FINAL REPORT

TEAM ID:	PNT2022TMID00945
PROJECT:	Gas leakage monitoring and alerting system

ABSTRACT:

In today's world, safety is of the utmost importance, and certain measures must be taken at both work and home ensure it. Working or living in dangerous environments necessitate specific safety measures, whether the subject is electricity or oil and gas.

A type of natural gas known as "Liquified Petroleum Gas" (LPG) is compressed under high pressure and stored in a metal cylinder. LPG is extremely vulnerable to fire and can result in catastrophic damage if left unprotected near any fire source.

LPG is primarily utilized for cooking and is more readily available than any other natural gas. Sadly, its widespread use makes gas leakage or even a blast a common occurrence. As a result, a system for detecting and monitoring gas leaks is required.

Through a flame sensor, the system will keep an eye on fire and flame.

The buzzer begins to ring when a fire is detected. Tests have shown that the system can keep track of wastage of gas and leaks and notify it to the user. The performance that was produced showed that it was successful in reducing the amount of domestic gas that was wasted.

INTRODUCTION:

The world is changing rapidly. Businesses in all sectors are getting ready to make up for the two years they lost due to the Covid-19 outbreak now that the pandemic is long over.

With scalable Internet of Things solutions, it is now time to embrace excellence and cut costs that aren't needed. This holds true for the oil and gas industry as well.

To provide the best possible customer service, a variety of businesses, including hotels and takeout restaurants, make use of flammable gases like carbon dioxide, LPG, ammonia and others.

It cannot be denied that such gases are utilized.

Nevertheless, they have also increased the risk and threat to human life. Gas-related businesses must take certain precautions to ensure the safest work possible because safety is their top priority.

OBJECTIVE:

A sensor based automatic gas leakage monitoring and alerting system has been proposed. It is an inexpensive, low-power, lightweight, portable, safe, user-friendly, effective, multi-featured, and simple system device. Because gas leakage not only contaminates the atmosphere but also waste gases and in turn hurt our economy. Detecting gas leaks will not only give us credibility in the health department but also boost our economy. Over the next few years, the market is expected to be primarily driven by the need to ensure safety in the workplaces.

PROBLEM FOUNDATION:

The leak of any gaseous molecule from a stove, pipeline, cylinder, or other source is known as gas leakage. This can happen on purpose or unintentionally. We are aware that these leaks pose a threat to our health and pose a significant threat to people, their homes, workplaces, industries, and the environment if they explode.

India's number of cooking gas connections has increased by 76%, from 140 million in 2014 to 247 million today. However, this has also led to an increase in the number of accidents involving liquefied petroleum gas (LPG—the cooking gas's chemical name) over the past few years.

LIST OF COMPONENTS:

1. Breadboard
2. Arduino UNO
3. LED
4. Gas Sensor
5. LCD 16*2
6. DC motor

7. Rotary potentiometer
8. Buzzer
9. Push Button
10. Resistors (1k ohm, 330 ohm)
11. Jump wires

● **BREADBOARD**:
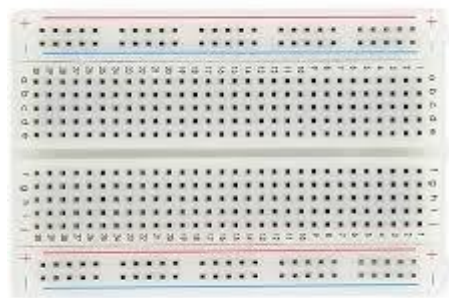
A breadboard is a common tool for circuit design and testing. When you use a bread board, you can make a circuit without having to solder components and wires. Mounting and reusing components is simpler.

Because components are not soldered, you can easily modify your circuit design at any time. It consists of a collection of conductive metal clips housed in a white ABS plastic box with one clip insulated by another. The plastic box has a number of holes that are arranged in a particular way. Two types of regions, which are also known as strips, make up the typical layout of a bread board.

Socket strips and bus strips. Typically, bus strips are utilized to supply the circuit with power. It has two columns, one for ground and one for power voltage. The majority of a circuit's components are held in place by socket strips. It typically has two sections, each with five rows and 64 columns. From within, electrical connections are made to each column.

● **ARDUINO UNO:**
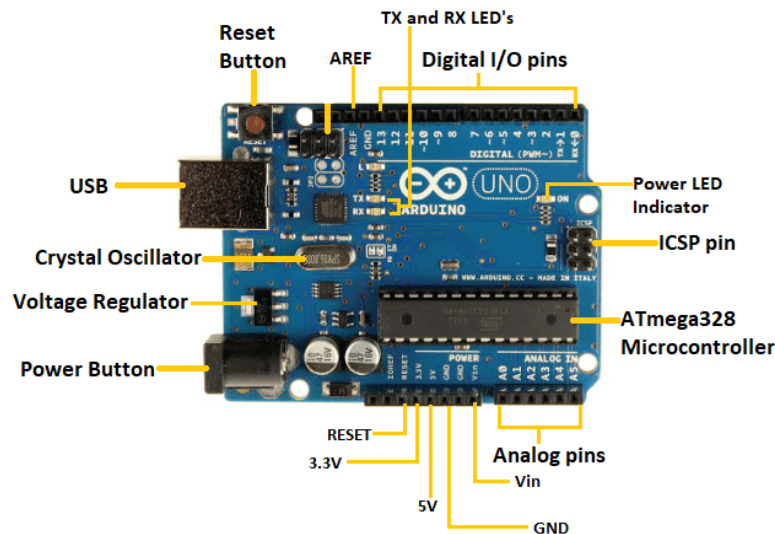
Arduino Uno R3 is one kind of ATmega328P based microcontroller board. It includes the whole thing required to hold up the microcontroller; just attach it to a PC with the help of a USB cable, and give the supply using AC-DC adapter or a battery to get started. The term Uno means "one" in the language of "Italian" and was selected for marking the release of Arduino's IDE 1.0 software. The R3 Arduino Uno is the 3rd as well as most recent modification of the Arduino Uno. Arduino board and IDE software are the reference versions of Arduino and currently progressed to new releases. The Uno-board is the primary in a sequence of USB-Arduino Board, & the reference model designed for the Arduino platform.

● **LED:**
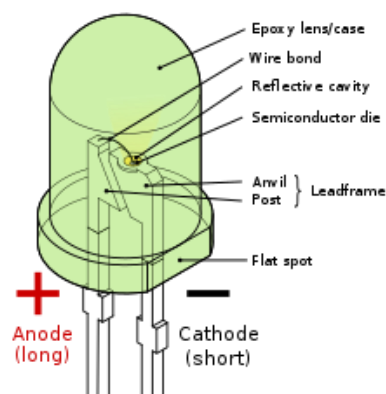
 Light Emitting Diode (LED) is an opto-electronic device which works on the principle of electro-luminance. Electro-luminance is the property of the

material to convert electrical energy into light energy and later it radiates this light energy. In the same way, the semiconductor in LED emits light under the influence of electric field. The symbol of LED is formed by merging the symbol of P-N Junction diode and outward arrows. These outward arrows symbolise the light radiated by the light emitting diode

● **GAS SENSOR:**
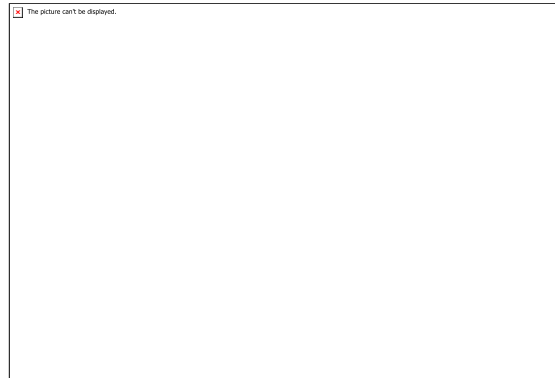
A gas sensor is a device which detects the presence or concentration of gases in the atmosphere. Based on the concentration of the gas the sensor produces a corresponding potential difference by changing the resistance of the material inside the sensor, which can be measured as output voltage. Based on this voltage value the type and concentration of the gas can be estimate.

● **LCD 16*2:**
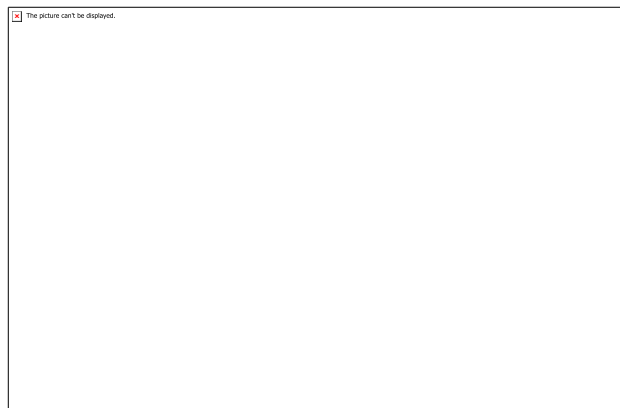
16×2 LCD is one kind of electronic device used to display the message and data. The term LCD full form is Liquid Crystal Display. The display is named 16×2 LCD because it has 16 Columns and 2 Rows. it can be displayed (16×2=32) 32 characters in total and each character will be made of 5×8 Pixel Dots. These displays are mainly based on multi-segment light emitting diodes. There are a lot of combinations of display available in the market like 8×1, 8×2, 10×2, 16×1, etc. but the 16×2 LCD is widely used. These LCD modules are low cost, and

programmer-friendly, therefore, is used in various DIY circuits, devices, and embedded projects.

● **DC MOTOR**:

 DC motor is an electrical machine that converts electrical energy into mechanical energy. In a DC motor, the input electrical energy is the direct current which is transformed into the mechanical rotation.

● **ROTARY POTENTIOMETERS**:

The rotary type potentiometers are used mainly for obtaining adjustable supply voltage to a part of electronic circuits and electrical circuits. The volume controller of a radio transistor is a popular example of a rotary potentiometer where the rotary knob of the potentiometer controls the supply to the amplifier. This type of potentiometer has two terminal contacts between which a uniform resistance is placed in a semi-circular pattern. The device also has a middle terminal which is connected to the resistance through a sliding contact attached with a rotary knob. By rotating the knob one can move the sliding contact on the semi-circular resistance.

● BUZZER:

A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric (piezo for short). Typical uses of buzzers and beepers include alarm devices, timers, train and confirmation of user input such as a mouse click or keystroke.

● PUSH BUTTON:

A push-button (also spelled pushbutton) or simply button is a simple switch mechanism to control some aspect of a machine or a process. Buttons are typically made out of hard material, usually plastic or metal.

● RESISTOR:
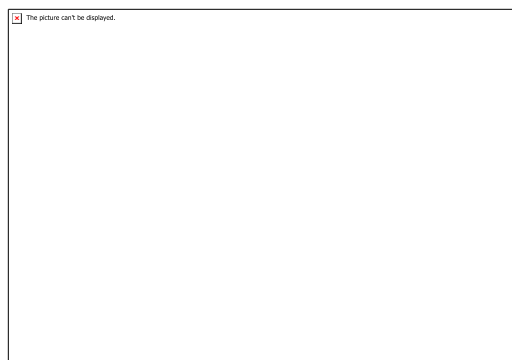
A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element.

● **JUMPER WIRES:**

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

BLOCK DIAGRAM:
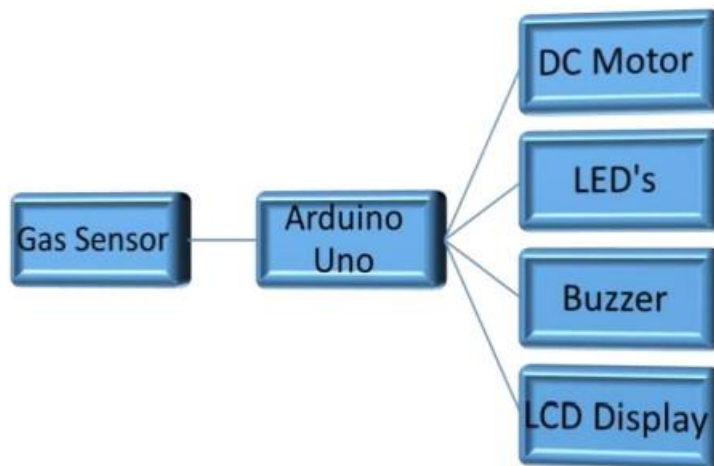
PROPOSED METHOD:

Arduino UNO is the project's primary component. When the amount of gas exceeds the threshold value, Arduino will make a decision and turn on an automatic fan to remove the extra gas from the room or kitchen.

An Arduino-compatible gas sensor can be found here. The amount of gas in the air will be measured by the gas sensor. We must then establish a gas threshold value. When the air in our kitchen or home has a gas value that is higher than

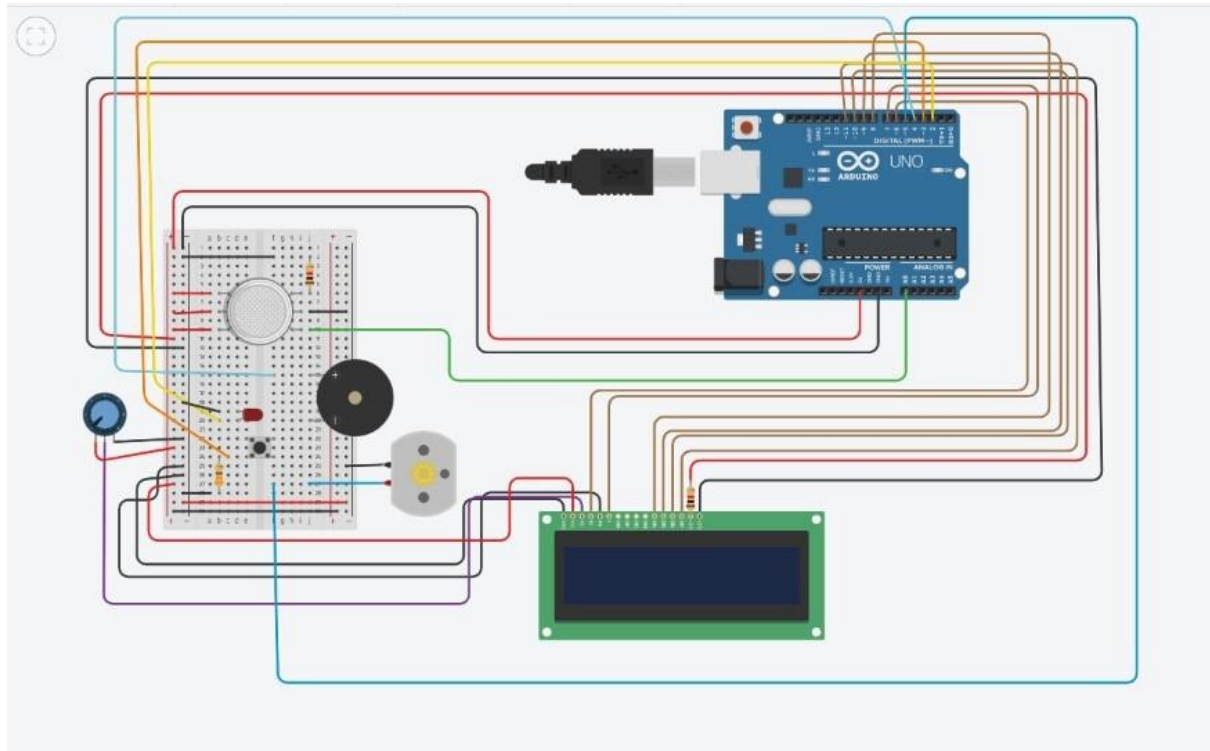the threshold value. The exhaust fan will turn on by itself. The exhaust fan will turn off automatically when all of the gas has been removed from the air.

The system's main component, the Arduino UNO, is responsible for the following functions. The sensor's output signal is used as input to the Arduino UNO to condition the signal. The results of the detection are shown on an LCD, identifies individuals in danger at home, in a factory, or at work. The buzzer buzzes and makes a beep sound.
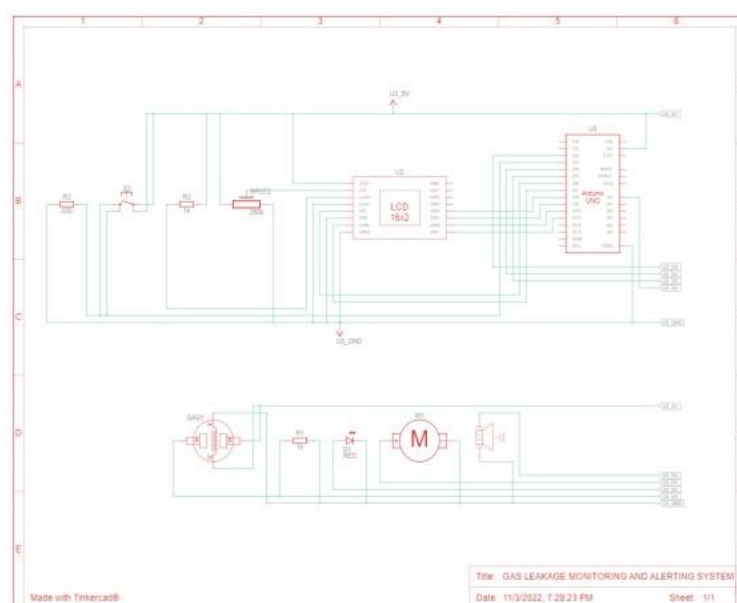
FLOWCHART:

```
                    ┌──────────────┐
                    │    Start     │
                    └──────┬───────┘
                           │
          ╱─────────────────────────────────╲
         ╱  Gas Sensor is connected to Arduino UNO ╲
         ╲─────────────────────────────────────────╱
                           │
                         ╱   ╲
                        ╱ Gas ╲
                       ╱amount >╲
                       ╲Threshold╱
                        ╲ Value ╱
                         ╲   ╱
                    ┌──────┴──────┐
              ┌─────┴────┐   ┌─────┴─────┐
              │    No    │   │    Yes    │
              └──────────┘   └───────────┘

     ┌────────────────┐      ┌─────────────────┐
     │LCD Display the │      │ LCD Display the │
     │value is low (or│      │ value is high   │
     │    normal      │      └─────────────────┘
     └────────────────┘
                             ┌─────────────────┐
     ┌────────────────┐      │Exhaust Fan,Red  │
     │      Stop      │      │LED,Buzzer will  │
     └────────────────┘      │      ON         │
                             └─────────────────┘

                             ┌─────────────────┐
                             │After the Gas    │
                             │amount in the air│
                             │become low exhaust│
                             │Fan will OFF     │
                             └─────────────────┘
```
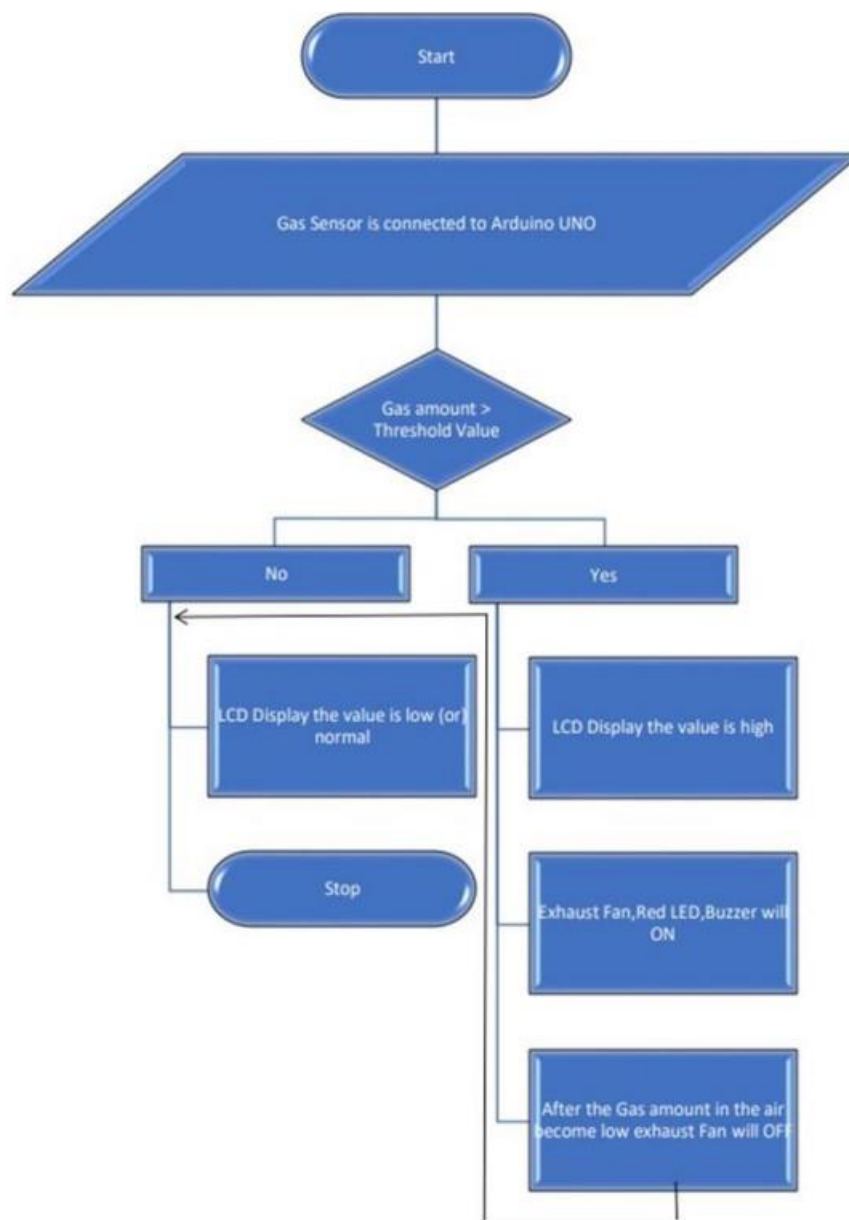
CIRCUIT DIAGRAM:

SCHEMATIC DIAGRAM:

CODE:

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(5,6,8,9,10,11);

int redled = 2;

int greenled = 3;

int buzzer = 4;

int sensor = A0;

int sensorThresh = 400;

void setup()
{
pinMode(redled, OUTPUT);

pinMode(greenled,OUTPUT);

pinMode(buzzer,OUTPUT);

pinMode(sensor,INPUT);

Serial.begin(9600);

lcd.begin(16,2);
}
void loop()
{
  int analogValue = analogRead(sensor);

  Serial.print(analogValue);

  if(analogValue>sensorThresh)
```

```
{
  digitalWrite(redled,HIGH);
  digitalWrite(greenled,LOW);
  tone(buzzer,1000,10000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("ALERT");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("EVACUATE");
  delay(1000);
}
else
{
  digitalWrite(greenled,HIGH);
  digitalWrite(redled,LOW);
  noTone(buzzer);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("SAFE");
  delay(1000);
  lcd.clear();
  lcd.setCursor(0,1);
  lcd.print("ALL CLEAR");
  delay(1000);
```

```
  }
}
```

TINKERCAD LINK:

https://www.tinkercad.com/things/1Y9bvvk66uz-magnificent-fyyran/editel?tenant=circuits

SOLUTION STATEMENT:

The primary objectives of this project are the detection of gas leaks and the provision of security whether the user is at home or not.

Wireless technology is used to protect users from gas leaks, making it less expensive and more adaptable. The system has sensors for detecting gas leaks connected to a microcontroller. The microcontroller will notify the user whenever there is a gas leak and use a Liquid Crystal Display (LCD) to display warning information. The user will be able to protect themselves in the event of an explosion, which could cause damage to Liquefied Petroleum Gas (LPG) cookers, injury, or even death. The ideal solution to gas leakage issues homeowners face on a daily basis is GLDS.

CONCLUSION:

Based on this project's performance, we can conclude that the project system's detection of LPG gas leaks is excellent. It is useful for both commercial and domestic purposes. We can use this system to save lives in dangerous situations. Propane, CO2, and other gases can be detected by a sensor node. It is possible to determine the estimated transmission range and power consumption. The sensor was constructed using straightforward steps and the Arduino UNO Micro controller area.