain of problems we focussed on was the difficulties and risks faced by people doing hazardous jobs. We looked at several hazardous jobs and occupations which are done by poor workers and un-skilled, un-trained labour. After considering several fields, we decided to focus on the field of fire hazards and fire-fighting.

Fire fighting in India is hugely underpowered, un-trained and in-equipped. We then focused on problems faced by households. The greatest fire hazards any ordinary household faces comes from either electrical fires or gas leaks. Our project is focused on eliminating the fire hazard risks due to gas leaks. We came up with innovative ideas to detect gas leaks before they spread and become 4major. The group arrived on a joint solution.

The main system of gas leak detection will be mounted on a remotely controlled car. The car can be controlled remotely which eliminates the risk to human life in case of fire or explosion. The car can also be used to check pipelines and major gas pipes in gas plants. The idea was to mount a sensor on the car which will sound an alarm when any gas is detected. The sensitivity can be controlled depending on the environment. The car can check for leaks efficiently and accurately rather than a human worker.

The aim of the project is to reduce threats to human lives in hazardous jobs or environments. This can be achieved by the application of the remote gas detection car.

PROBLEM IN FOCUS

We started with the area of hazardous jobs. Here are some of the hazardous jobs we took a look at:

1. Firefighters

The first most dangerous jobs in the list are firefighters. You have to be ready for any kind of eventuality. Any time a call could come and you have to be ready in seconds. Firefighters have to get inside the burning building and save people's lives. Some of them die. Monthly salary could be around Rs 8000/- to Rs 12,000/-

2. Construction Workers

Construction workers have to work on high buildings or skyscrapers. And it is very dangerous because there are many accidents where workers fell from the top and die. Constructions workers could make Rs 300/- to Rs 400/- daily.

5. Search and Rescue Operations

If there is a natural disaster like flood, cyclone or hurricane then you have to do search and rescue operations. These operations are very dangerous because of bad weather your chopper or plane might wander away and crash somewhere.

6. Electric Lineman and Repairers

All power grids and electric lines carry high voltage current. And you need linemen and repairers if something goes wrong to rectify transformers and electric lines. Job is very dangerous there could be a power leak in the line while they are working on. Electric lineman makes Rs 8000/- to Rs 15,000/- per month.

7. Police and Patrol Officers

Police officers and constables have to deal with thugs and most viscous criminals in the society. Sometime you have to open fire and in exchange from the other side you might die. The salary of a police officer could be in between Rs 10,000/- to Rs20,000/-

8. Iron and Steel Workers

Crude iron is melted in a furnace where temperature could reach up to 2000 to 3000 degree Celsius. And metal crafters have to pour this molten iron into another container. If something goes wrong then molten iron could fall on the workers and they might die. So this is very dangerous. A worker could make Rs 8000 to Rs 10,000/-

9. E Waste Recycler

E waste is things like waste parts of computer, mobile phone and other tech gadgets.

The waste materials could be hazardous to your health. The e waste recycler makes very less money like Rs 8000 to Rs 12,000/-

10. Chemical and Gas Factory Workers

Like iron and steel workers chemical and gas factory workers face many life-threatening challenges. Daily hundreds of workers die in these factories because lack of safety measures.

11. Logging Workers or Lumberjack

Logging workers or people who cut trees called lumberjack is a very dangerous job. Machines they use could be very dangerous if don't know to use it. They cut a tree in seconds hence the danger is very imminent.

12. Sweeper and Sanitation Workers

Street sweeper, sanitation workers face many health problems because of nature of their work. They die early because of lack of sanitation and healthcare facility. They make very less money like Rs 6000/- to Rs 7000/-

13. Truckers and Transport Drivers

Truck and other transport drivers have to travel long distances and sometimes they have to go dangerous places where there is no security.

They may get robbed or even get killed. Hence the job is quite dangerous.

14. Soldiers

Job of a soldier is much respected but it is quite dangerous. You have to go to war and you might lose your life. Terrorism and global disorder always makes life of a solider very dangerous.

FIRE HAZARDS

A country's overall wellbeing highly depends on its ability to respond to crisis. Fire service is one of the most critical emergency response services of a country. Fire authorities on all levels strive to preserve lives, property, and natural resources. It has been observed, that many emerging economies struggle to respond to a fire hazard in time, causing a huge loss to life and property. Due to increasing population and widespread habitation, there is a great pressure on the fire authorities, which often fail to be prompt due to primitive infrastructure and technology.

Today, geospatial technologies & tools are playing a major role in improving the performance of a country in all its major economy verticals such as agriculture, mining, infrastructure, transportation, logistics, security, disaster management, defense, urban planning, etc. Many fire authorities around the world have embraced GIS as a tool that helps them balance needs, uses, and hazards to promote environmental sustainability while identifying and limiting vulnerability. Effectively handling fires, whether structural fires in densely populated areas or wildfires over acres of forest land, involves planning strategic response on a regional scale. GIS can help in developing a tactical response for a specific event, formulating and carrying out a mitigation program, and analysing incident data to improve policies and training programs.

GAS LEAKS:

Presently, Liquefied Petroleum Gas (LPG) is being extensively used in domestic, commercial and automobile sectors replacing traditional fuels because of more economy and pollution free.

Causes of leaks in homes:

• Leaking gas from sub-standard and dilapidated gas pipes.

• Wrong installation of regulator on gas cylinder.

• Installation of gas cylinder and gas oven in fire prone location.

• Leaving the kitchen room during cooking process.

• Use of improper cooking utensils

Liquefied Petroleum gases are highly combustible and inflammable when comes in contact with the source of any ignition in air. Millions of people in the world are utilizing this LPG as the most convenient, economical and pollution free cooking purposes. But it requires some safe handling procedure to avoid any accident. LPG is stored in the high tensile steel container under high pressure but the high-pressure gas may start leaking from any weak rubber pipe, joint or sealed connector provided in the LPG container. Therefore, awareness about some statutory warning and safety precautions can avert any accidental hazards while using this useful and popular cooking, industrial and automobile fuel.

What to do in case of LPG leaking?

1.In case of any sign of gas leaking immediately turn off the regulator valve to stop gas flow.
2.Open the doors and windows to exhaust the accumulated gas outside the kitchen room.
3.Wait for half an hour till the total accumulated gas is completely removed.
4.Do not turn on regulator switch, gas oven or any other source of ignition till the kitchen room is completely free from leakage gas and safe for cooking.
5.If it is difficult to control the gas leakage then immediately inform the LPG supplier or Fire services to avoid any fire accident.

6.As a precautionary measure it is wise to evacuate everyone from the affected area.

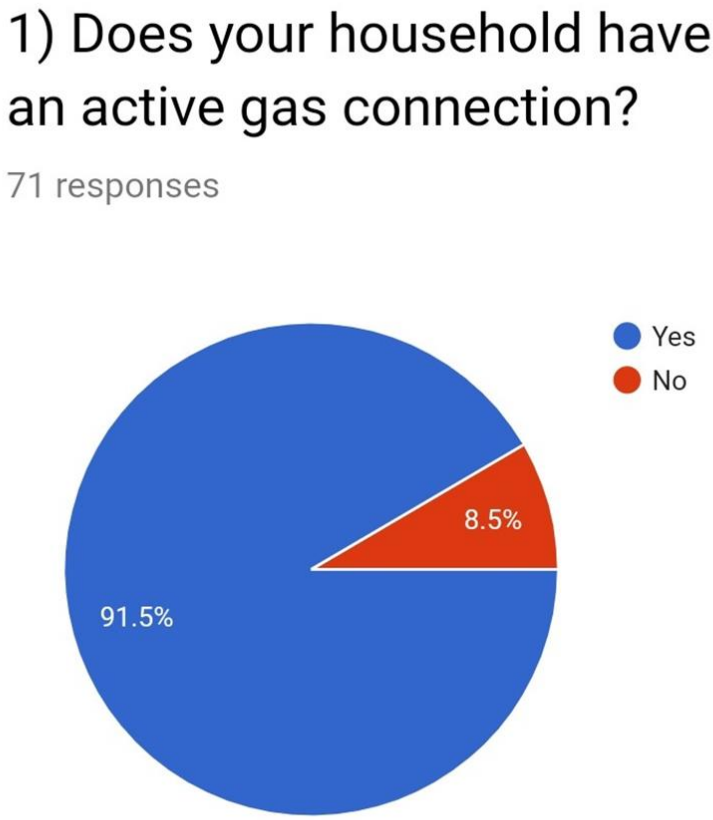
What to do when LPG is on fire?

1.Miniature fire extinguisher kept in house should be used immediately to extinguish initial fire broke out from gas cylinder. Simultaneously, fire brigade may be called if the fire does not come under immediate control.
2. Assessing the situation evacuate everyone from the building.
3. Small fire can be extinguished immediately with the help of wet cloth and then turn off the regulator switch immediately.

SURVEY AND ANALYSIS

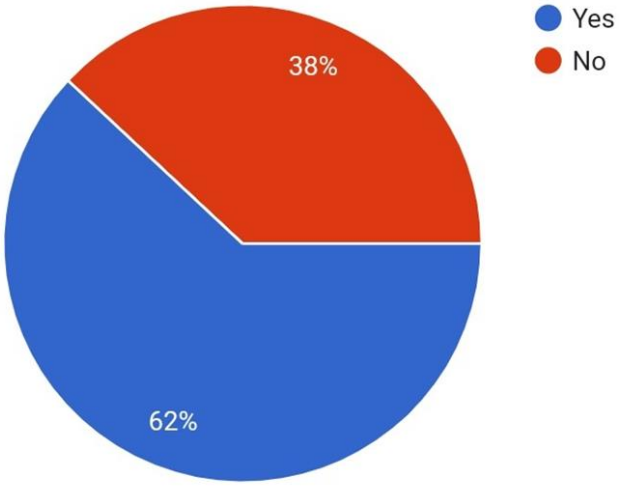
- To assess the magnitude of the problem we faced, we conducted a survey.
- The survey was carried out to get a general view of people on the problem of gas leaks
- Participants answered 6 simple questions with yes or no choices.
- The survey gives us an idea about the magnitude of the problem we face and how we can tackle it.

Questions and Responses:



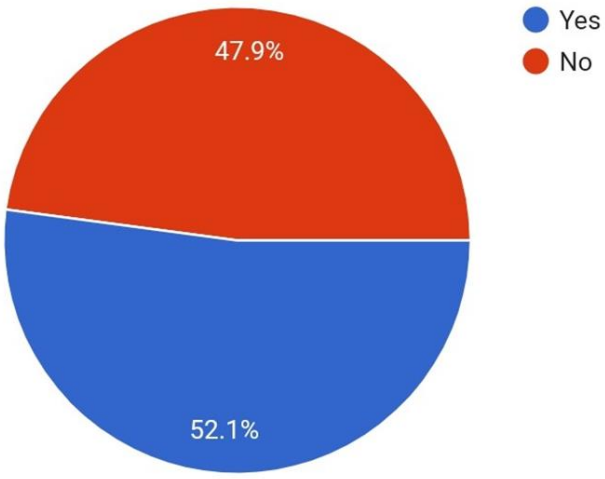
3)Do you think gas cylinder supply is carried out with necessary precautions?

71 responses



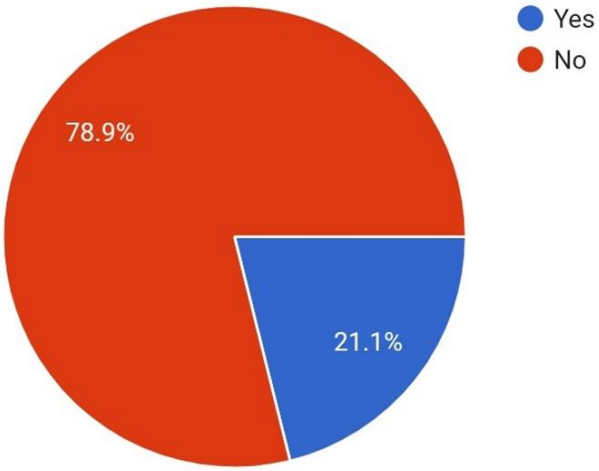
2)Have you witnessed a gas leak in your home or anywhere else?

71 responses



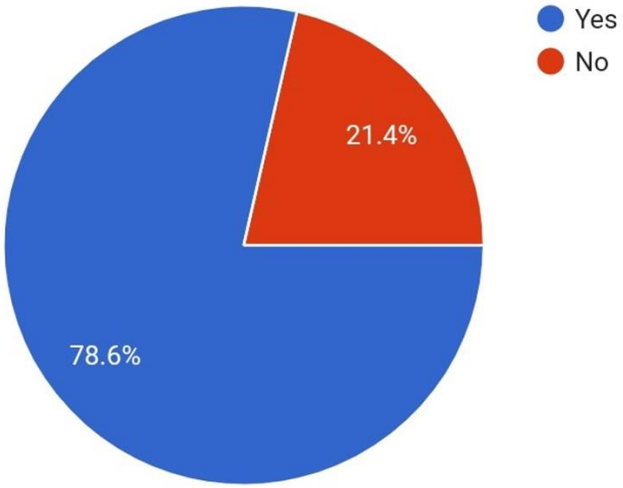
4)Is your house equipped with gas sensors?

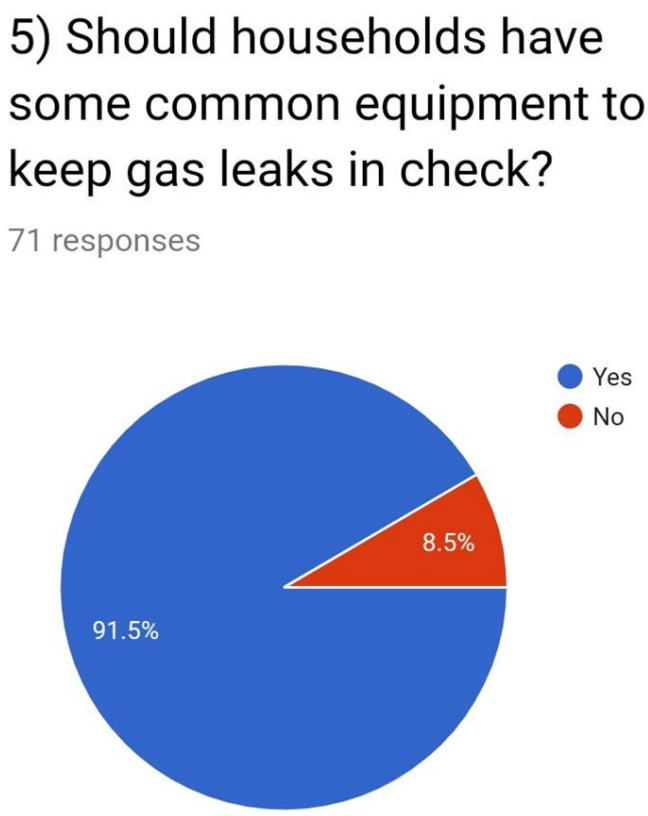
71 responses



6)Do small restaurants and eateries handle their gas recklessly?

70 responses





Result:

From the survey it was clear that gas leaks are fairly common. The problem did require a feasible solution. 91.5% of persons agreed that households should have some form of equipment to check gas leaks. It was also clear that restaurants and eateries handle their gas recklessly.

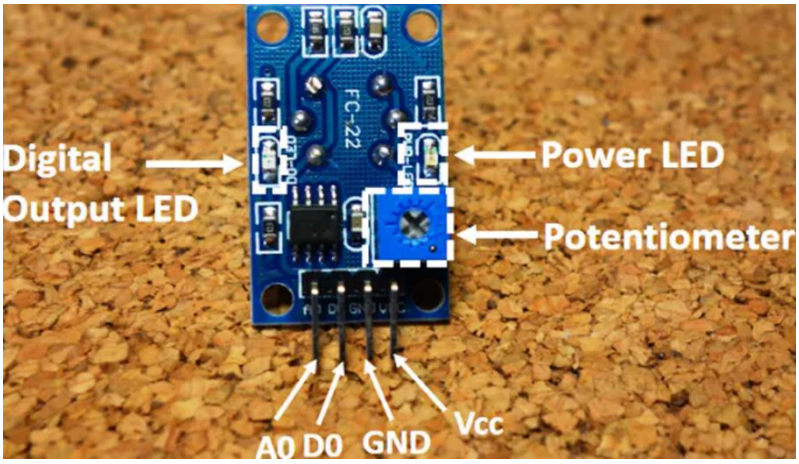
From the survey we can conclude that the problem of gas leaks must be kept in check from time to time.

GAS DETECTION

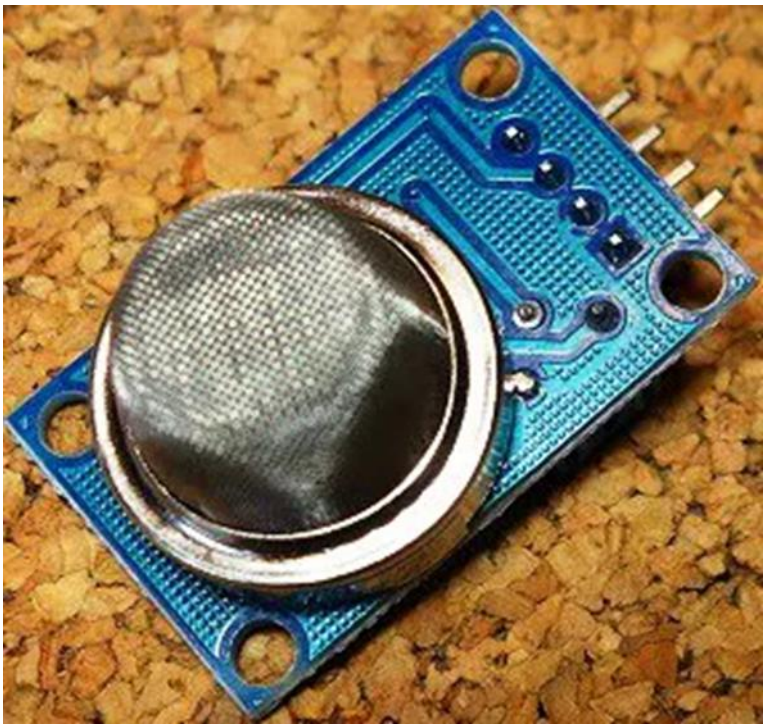
MQ-2 SENSOR:

The MQ-2 smoke sensor is sensitive to smoke and to the following flammable gases:

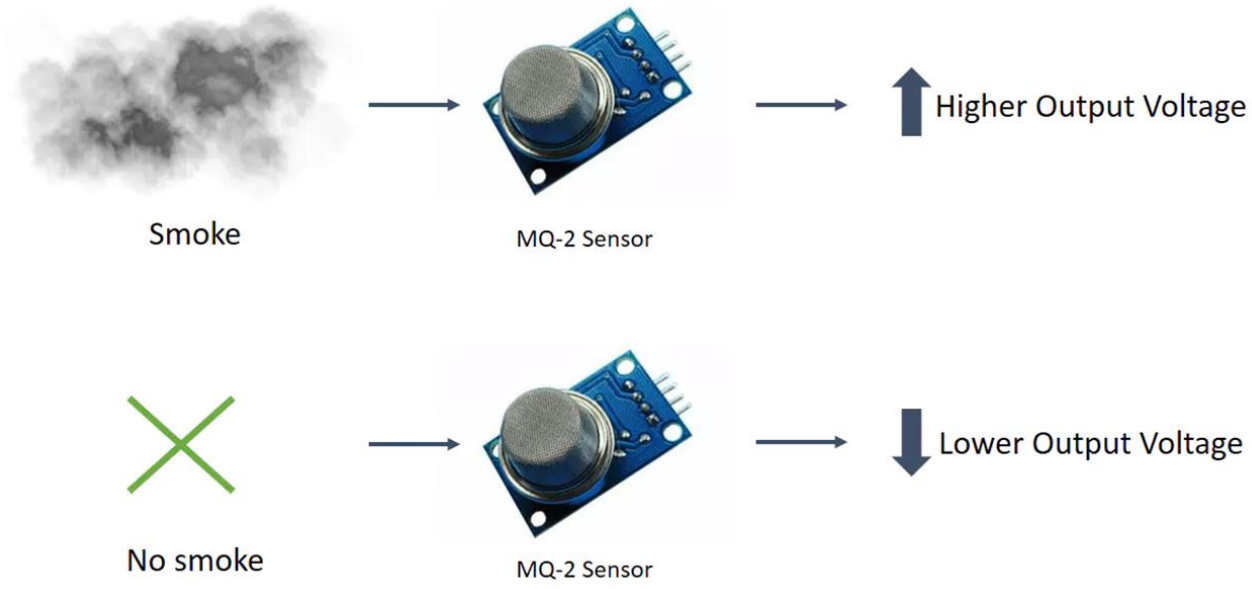
- LPG
- Smoke
- Butane
- Propane
- Methane
- Alcohol
- Hydrogen



The resistance of the sensor is different depending on the type of the gas. The smoke sensor has a built-in potentiometer that allows you to adjust the sensor sensitivity according to how accurate you want to detect gas.



- The voltage that the sensor outputs changes accordingly to the smoke/gas level that exists in the atmosphere. The sensor outputs a voltage that is proportional to the concentration of smoke/gas.
- In other words, the relationship between voltage and gas concentration is the following:
- The greater the gas concentration, the greater the output voltage.
- The lower the gas concentration, the lower the output voltage.
- The sensor analog output voltage is read and when the smoke reaches a certain level, it will make sound a buzzer and a red LED will turn on.
- When the output voltage is below that level, a green LED will be on.



Arduino Code:

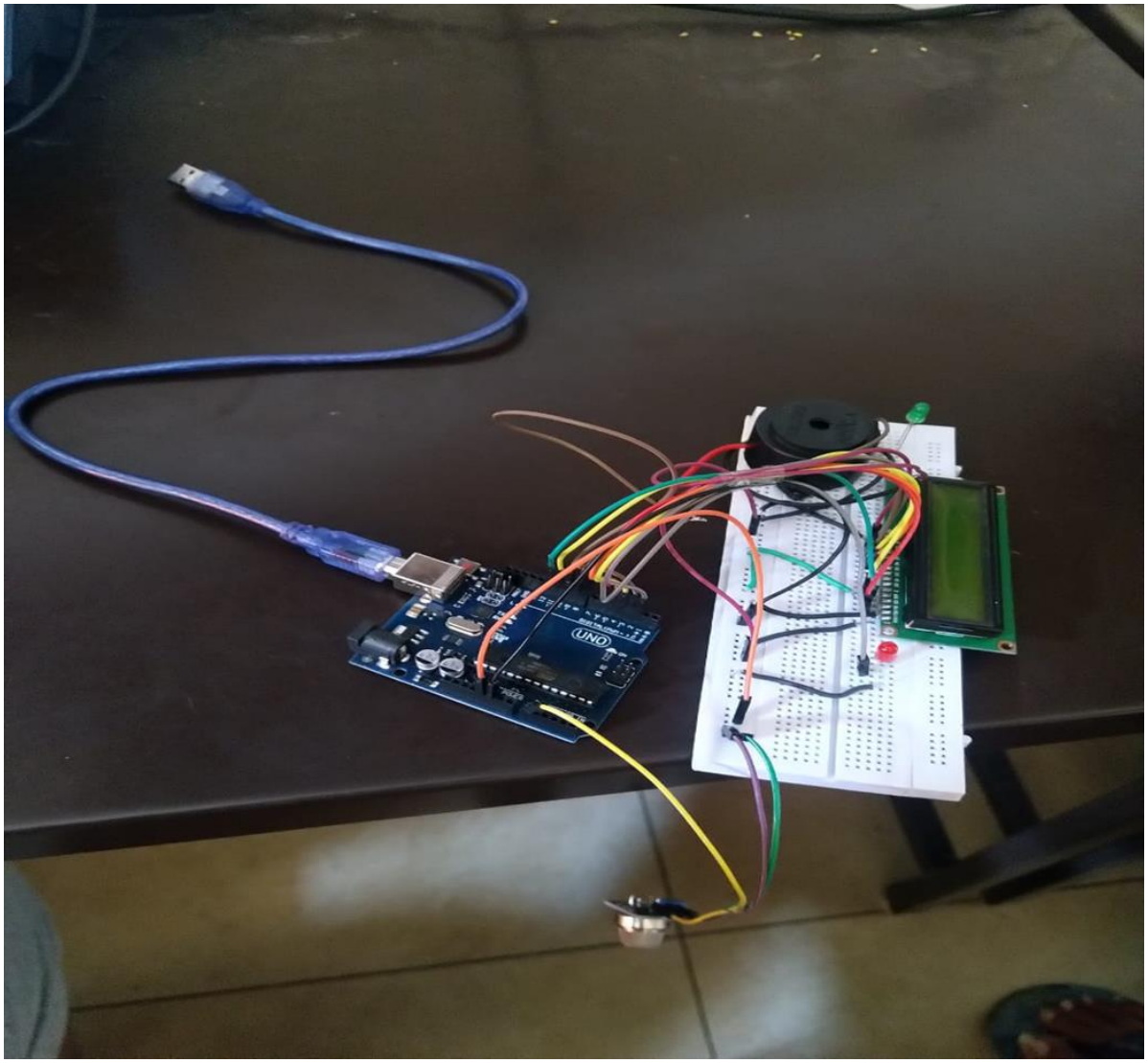
```
#define         MQ_PIN                      (0)     //define which analog input
channel you are going to use
#define         RL_VALUE                    (5)     //define the load resistance
on the board, in kilo ohms
#define         RO_CLEAN_AIR_FACTOR         (9.83)  //RO_CLEAR_AIR_FACTOR=(Sensor
resistance in clean air)/RO,
                                                    //which is derived from the
chart in datasheet
```

```
/************************Software Related Macros************************************/
#define         CALIBARAION_SAMPLE_TIMES     (50)    //define how many samples you
are going to take in the calibration phase
#define         CALIBRATION_SAMPLE_INTERVAL  (500)   //define the time interal(in
milisecond) between each samples in the
                                                     //cablibration phase
#define         READ_SAMPLE_INTERVAL         (50)    //define how many samples you
are going to take in normal operation
#define         READ_SAMPLE_TIMES            (5)     //define the time interal(in
milisecond) between each samples in
#include <LiquidCrystal.h>

const int rs = 12, en = 11, d4 = 5, d5 = 4, d6 = 3, d7 = 2;
LiquidCrystal lcd(rs, en, d4, d5, d6, d7);
//normal operation

/************************Application Related Macros*********************************/
#define         GAS_LPG                      (0)
#define         GAS_CO                       (1)
#define         GAS_SMOKE                    (2)

/***************************Globals************************************************
/
float           LPGCurve[3]  =  {2.3,0.21,-0.47};   //two points are taken from
the curve.
                                                    //with these two points, a
line is formed which is "approximately equivalent"
                                                    //to the original curve.
                                                    //data format:{ x, y, slope};
point1: (lg200, 0.21), point2: (lg10000, -0.59)
float           COCurve[3]  =  {2.3,0.72,-0.34};    //two points are taken from
the curve.
                                                    //with these two points, a
line is formed which is "approximately equivalent"
                                                    //to the original curve.
                                                    //data format:{ x, y, slope};
point1: (lg200, 0.72), point2: (lg10000,  0.15)
float           SmokeCurve[3] ={2.3,0.53,-0.44};    //two points are taken from
the curve.
                                                    //with these two points, a
line is formed which is "approximately equivalent"
                                                    //to the original curve.
                                                    //data format:{ x, y, slope};
point1: (lg200, 0.53), point2: (lg10000,  -0.22)
float           Ro           =  10;                 //Ro is initialized to 10 kilo
ohms

void setup()
{
  Serial.begin(9600);                               //UART setup, baudrate =
9600bps
  Serial.print("Calibrating...\n");
  Ro = MQCalibration(MQ_PIN);                       //Calibrating the sensor.
Please make sure the sensor is in clean air
   lcd.begin(16, 2);                                                  //when you
perform the calibration
  Serial.print("Calibration is done...\n");
  Serial.print("Ro=");
```

```
  Serial.print(Ro);
  Serial.print("kohm");
  Serial.print("\n");
lcd.print("Calibration is done...\n");
lcd.print("Ro=");
lcd.print(Ro);
lcd.print("kohm");
lcd.print("\n");
}

void loop()
{
   Serial.print("LPG:");
   Serial.print(MQGetGasPercentage(MQRead(MQ_PIN)/Ro,GAS_LPG) );
   Serial.print( "ppm" );
   Serial.print("    ");
   Serial.print("CO:");
   Serial.print(MQGetGasPercentage(MQRead(MQ_PIN)/Ro,GAS_CO) );
   Serial.print( "ppm" );
   Serial.print("    ");
   Serial.print("SMOKE:");
   Serial.print(MQGetGasPercentage(MQRead(MQ_PIN)/Ro,GAS_SMOKE) );
   Serial.print( "ppm" );
   Serial.print("\n");
        lcd.setCursor(0, 0);
        lcd.print("LPG:");
lcd.print(MQGetGasPercentage(MQRead(MQ_PIN)/Ro,GAS_LPG) );
//lcd.print( "ppm" );
lcd.print("     ");
  lcd.setCursor(9, 0);
lcd.print("CO:");
lcd.print(MQGetGasPercentage(MQRead(MQ_PIN)/Ro,GAS_CO) );
//lcd.print( "ppm" );
lcd.print("       ");
 lcd.setCursor(0, 1);
lcd.print("SMOKE:");
lcd.print(MQGetGasPercentage(MQRead(MQ_PIN)/Ro,GAS_SMOKE) );
//lcd.print( "ppm" );
lcd.print("         ");
   delay(200);
}

/**************** MQResistanceCalculation *************************************
Input:   raw_adc - raw value read from adc, which represents the voltage
Output:  the calculated sensor resistance
Remarks: The sensor and the load resistor forms a voltage divider. Given the
voltage
         across the load resistor and its resistance, the resistance of the sensor
         could be derived.
******************************************************************************
/
float MQResistanceCalculation(int raw_adc)
{
  return ( ((float)RL_VALUE*(1023-raw_adc)/raw_adc));
}

/************************** MQCalibration *************************************
Input:   mq_pin - analog channel
Output:  Ro of the sensor
```

```
Remarks: This function assumes that the sensor is in clean air. It use
         MQResistanceCalculation to calculates the sensor resistance in clean air
         and then divides it with RO_CLEAN_AIR_FACTOR. RO_CLEAN_AIR_FACTOR is
about
         10, which differs slightly between different sensors.
************************************************************************************
/
float MQCalibration(int mq_pin)
{
  int i;
  float val=0;

  for (i=0;i<CALIBARAION_SAMPLE_TIMES;i++) {            //take multiple samples
    val += MQResistanceCalculation(analogRead(mq_pin));
    delay(CALIBRATION_SAMPLE_INTERVAL);
  }
  val = val/CALIBARAION_SAMPLE_TIMES;                   //calculate the average
value

  val = val/RO_CLEAN_AIR_FACTOR;                        //divided by
RO_CLEAN_AIR_FACTOR yields the Ro
                                                        //according to the chart
in the datasheet

  return val;
}
/*************************  MQRead *****************************************
Input:   mq_pin - analog channel
Output:  Rs of the sensor
Remarks: This function use MQResistanceCalculation to caculate the sensor
resistenc (Rs).
         The Rs changes as the sensor is in the different consentration of the
target
         gas. The sample times and the time interval between samples could be
configured
         by changing the definition of the macros.
************************************************************************************
/
float MQRead(int mq_pin)
{
  int i;
  float rs=0;

  for (i=0;i<READ_SAMPLE_TIMES;i++) {
    rs += MQResistanceCalculation(analogRead(mq_pin));
    delay(READ_SAMPLE_INTERVAL);
  }

  rs = rs/READ_SAMPLE_TIMES;

  return rs;
}

/*************************  MQGetGasPercentage ********************************
Input:   rs_ro_ratio - Rs divided by Ro
         gas_id      - target gas type
Output:  ppm of the target gas
Remarks: This function passes different curves to the MQGetPercentage function
which
```

```
         calculates the ppm (parts per million) of the target gas.
************************************************************************************
/
int MQGetGasPercentage(float rs_ro_ratio, int gas_id)
{
  if ( gas_id == GAS_LPG ) {
     return MQGetPercentage(rs_ro_ratio,LPGCurve);
  } else if ( gas_id == GAS_CO ) {
     return MQGetPercentage(rs_ro_ratio,COCurve);
  } else if ( gas_id == GAS_SMOKE ) {
     return MQGetPercentage(rs_ro_ratio,SmokeCurve);
  }

  return 0;
}

/*************************  MQGetPercentage ********************************
Input:   rs_ro_ratio - Rs divided by Ro
         pcurve      - pointer to the curve of the target gas
Output:  ppm of the target gas
Remarks: By using the slope and a point of the line. The x(logarithmic value of
ppm)
         of the line could be derived if y(rs_ro_ratio) is provided. As it is a
         logarithmic coordinate, power of 10 is used to convert the result to non-
logarithmic
         value.
************************************************************************************
/
int  MQGetPercentage(float rs_ro_ratio, float *pcurve)
{
  return (pow(10,( ((log(rs_ro_ratio)-pcurve[1])/pcurve[2]) + pcurve[0])));
}
```


UNO

REMOTELY CONTROLLED CAR

- In this project we are trying to develop a Bluetooth controlled car with many surveillance applications. In this we are using the L293D motor driver to control the motors of the vehicle. We used two 100rpm motors for the movement of the car in clockwise or anticlockwise direction. The working of the motors using the motor driver is explained in the motor driver working above. The IC is connected to Arduino to get the command of logic from the pins of Arduino.
- A Bluetooth module is used to command the car using an android application from a smartphone. The Bluetooth module receives the information/signal transmitted by the application and then it further transfers and receives to the Arduino.
- (L293D) Logic Table:
- Let's consider a Motor connected on left side output pins (pin 3,6). For rotating the motor in clockwise direction the input pins has to be provided with Logic 1 and Logic 0.
    - Pin 2 = Logic 1 and Pin 7 = Logic 0 | Clockwise Direction
    - Pin 2 = Logic 0 and Pin 7 = Logic 1 | Anticlockwise Direction
    - Pin 2 = Logic 0 and Pin 7 = Logic 0 | Idle [No rotation] [Hi-Impedance state]
    - Pin 2 = Logic 1 and Pin 7 = Logic 1 | Idle [No rotation]

- The car can be operated remotely. This enables the operator to detect the gas without being in close proximity. This eliminates risk to his or her life.

CONCLUSION

By use of the gas detection device we can easily eliminate leaks in pipelines. This not only protects from fire hazards but also saves a large amount of gas from being wasted.

In households the gas lines can be checked on a scheduled basis to detect minor leaks. When fixed these, leaks will be prevented from escalating into large gas leaks. It will also prevent unnecessary wastage of gas. Since natural gas is a valuable non-renewable resource, we should minimize its wastage and use it wisely.

The aim of our project is achieved with the application of the remotely controlled gas detection car. We have successfully provided a solution, eliminating a hazard in the lives of firemen and households.

We as students are proud to make a contribution to solutions to problems faced by the common man. The country can progress only when the sharp minds work together as a team and cooperate to provide feasible solutions. We must strive to achieve personal goals, but also that of the world as a whole. The world can remain without us, but we cannot live without it. The moment we work on overcoming the same is the moment we know we are moving on to greater things. We must choose the world that we want.