1.INTRODUCTION

1.1 Project Overview

The internet of Things is a developing topic of technical, social, and economic significance. The usage of the gas brings great problems in the domestic as well as working places. The inflammable gas such as Liquidized petroleum gas (LPG), which is excessively used in the house and at work places. The leakage of the gas causes destructible impact to the lives and as well as to the heritage of the people. Most of the societies have fire safety mechanism. But it can use after the fire exists. In order to have a control over such conditions we proposed system that uses sensors which is capable of detecting the gases such as LPG, CO2, CO and CH4. IoT technologies offer the possibility to transform agriculture, industry and energy production and distribution by increasing the availability of information along the value chain of production using networked sensors.

1.2 Purpose

Gas detectors can be used to detect combustible, flammable and toxic gases, and oxygen depletion. This type of device is used widely in industry and can be found in locations, such as on oil rigs, to monitor manufacturing processes and emerging technologies such as photovoltaic. They may be used in firefighting.

2.LITERATURE SURVEY

2.1 Existing problem

[1] Smart detection System for LPG Gas Leakage using IoT by Ravisankar B, Gurubaran K, Manoj D, Nagendran R, Gowrishankar V, Satheesh R published in 2022 This paper presents the gas detections model using Arduino UNO on the basis of IOT (internet of things). The gas sensor is used to identify the smell of gas leakage. LCD is turned on, when the gas gets leaked. If gas leakage takes place, both the LCD and GSM modem will be turned ON. With the help of GSM modem, messages notifying gas leakage will be send as SMS to user. Then user can take a proper action to avoid any incidents from happening .

[2] Industrial Plant Safety Gas Leakage Detection System by Ravi Kishore , R.N.V.Greeshma, Kusuma Priya , Yatish Krishna Yogi Borra published in 2018 This paper proposes a leakage detector which sends the warning to the concerned people through SMS. This detector senses the presence of harmful gases particularly, LPG, Methane and Benzene. LPG and Methane gases catch fire easily resulting in blasts. Benzene is carcinogen effecting the health of workers, if inhaled in higher concentrations. Hence, detection of these gases is essential. This low cost project includes MQ6, MQ4 and MQ135 gas sensors which detect LPG, Methane and Benzene gas leaks respectively and uses ESP-32 as a Wi-Fi module.

[3] Gas Leakage Detection and Alert System by Sayali Joshi, Uma Karanje, Shital Munjal published in The paper exhibits the aim of this project is developing a system that can detect gas leakage . On detection it will send an alert SMS and the gas supply knob of cylinder will be switched off automatically .

[4] Development of a Gas Leakage Detector with Temperature Control system by N. M. Tahir,A.Y. Nasir, Adoyi Boniface, A.M. Hassan published in 2019 This project presents an alternative approach to develop a device that can automatically detect and control gas leakages and also monitor temperature in vulnerable areas. The system detects the leakage of the LPG (Liquefied Petroleum Gas) using a gas sensor and then also monitors the temperature using a temperature sensor.

2.2 References

[1] Smart Detection System for LPG Gas Leakage using IoT

[2] Industrial Plant Safety Gas Leakage Detection System

[3] Gas Leakage Detection and Alert System

[4] Implementation of Automated Gas Leakage Monitoring System Using Zigbee

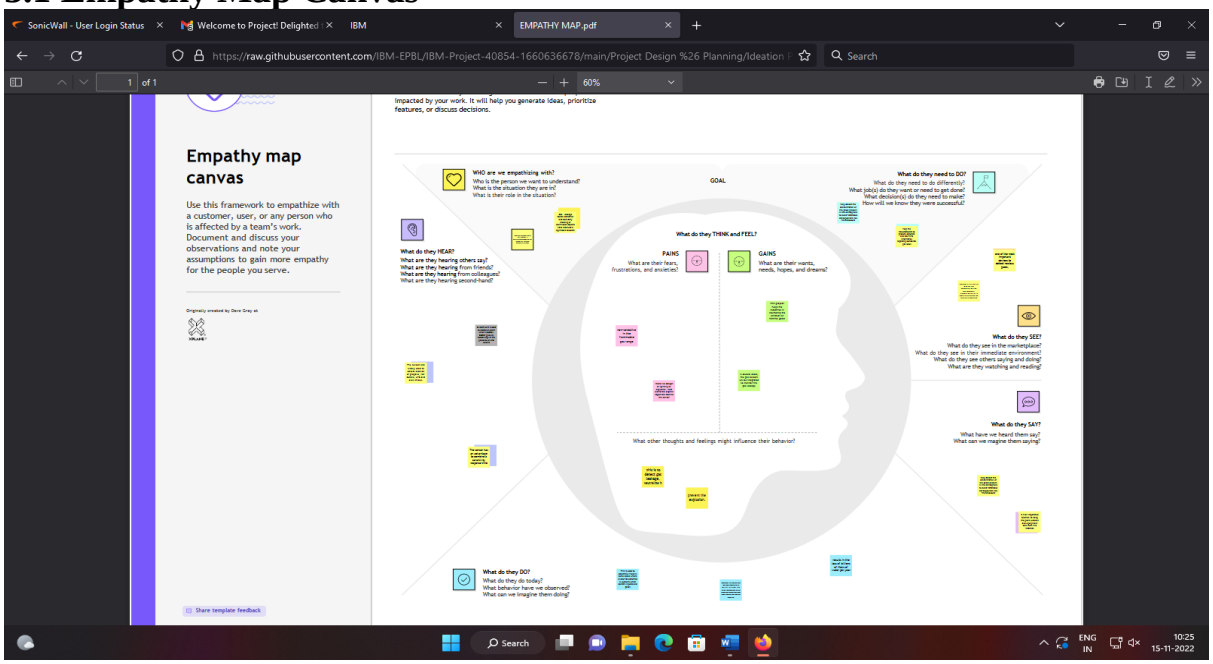
[5] Development of a Gas Leakage Detector with Temperature Control system

2.3 Problem Statement Definition

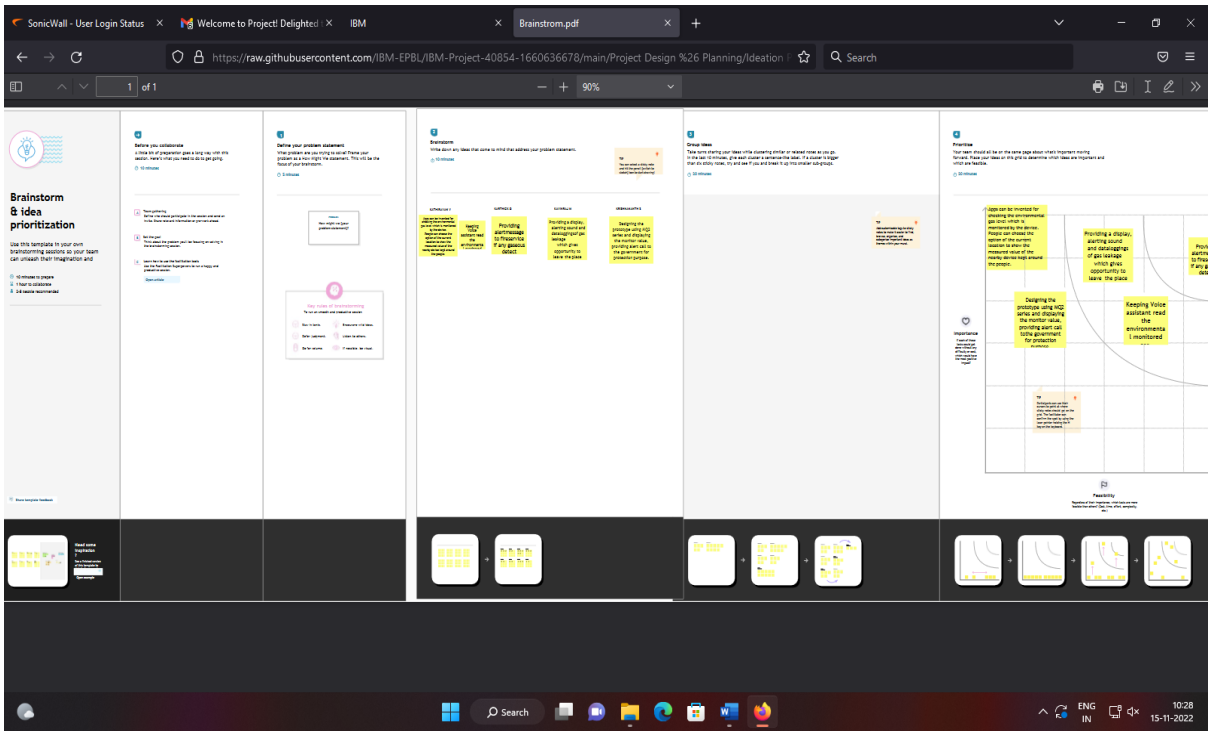
Problem Statement (PS)	I am (Customer)	I am trying to	But	Because	Which makes me Feel
PS-1	Industrialist	Monitor gas leakage in the industry	I don't have any system for monitoring	The affordable of the system is high and the systems are sometimes making disasters	Unsafe
PS-2	Industrialist	Control the gas leakage	Also, the installation process is too complicated	The number of sensors is unpredictable and the positioning of equipment is improper	Disastrous

3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming

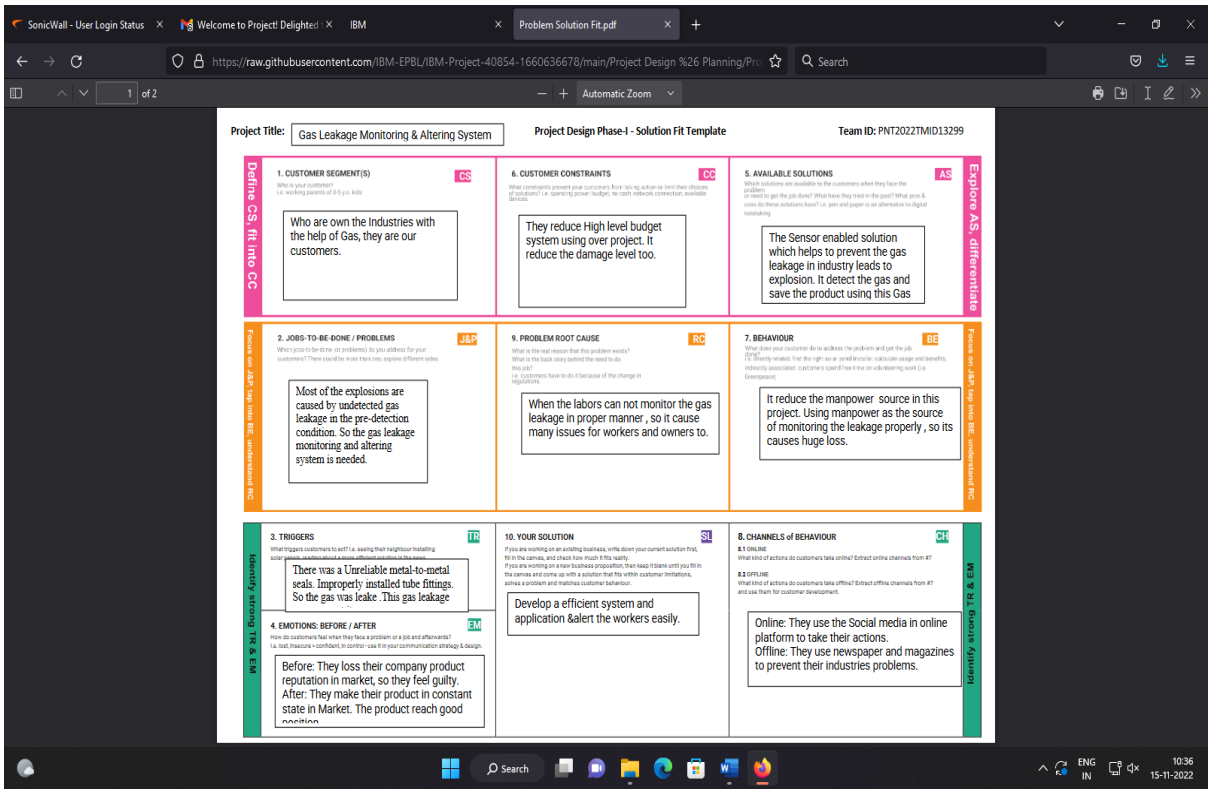


3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Liquid Petroleum Gas (LPG) is a highly flammable chemical that consists of mixture of propane and butane. LPG is used for cooking at home, restaurant, and certain use for industry. They have certain weaknesses that make the gas leakage occur. The leakage of gases only can be detected by human nearby and if there are no human nearby, it cannot be detected. But sometimes it cannot be detected by human that has a low sense of smell.Furthermore, gas leakage can cause fire that will lead to serious injury or death and it also can destroy human properties.

2.	Idea / Solution description	● When the gas leakage is detected it will alert the user by alarm/buzzer ● It can send the sms to the user also ● We can also make the exhaust fan on while during the gas leakage ● Detection of the gas leakage is important and halting leakage is important equally.
3.	Novelty / Uniqueness	● instant detection of gas leakage ● send sms to the concerned user ● easy to access and operate
4.	Social Impact / Customer Satisfaction	● Cost efficient ● Easy to access and operate ● Easy installation and detect the gas leakage fastly ● Prevent fires and explosions
5.	Business Model (Revenue Model)	● This project is mainly for Industries so we can visit to the industries and explain them about the benefits of our
		project and make aware about the gas leakage also . ● We can also use this in household as well as industries
6.	Scalability of the Solution	● Our end to end wireless gas monitoring system uses wireless sensors to detect the presence of toxic gases . The solution can hence be scaled up for flexible functionality and offer great extendibility for multi-purpose usage. ● We can also upgraded it in future like making exhaust fan on while gas is detected (or) like making automatically close the valve of gas cylinder when the gas is start to leak

3.4 Problem Solution fit



4.REQUIREMENT ANALYSIS

4.1 Functional requirement

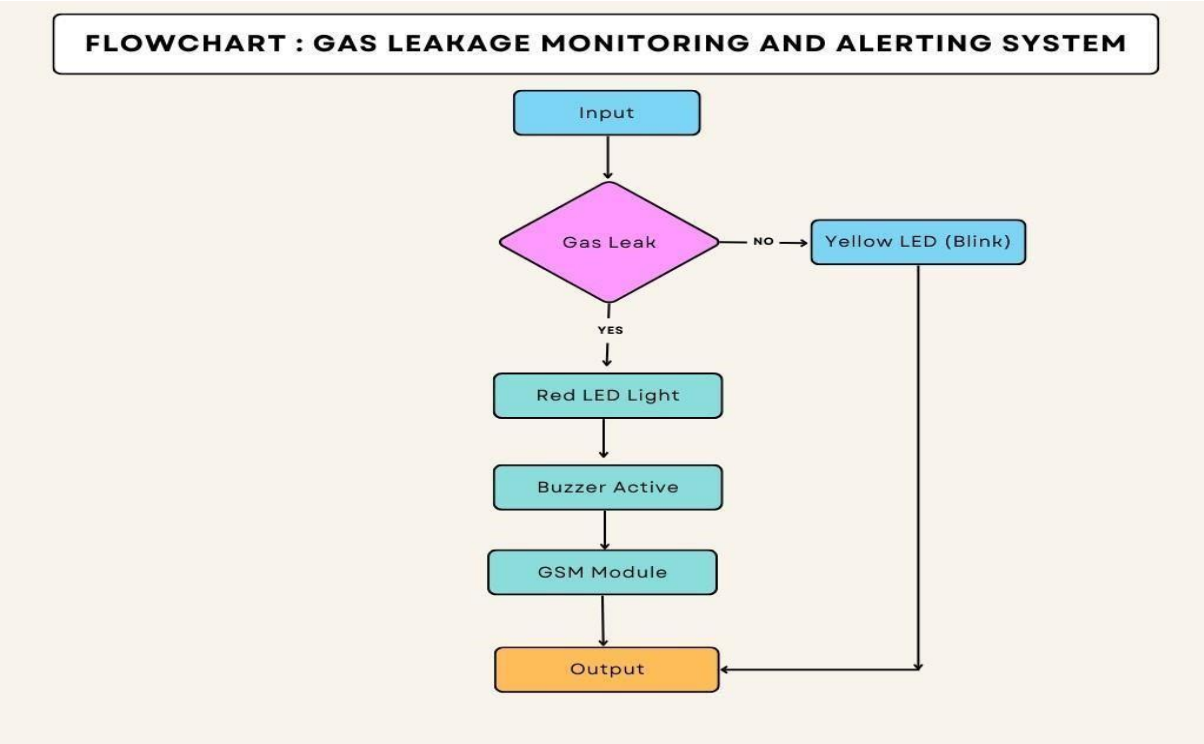
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Monitoring	Level of gas is monitored using sensor and if there is any leakage, alert can be sent through messages and with a buzzer sound.
FR-2	User Reception	The data like the level of gas can be send through messages and alerts.
FR-3	User Understanding	The user can monitor the level of gas with the help of the data. If there is an increase in gas level then the alert will be given by message or buzzer sound.
FR-4	User Performance	When the user gets notified, they could take precaution steps like turning the gas off, turn on the exhaust fan/sprinkler and avoid serious accidents.

4.2 Non-Functional requirements

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The system interface should be easy and effective.
NFR-2	**Security**	The communication between the Arduino and the GLDS should be secure by encryption
NFR-3	**Reliability**	Function under stated conditions for a stated time period. It might have a capacity to recognize the smoke accurately and does not give a false.
NFR-4	**Performance**	The system should response immediately to any leakage situation. The gas detector should be from anywhere at any time.

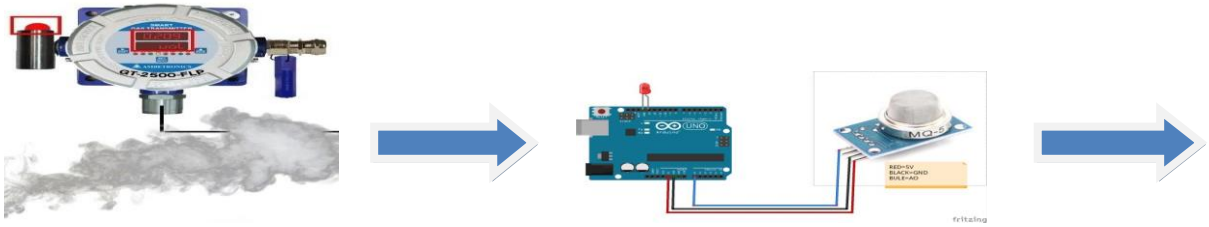
5.PROJECT DESIGN

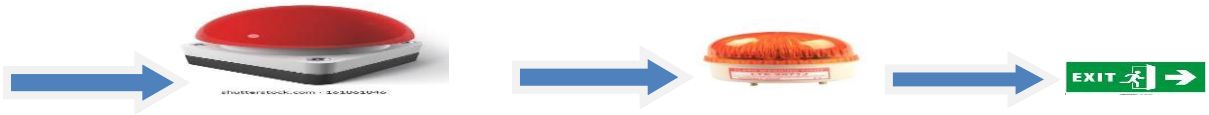
5.1 Data Flow Diagram



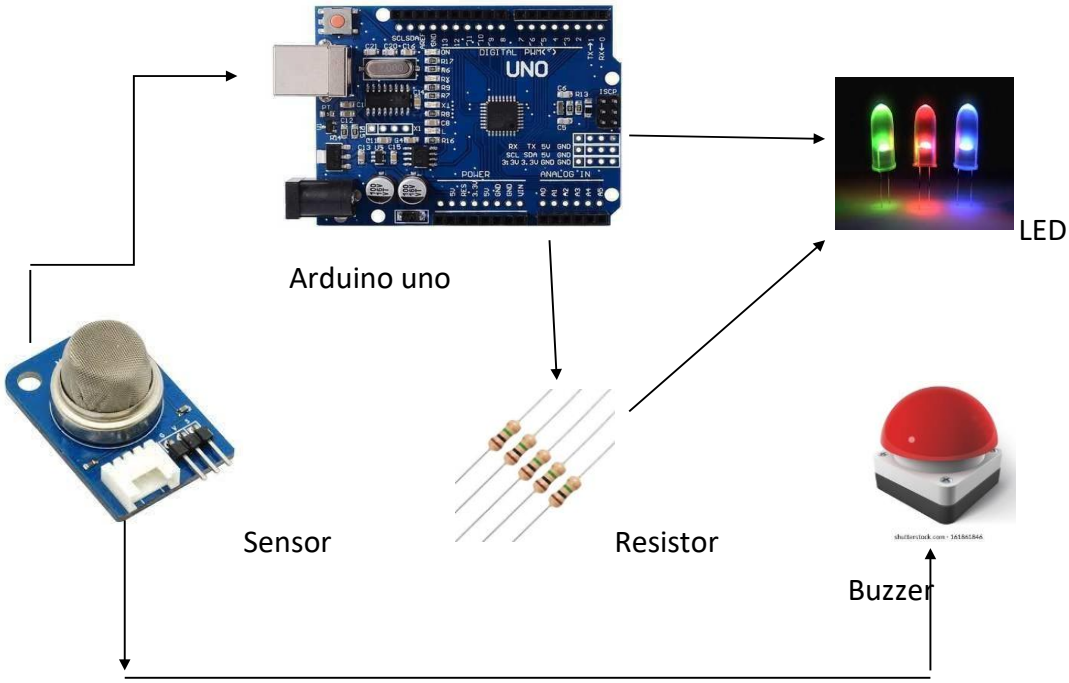
5.2 Solution & Technical Architecture

Solution Architecture





Technical Architecture



6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority
Sprint-1	Analysing the gas leakage	USN-1	The owner who wants to save his employees or a person who wants to save their family from explosion takes necessary actions	2	High
Sprint-1	Preventing from explosion	USN-2	The fire officers worry about any explosions due to gas leakage which may cause many death	1	High

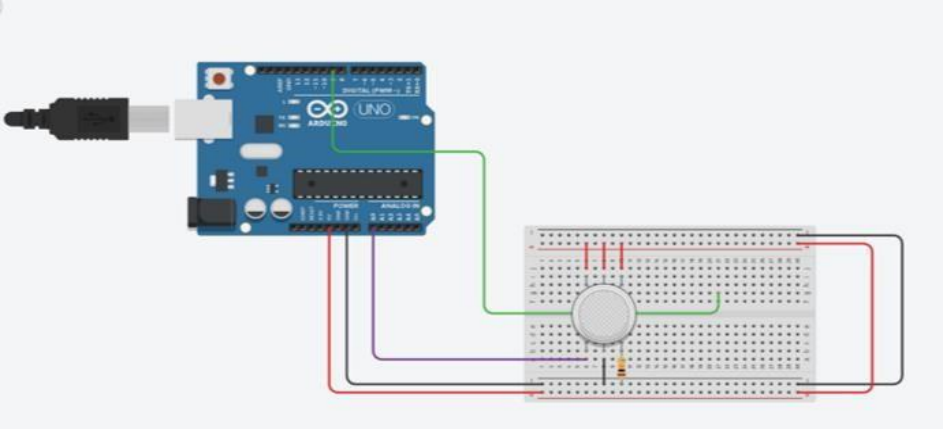
6.2 Sprint Delivery Schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority
Sprint-1	Analysing the gas leakage	USN-1	The owner who wants to save his employees or a person who wants to save their family from explosion takes necessary actions	2	High
Sprint-1	Preventing from explosion	USN-2	The fire officers worry about any explosions due to gas leakage which may cause many death	1	High
Sprint-2	To detect the gas leakage	USN-3	The owner can take necessary steps by deploying gas detectors in their surroundings	2	Low
Sprint-3	Testing and training of the model device	USN-4	The programmer can design an gas leakage detection model .	2	Medium
Sprint-4	Notification	USN-5	The gas leakage detected by the model can be notified using SMS or alarming system	1	High

7.CODING & SOLUTIONING

7.1 Feature 1

```
int val = A0;

void setup()
{             pinMode
(9,OUTPUT);   pinMode
(A0,INPUT);
Serial.begin(9600);
}
void loop()
{
  val  =  analogRead  (A0);
if (val <500 )
  {digitalWrite  (9,  LOW);}
else
  {digitalWrite(9, HIGH);}
}
```



7.2 Feature 2

int val = A0; voidsetup()

{

pinMode (9,OUTPUT); pinMode (A0,INPUT);

Serial.begin(9600);

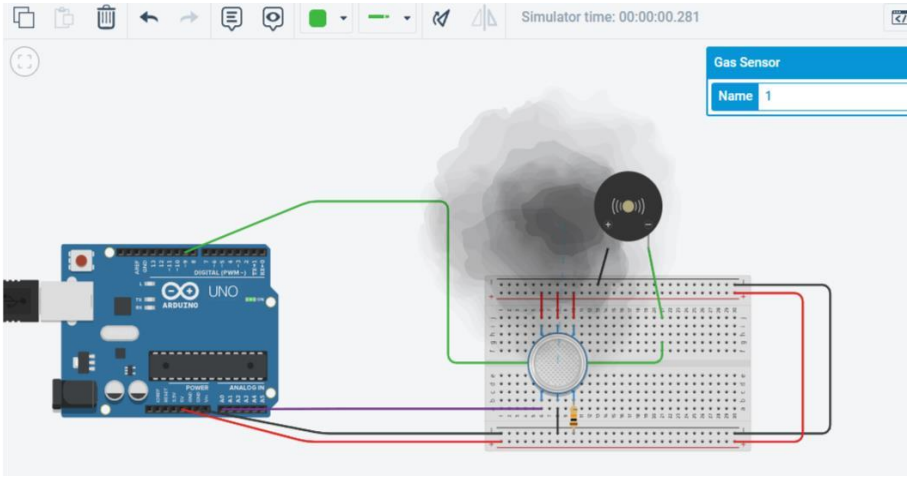
} void loop()

{

val = analogRead (A0); if (val <500)

{digitalWrite (9, LOW);}

```
 else
 {digitalWrite(9, HIGH);}
}
```

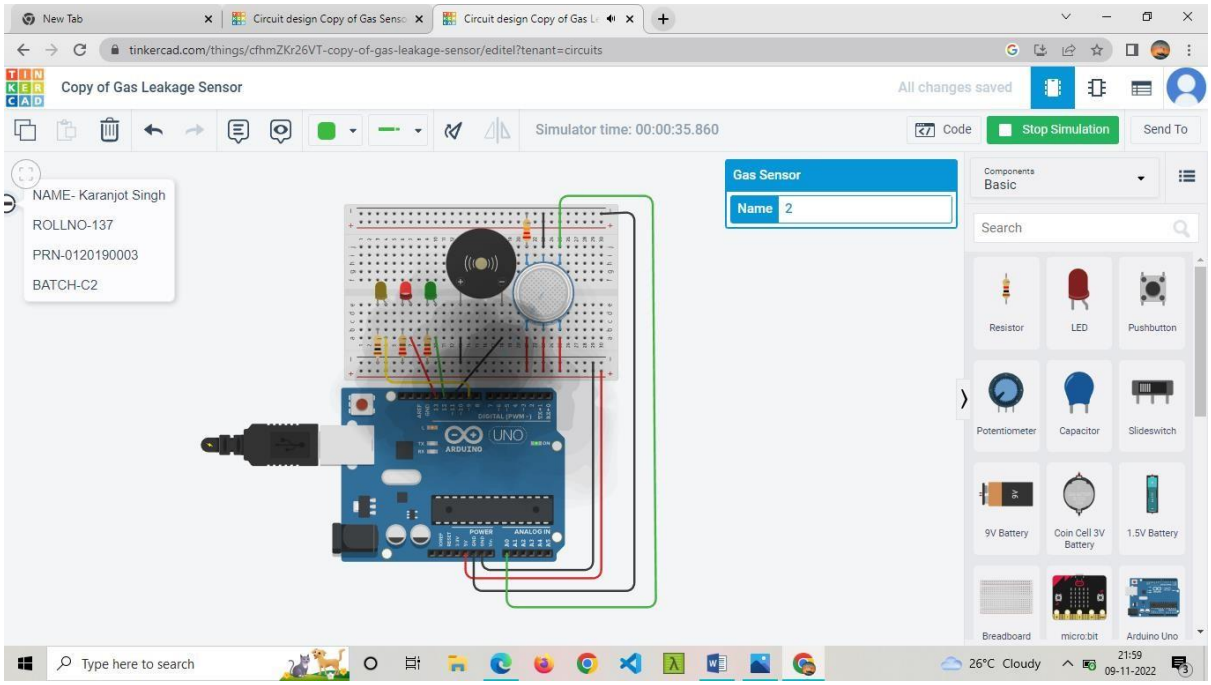


8.TESTING

```
int redLed = 13; int greenLed = 12; int yelloled = 9; int buzzer = 11; int smokeA0 = A0; void setup()
{
 pinMode(redLed, OUTPUT);  pinMode(greenLed, OUTPUT);
pinMode(yelloled, OUTPUT);  pinMode(buzzer, OUTPUT);
pinMode(smokeA0, INPUT);
 Serial.begin(9600);
}

void loop() {  int analogSensor = analogRead(smokeA0);

 Serial.print("Gas Level: ");  Serial.println(analogSensor);  if
(analogSensor > 682 && analogSensor < 719)
 {
  digitalWrite(yelloled, HIGH);  digitalWrite(greenLed, LOW);
digitalWrite(redLed, LOW);  tone(buzzer, 3000, 200);
 }
 else if(analogSensor > 720)
 {
```

```
  digitalWrite(redLed, HIGH);   digitalWrite(greenLed, LOW);
digitalWrite(yelloled, LOW);   tone(buzzer, 1000, 200);
 }

 else
 {
  digitalWrite(redLed, LOW);   digitalWrite(greenLed, HIGH);
digitalWrite(yelloled, LOW);   noTone(buzzer);
 }   delay(100);
}
```

9.RESULT



10.ADVANTAGE & DISADVANTAGE

Advantage

- The sensor-enabled solution helps prevent the high risk of gas explosions and affecting any casualties within and outside the premises.
- The gas sensors help detect the concentration of the gases present in the atmosphere to avoid hazardous consequences like fire breakouts.

Disadvantage

- Only one gas can be measured with each instrument
- When heavy dust, steam or fog blocks the laser beam, the system will not be able to take measurements
- This is also the case when a person or vehicle blocks the path

11.CONCLUTION

After this project performance, can conclude that detection of the LPG gas leakage is incredible in the project system. Applicable usefully in the industrial and domestic purpose. In danger situations we are able to save the life by using this system. An alert is indicated by the GSM module. A sensor node senses gas like CO2, oxygen, propane. The estimated range of transmission and consumption of power is obtained. The simple procedures and Arduino UNO Micro controller area used to build the sensor

12.FERATURE SCOPE

- The gas leakage detection system can be optimized for detecting toxic gasses along with upgrading them with smoke and fire detectors to identify the presence of smoke and fire.
- Ensuring worker safety is important but making using of the right technology is even more vital.
- It can be monitored, and preventive measures can be taken to avoid any disaster.

13.APPENDIX

Source Code

```
int redLed = 13; int greenLed = 12; int yelloled = 9; int buzzer = 11; int
smokeA0 = A0; void setup()
{
  pinMode(redLed, OUTPUT);
pinMode(greenLed, OUTPUT);
pinMode(yelloled, OUTPUT);   pinMode(buzzer,
OUTPUT);   pinMode(smokeA0, INPUT);
  Serial.begin(9600);
}

void loop() {   int analogSensor =
analogRead(smokeA0);

  Serial.print("Gas Level: ");
Serial.println(analogSensor);   if (analogSensor >
682 && analogSensor < 719)
  {
    digitalWrite(yelloled, HIGH);
digitalWrite(greenLed, LOW);
digitalWrite(redLed, LOW);     tone(buzzer,
3000, 200);
  }
  else if(analogSensor > 720)
  {
```

```
   digitalWrite(redLed, HIGH);
digitalWrite(greenLed, LOW);
digitalWrite(yelloled, LOW);     tone(buzzer,
1000, 200);
  }

  else
  {
   digitalWrite(redLed, LOW);
digitalWrite(greenLed, HIGH);
digitalWrite(yelloled, LOW);     noTone(buzzer);
  }
delay(100);
}
```

Demonstration Video Link:

https://www.loom.com/share/182711ee02934bd3ba109301c9d58d41