Gas Leakage Monitoring andAlerting System

IBM NALAIYATHIRAN (HX8001)
PROJECT REPORT

Submitted by

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ANNA UNIVERSITY: CHENNAI 600 025

BONAFIDE CERTIFICATE

Certified that this project report **"Gas Leakage Monitoring and Alerting System"** is the bonafide work of **"MOHAMMED SALAHUDEEN S (211719106050), MANIKANDAN E (211719106048), HARIHARAN K (211719106021)** and **DHIBAK KUMAR S (211719106014)",** who carried out the project work under my supervision.

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Gas Leakage Monitoring and Alerting System

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TEAM ID : PNT2022TMID26516

Abstract :-

Safety plays a critical role in today's world and it is vital that certain solutions are implemented in places of work and living. Whether it is electricity or oil and gas, working or living in hazardous conditions demand certain safety protocols. Liquified Petroleum Gas (LPG) is a type of natural gas liquified under extreme pressure and contained in a metal cylinder. LPG is extremely sensitive to fire and causes a great disaster if exposed to any fire source without precaution. LPG is more widely available than any other natural gas and is primarily used for cooking. Unfortunately, its broad use makes the event of gas leakage or even a blast standard. Therefore, there is a need to develop a gas leakage detection and monitoring system. The system will monitor flame and fire through flame sensor. When a fire is detected, the buzzer begins to sound.The system has

been tested and it is able to monitor gas wastage, leakage and notify the user.The resulting performance indicated its effectiveness toward saving a significant portion of the wasted gas in domestic.

Project Report

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1. INTRODUCTION

Now a days the home safety detection system plays the important role for the security of people. Since all the people from the home goes to work on daily basis, it makes impossible to check on the appliances available at home specially LPG gas cylinder, wired circuits, Etc. Since last three years there is a tremendous hike in the demands of liquefied petroleum gas (LPG) and natural gas. To meet this access amount of demand for energy and replace oil or coal due to their environmental disadvantage, LPG and natural gas are preferred.

These gases are mostly used on large scale in industry, heating, home appliances and motor fuel. So as to track this leakage gas, the system includes gas sensor. This sensor senses the amount of leak gas present in the surrounding atmosphere. Through this, explosion or getting affected by the leakage of gas could be avoided.

Various commercial companies such as hotels and takeaway joints utilize flammable gasses - for instance, carbon dioxide, LPG, ammonia, and so on - to deliver the best customer service possible. The use of such gasses cannot be denied. However, they have also brought about a greater risk and threat to human life. With safety a primary concern, businesses dealing with gas must take certain precautions to ensure work is carried out in the most secure mannerpossible.

1.1 PROJECT OVERVIEW

Project Name	Gas Leakage Monitoring and Alerting Systems
TEAMID	PNT2022TMID26516
Team Lead	Mohammed Salahudeen S

Problem Project will Address	Unexpexted Hazadous Gas Leakage From Industries which will lead to many Accidents
Project Goals	To Detect and Alert the industry workers
Project Objectives and Scopes	The objective of this work is **to present the design of a cost effective automatic alarming system, which can detect liquefied petroleum gas leakage in various premises**.

1.2 PURPOSE

This project helps the industries in monitoring the emission of harmful gases.In several areas, the gas sensors will be integrated to monitor the gas leakage.If in any area gas leakage is detected the admins will be notified alongwith the location.In the web application, admins can view the sensor parameters.

2. LITERATURE SURVEY

Existing problem

Gas leakage is nothing but the leak of any gaseous molecule from a stove, or pipeline, or cylinder etc. This can occur either purposefully or even unintendedly. As we are aware that these kinds of leaks are dangerous to our health, and when it becomes explosive it could cause great danger to the people, home,workplace, industry and the environment. Few of the major incidents that took place due to gas leakage include the Bhopal Disaster and the Vizag Gas leak. The Bhopal disaster is known to be the worst industrial accident ever. Approximately 45 tons of Methyl Isocyanate was leaked from this insecticide plant. Methyl Isocyanate is an organic compound and a chemical that could come from the carbamate pesticides. This colorless, poisonous and flammable liquid is something thathuman beings have to be away from. Vizag Gas leak was a resultant of the escape of styrene that were unattended for a long period. This colorless oily liquid can spread in fumes. So, a detector must be made in such a way that coulddetect any kind of gas, fume, leak, smoke etc. However harmful and dangerous itcan be, the detector could be attached with certain parameters that could help to prevent the issue.

2,2 REFERENCES

Prof.M.Amsaveni, A.Anurupa, R.S.AnuPreetha, C.Malarvizhi, M.Gunasekaran;(2015)

"GSM based LPG leakage detection and controlling system"

They proposed their methodology that the system takes an automatic control action after the detection of 0.001% of Gas leakage. This automatic control action provides a mechanical handle for closing the valve. We are increasing the security for human by means of a relay which will shut \ down the electric power to the house. Also by using GSM, we are sending an alert message to the users and a buzzer is provided for alerting the neighbors about the leakage.

Advantages:

In this methodology that the system takes an automatic control action after thedetection of 0.001% of LPG leakage.

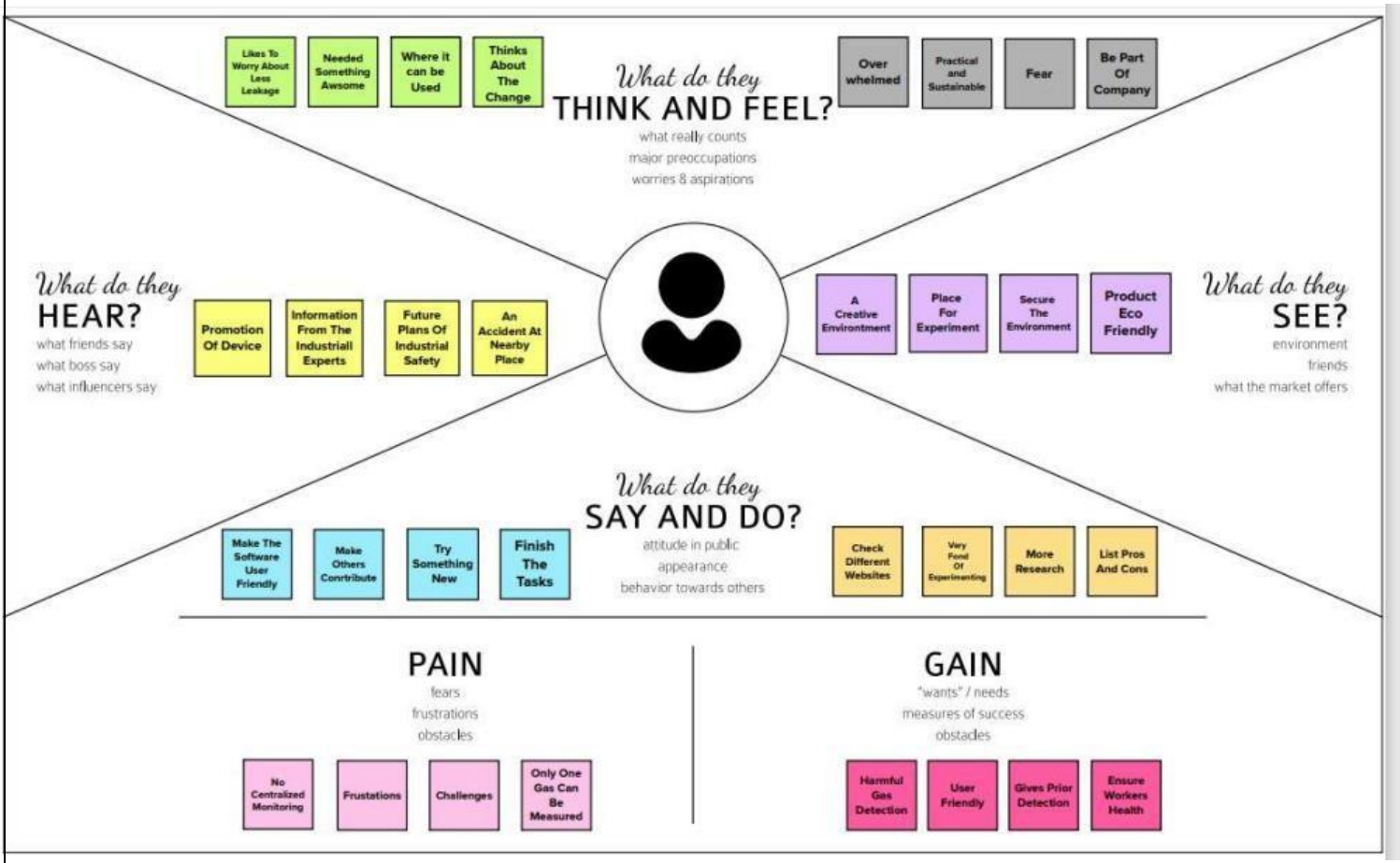
Disadvantages:

(1) System only able to send SMS and alert the user only when the mobile is ON.

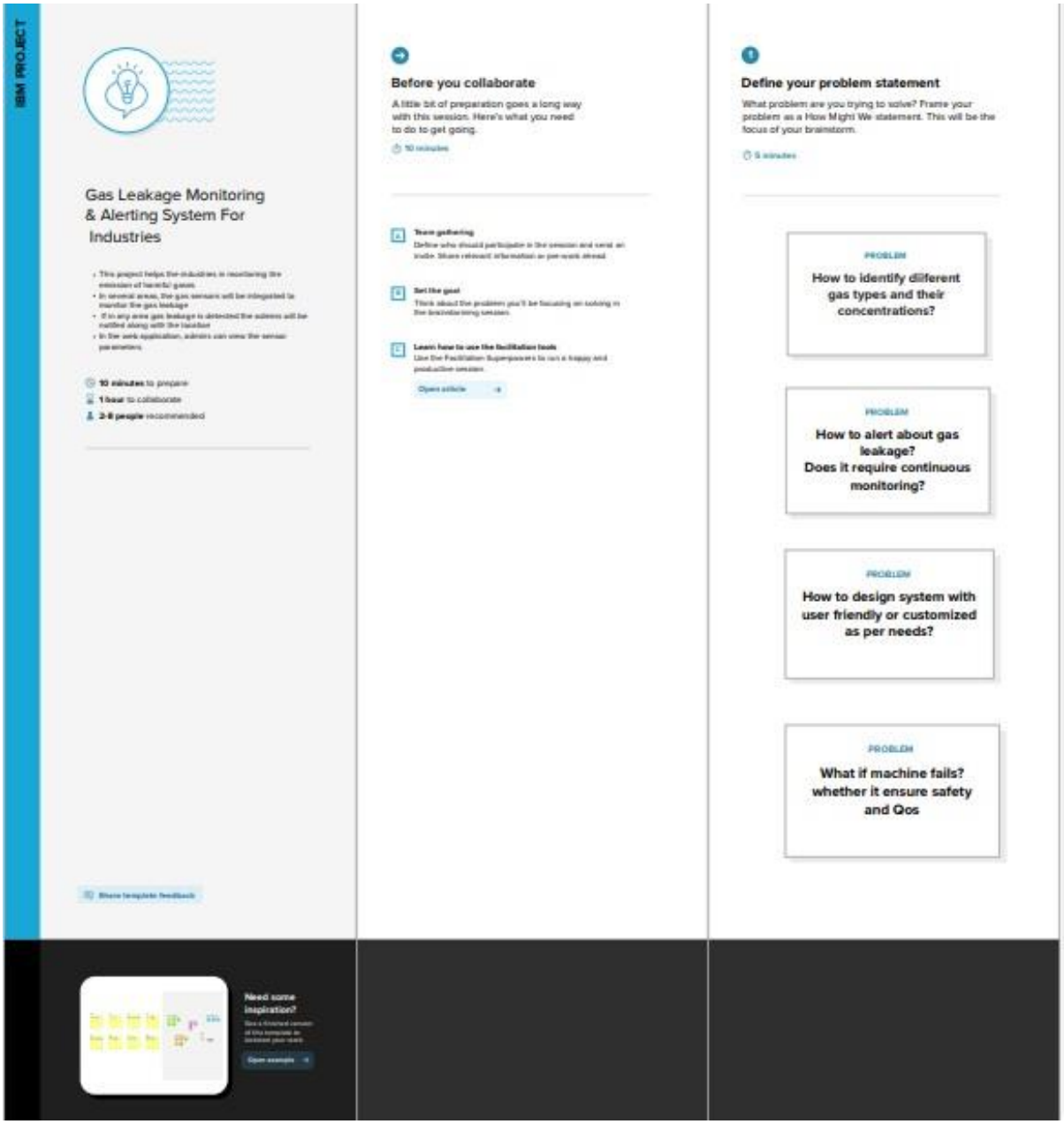
(2) This method looks very ordinary and old fashioned

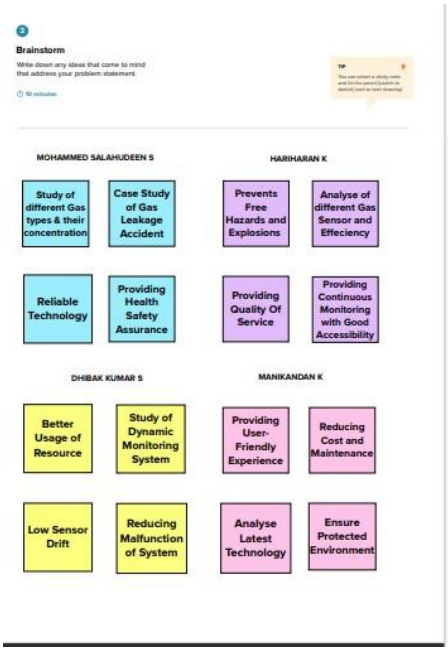
3. IDEATION & PROPOSED SOLUTION

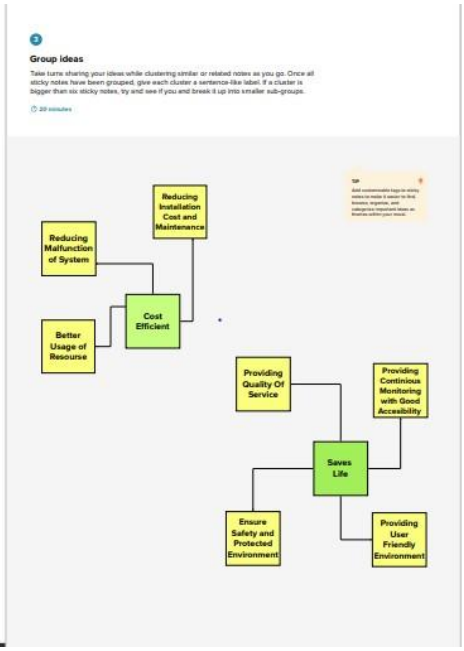
Empathy Map Canvas

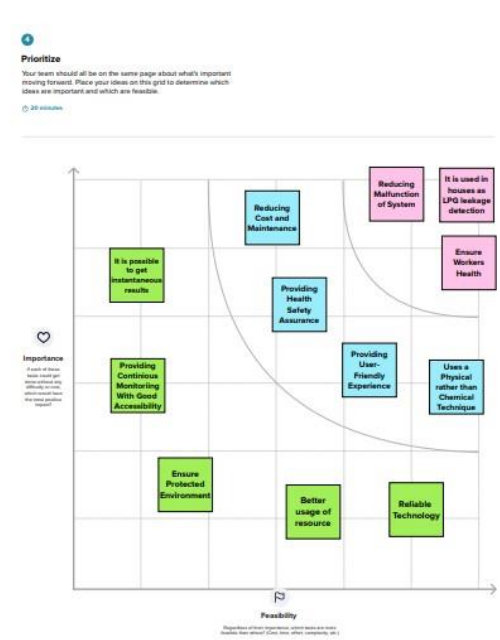


IDEATION & BRAINSTORMING




2
Brainstorm
Write down any ideas that come to mind that address your problem statement.
10 minutes
TIP
MOHAMMED SALAHUDEEN S
Study of different Gas types & their concentration
Case Study of Gas Leakage Accident
Reliable Technology
Providing Health Safety Assurance
HARIHARAN K
Prevents Free Hazards and Explosions
Analyse of different Gas Sensor and Effeciency
Providing Quality Of Service
Providing Continuous Monitoring with Good Accessibility
DHIBAK KUMAR S
Better Usage of Resource
Study of Dynamic Monitoring System
Low Sensor Drift
Reducing Malfunction of System
MANIKANDAN K
Providing User-Friendly Experience
Reducing Cost and Maintenance
Analyse Latest Technology
Ensure Protected Environment


3
Group ideas
Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.
20 minutes
TIP
Reducing Malfunction of System
Reducing Installation Cost and Maintenance
Cost Efficient
Better Usage of Resourse
Providing Quality Of Service
Providing Continious Monitoring with Good Accesibility
Saves Life
Ensure Safety and Protected Environment
Providing User Friendly Environment


4
Prioritize
Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.
20 minutes
Reducing Malfunction of System
It is used in houses as LPG leakage detection
Reducing Cost and Maintenance
Ensure Workers Health
it is possible to get instantaneous results
Providing Health Safety Assurance
Importance
Providing User-Friendly Experience
Providing Continious Monitoring With Good Accessibility
Uses a Physical rather than Chemical Technique
Ensure Protected Environment
Better usage of resource
Reliable Technology
Feasibility

PROPOSED SOLUTION

Problem Statement (Problem to be solved)

Gas Leakage Monitoring and Alerting System for safety purpose. The Gas Leakage monitoring has a big role in industries and also at many factories where Gas manufacture is happening. This monitoring will help many Gas Leakage related accidents and Workers who work in busy industries, compact with harmful or harmless gases, it is required to continuously check the pipelines and detect leakages if any.So that the workers focus on major problems rather than worrying about monitoring or leakage of gas, this will indeed reduce the manpower of that industry and creates efficient workspace

Idea / Solution description

Our solution notifies the workers and different service departments, based on the severity of the leakage of gases through emergency call directed by our app and alerts the people at work even if there is a small leakage.

Novelty / Uniqueness

The existing solutions addressing this problem, provides solutions but lacks in many aspects such as detecting only few gases, delayed response and alerts only the main departments. But in our project, when the leakage of gas is identified, through our app an automated emergency call is made to local service department to rectify the problem. On the other hand, if the leakage crosses the prescribed threshold value of the gases and if the stipulated time to resolve the problem is over, the call is directed to the fire service department.

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Social Impact / Customer Satisfaction

Our proposed idea is of greater help for the industry, theworkers and also for the people who reside nearby. It will save many people from dangerous situations and prevents accidents like Bhopal Gas Tragedy. This project also helps to reduce the worker's mental pressure and enabling them to concentrate on other works.

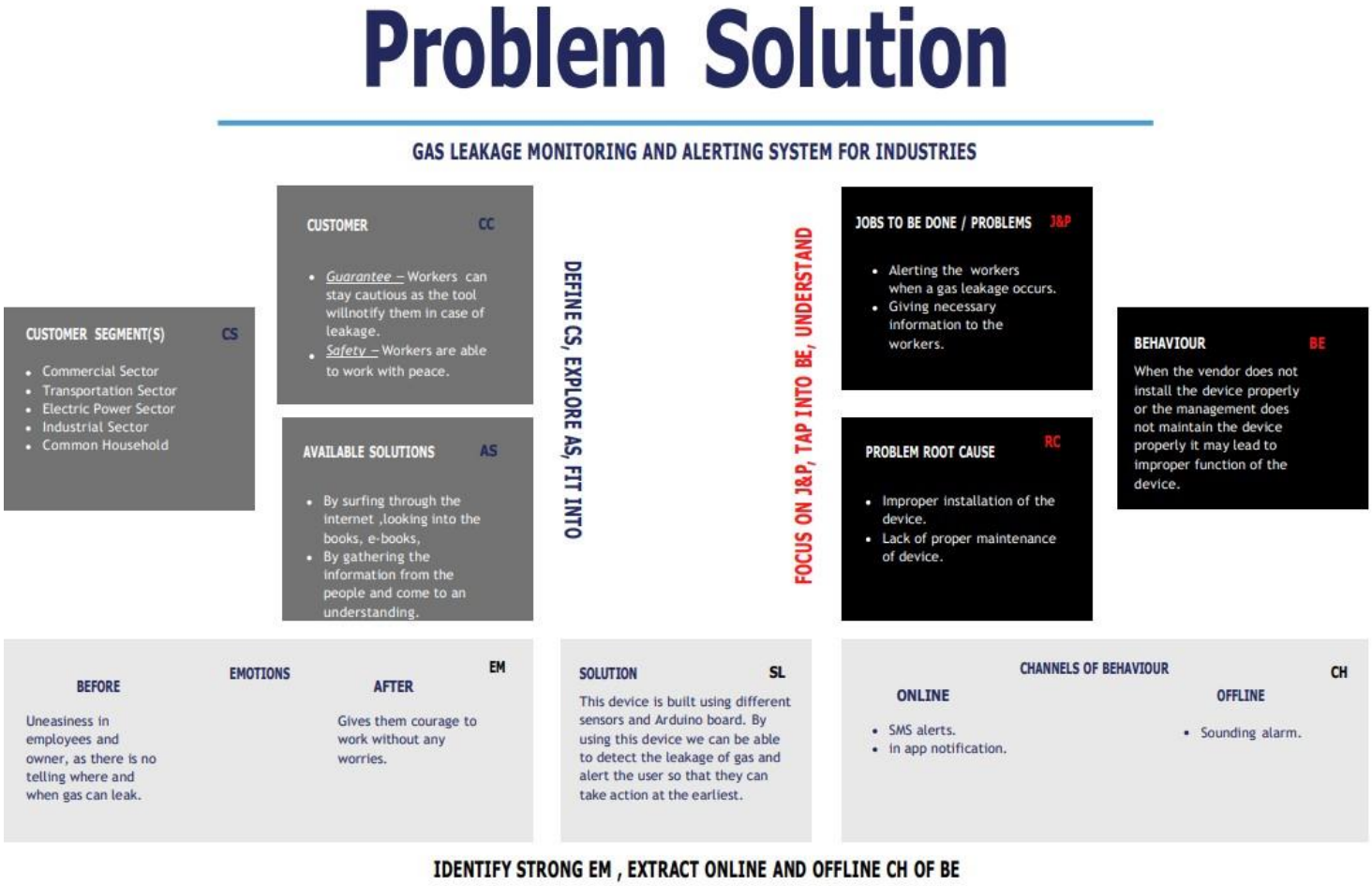
Business Model (Revenue Model)

The main target of our project is Industries so we have planned to visit industries and explain them about the advantages of our project and create awareness on this problem.

Scalability of the Solution

This solution can be integrated in near future for furtheruse because it is the basic or initial stage of any upgraded version

PROBLEM SOLUTION FIT



4. REQUIREMENT ANALYSIS

Functional requirement

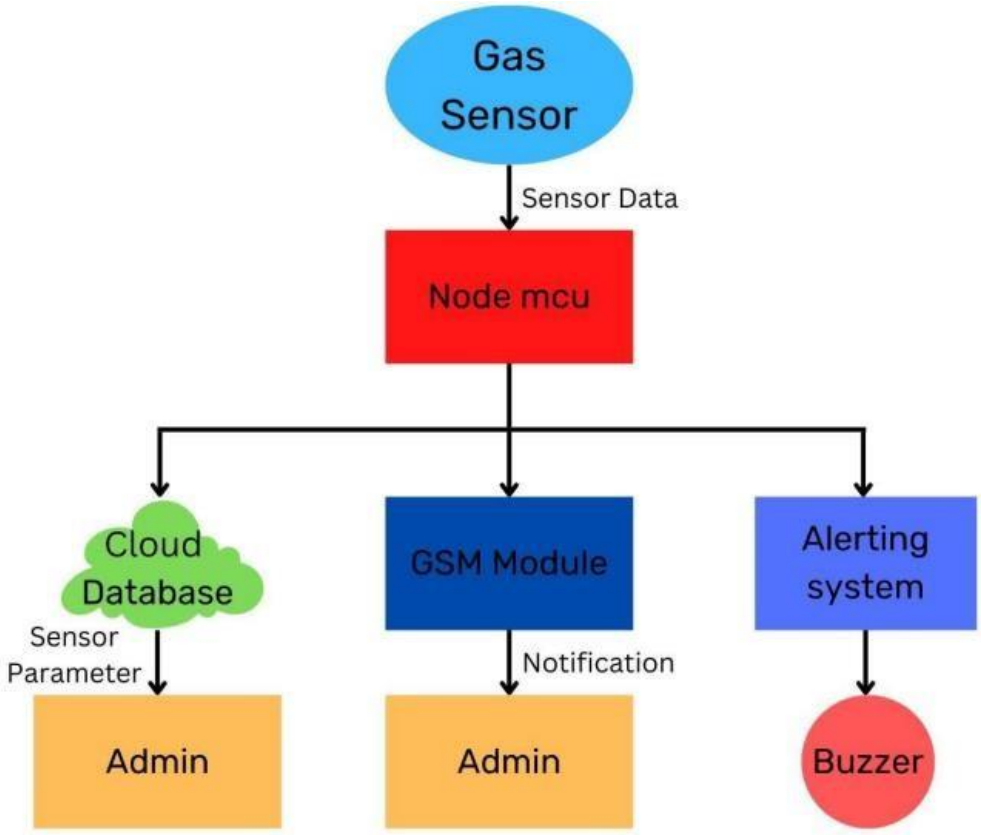
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Gmail Registration through Mobile
FR-2	User Confirmation	Confirmation via Email Confirmationvia OTP
FR-3	Detection	The said system can be deployed in homes, hotels, factory units, LPG cylinder storage areas, and so on. Themain advantage of this Arduino based application is thatit can determine the leakage and send the data over to a site.
FR-4	Monitoring	The leakage can be monitored and can be optimized for detecting toxic gasses.
FR-5	Alerting	Along with monitoring the leakage of gas, through ourapp an automated emergency message is sent to localservice department to rectify the problem. On the other hand, if the leakage crosses the prescribed threshold value of the gases and if the stipulated time to resolve the problem is over, the message is forwarded to the fire service department.
FR-6	Communication	The registered user is able to get alert from the system through a SMS and can also be able to get notification inapp.

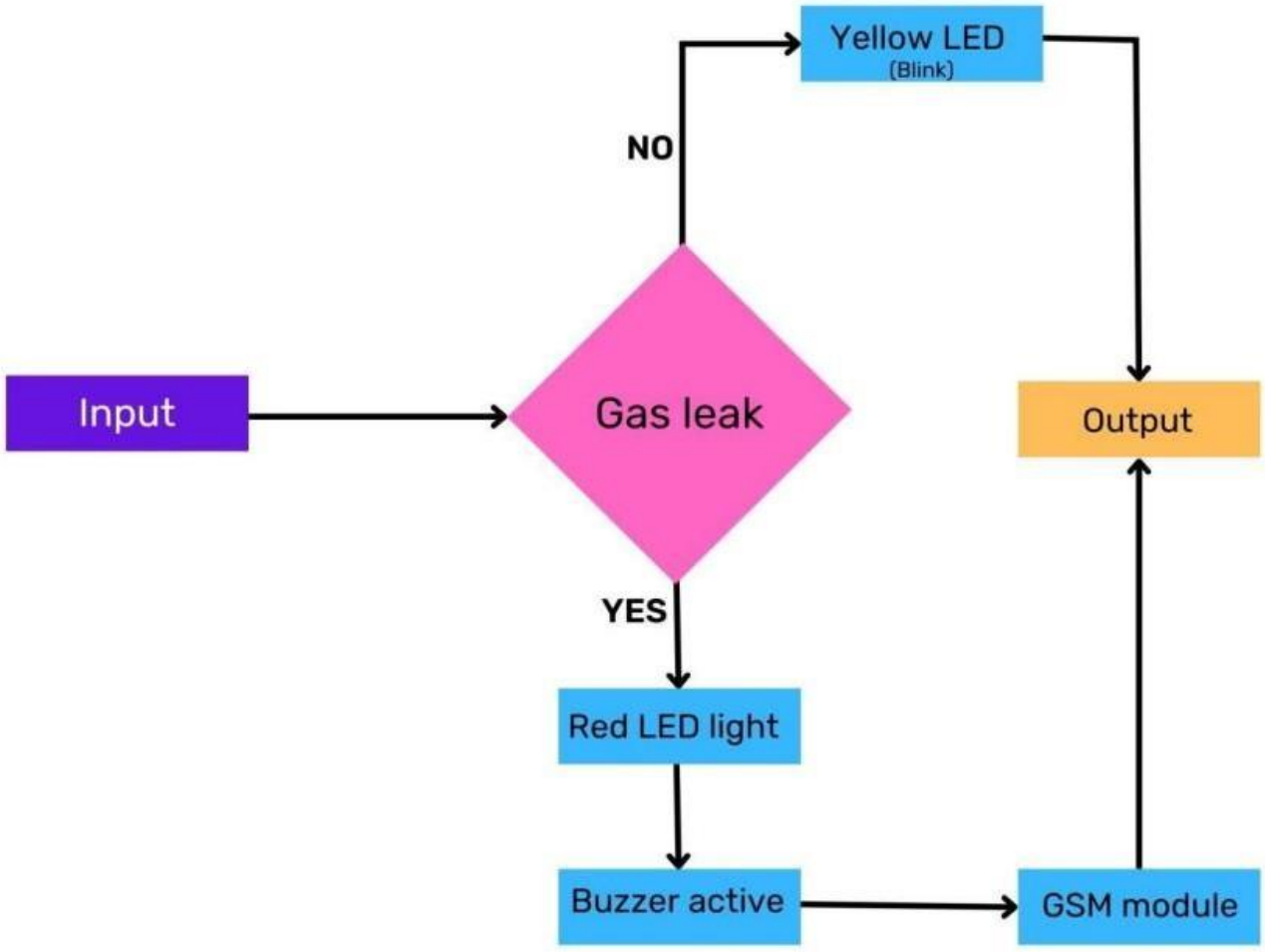
Non Functional requirement

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	This tool verifies that usability is a special and important perspective to analyse user requirements, which can further improve the tool quality. In the model process with user experience as the core, the analysis of users' usability can indeed help designers better understand users' potential needs, behaviour and experience.
NFR-2	**Security**	By identifying the danger of hazardous gas leakage with prior notification people can evacuate in time.
NFR-3	**Reliability**	By the use of various sensors we can detect variousgas leakage and can identify the location of the leakage
NFR-4	**Performance**	In this technique the gas sensor sends the signal to the Arduino UNO after detecting the gas leakage . Arduino to other externally connected devices such as buzzer and GSM send vigorous signals. SMS is sent by GSM module to the provided mobile number as a result an automated message is sent to local service department to rectify the problem. On the other hand, if the leakage crosses the prescribed threshold value of the gases and if the stipulated time to resolve the problem is over, the message is forwarded to the fire service department. .
NFR-5	**Availability**	By developing & deploying resilient tool we alert the user by sounding the alarm and sending a SMS to a registered user.
NFR-6	**Scalability**	By using this system that detects the gas leakage applicable usefully in the industrial and domestic purpose. In danger situations we are able save lives by using this system.

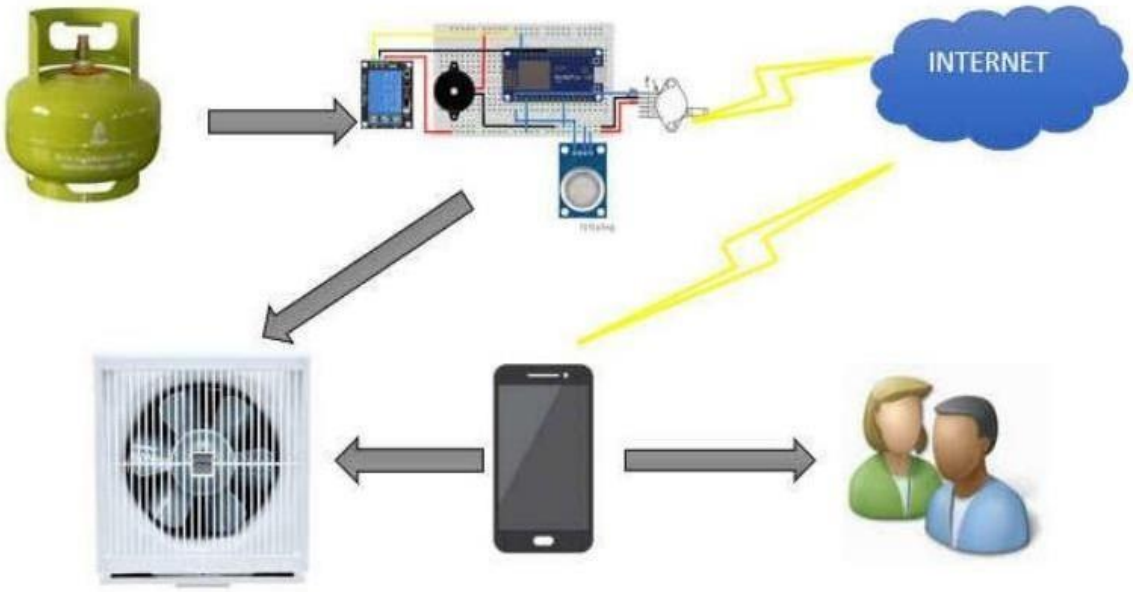
5. PROJECT DESIGN

Data Flow Diagrams

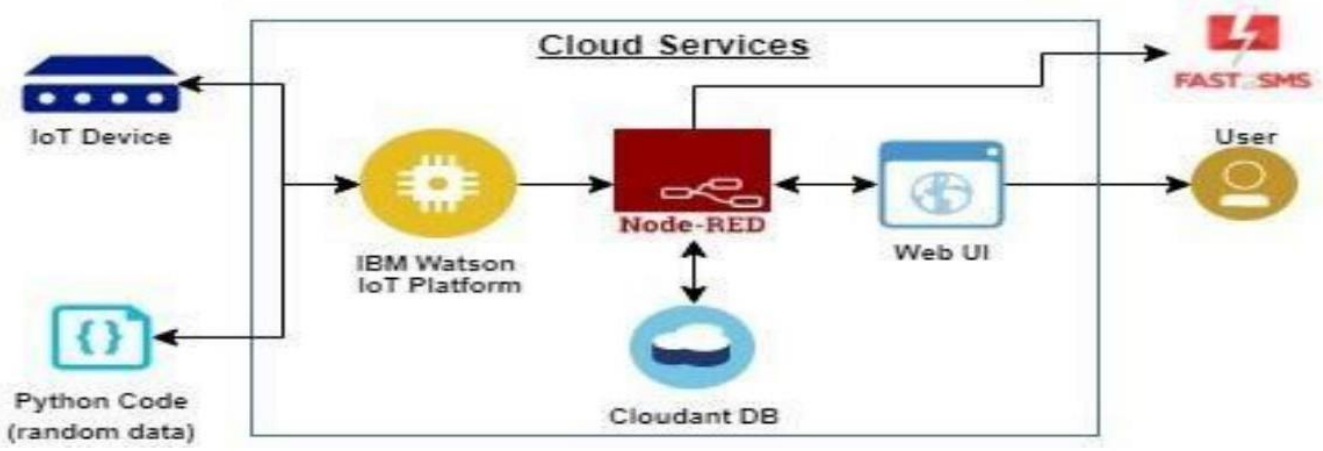



Yellow LED
(Blink)
NO
Input
Gas leak
Output
YES
Red LED light
Buzzer active
GSM module

SOLUTION ARCHITECTURE



TECHNICAL ARCHITECTURE



USER STORIES

User Type	Functional Requirements (EPIC)	User Story Number	User Story/Task	Acceptance Criteria	Priority	Release
Customer (18pplication)	Registration	USN-1	As a user, I canregister for theapplication by entering my email, password, and confirming my password.	I can accessmy account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	Medium	Sprint-1
		USN-3	As a user, I can register for theapplication through Gmail		Medium	Sprint-1
	Login	USN-4	As a user, I canlog into the application by entering email & password		High	Sprint-1

	Dashboard	USN-5	As a user, I canlogin with my credentials to see my dashboard	I will be ableto see my dashboard and the application	High	Sprint-2
Customer (Web user)	Dashboard	USN-6	As a web user, Iwill go to the application's URL and login by entering my credentials	I will be able to login and view my dashboard	Medium	Sprint-2
Customer Care Executive	Helping the customers	USN-7	As a customer care person, I will respond to the customer's queries	I will be ableto see the customer's difficulties, queries and feedback	High	Sprint-3
Administrat or	Working with data	USN-8	As an administrator, I can login to the application's server	I will be able to view the applications data server	High	Sprint-3
	Asking and responding	USN-9	As an administrator, I can ask and respond to the customer's questions	I will be able to answerable to the customers	Medium	Sprint-4

	Maintaining the database	USN-10	As an administrator, I will be able to view the database	I will be able to view, modify and maintain the application's database	High	Sprint-4
	Managing the overall process	USN-11	As an administrator, I can control the overall process	I can control and maintain the overall application's process	High	Sprint-4

6. PROJECT PLANNING & SCHEDULING

Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Analyzing 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	Mohammed Salahudeen S HariHaran K Dhibak Kumar S Manikandan E
Sprint-1	Preventing from explosion	USN-2	The fire officers worries about any explosions dueto gas leakage which maycause many death	1	High	Mohammed Salahudeen S HariHaran K Dhibak Kumar S
Sprint-2	To detect the gas leakage	USN-3	The owner can take necessary steps by deploying gas detectors in their surroundings	2	Low	Mohammed Salahudeen S HariHaran K Dhibak Kumar S Manikandan E
Sprint-3	Testing and training of the model device	USN-4	The programmer can design an gas leakage detection model by trainingthe dataset	2	Medium	Mohammed Salahudeen S HariHaran K Dhibak Kumar S Manikandan E
Sprint-4	Notification	USN-5	The gas leakage detectedby the model can be notified using SMS or alarming system	1	High	Mohammed Salahudeen S HariHaran K Manikandan E

Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

7. CODING & SOLUTIONING

Feature 1

- This project helps the industries in monitoring the emission of harmfulgases
- In several areas, the gas sensors will be integrated to monitor the gasleakage

Feature 2

- If in any area gas leakage is detected the admins will be notified alongwith the location
- In the web application, admins can view the sensor parameters.

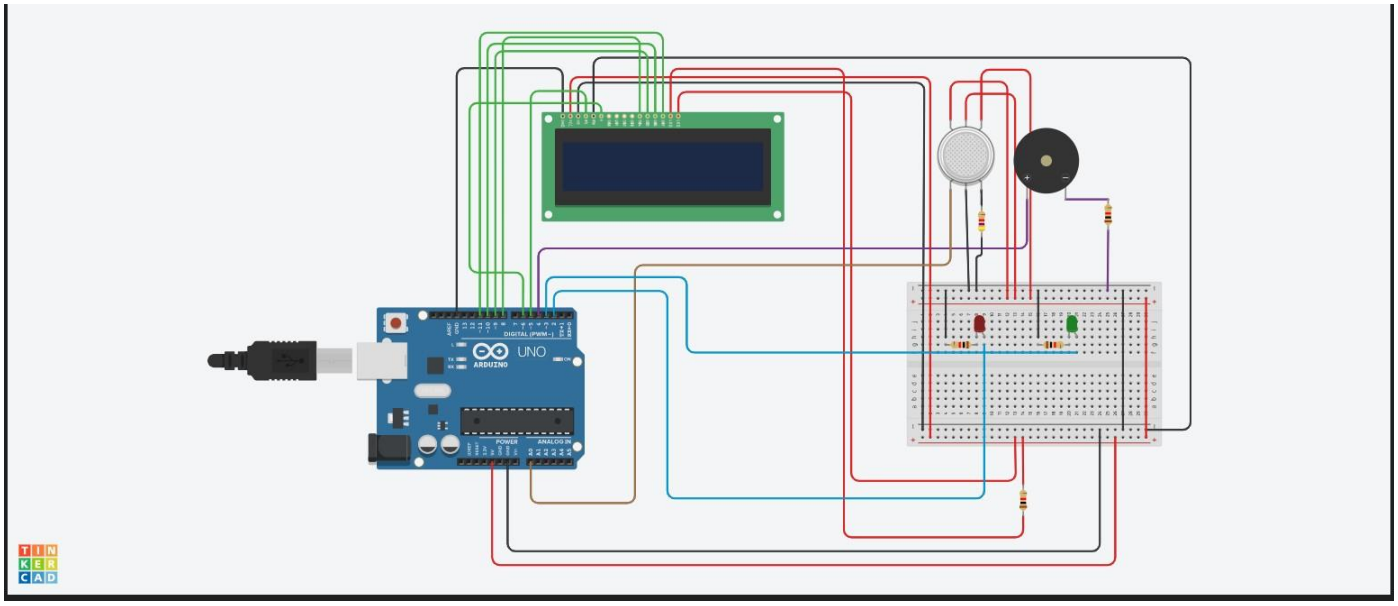
CODE

TINKERCAD

```
#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);
 }

}
```

CIRCUIT DIAGRAM:



CODE:

PROTEUS

```
#include<Servo.h>
Servo myservo;
int pos = 0;
int val;int motor = 8;
#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
#include <TinyGPS.h>
#include <SoftwareSerial.h>
SoftwareSerial mySerial(9, 10);
byte tx=1;
TinyGPS gps;  //Creates a new instance of the TinyGPS object

const int SPEAKER = 6;
const int LED_RED = 7;
const int LED_YELLOW = 10;
int Relay=7;
```

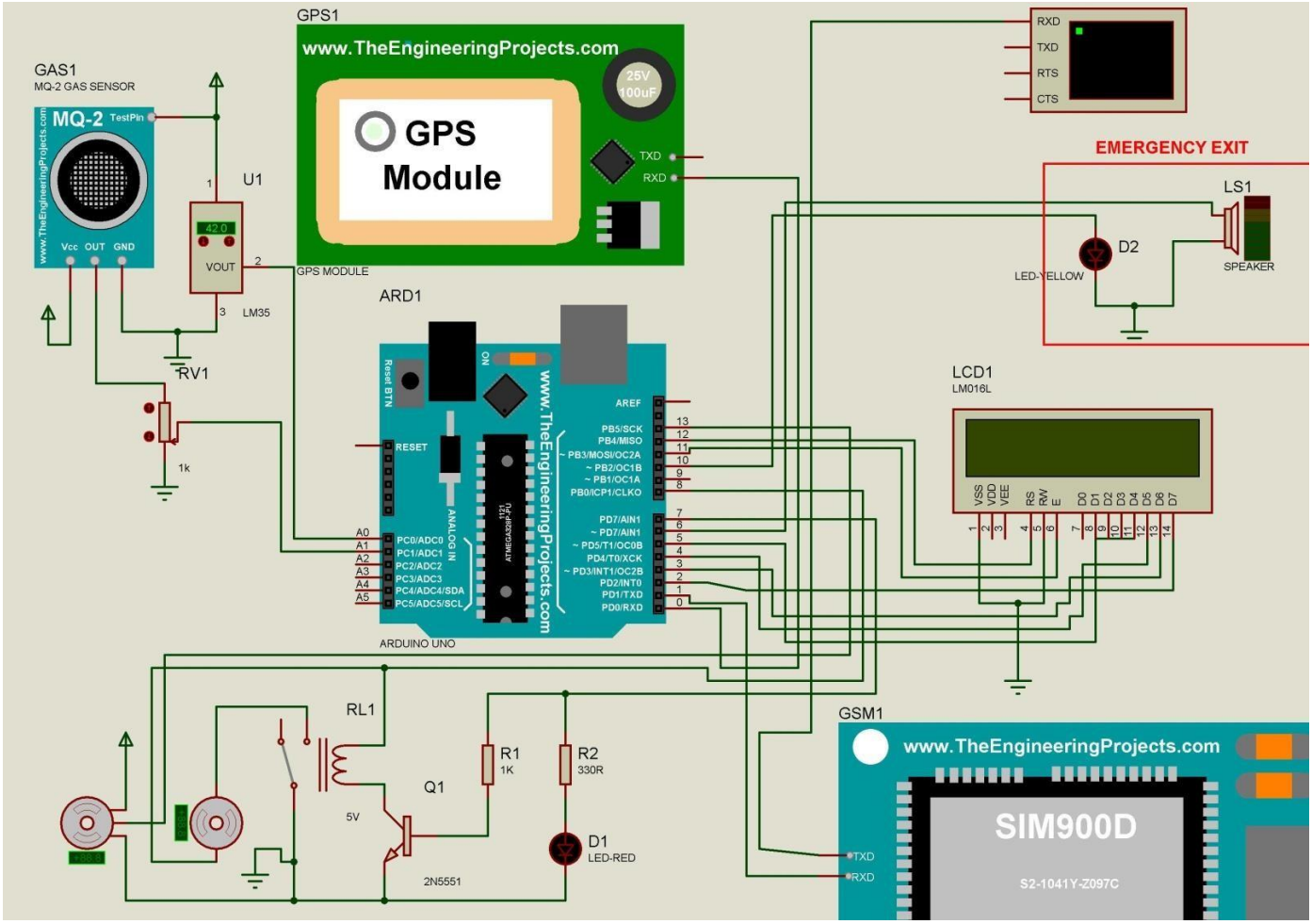
```
int tempC_1 = 0; //set initial tempC 0° for all LM35
int smkC_1 = 0; //set initial tempC 0º for all MQ 2
const int SensorPin1 = A0; //fire input sensor pin
const int SensorPin2 = A1;
String textForSMS;
void setup()
{
  pinMode(motor, OUTPUT);
  pinMode(tx, OUTPUT);
  pinMode(Relay, OUTPUT);
  myservo.attach(13);
  pinMode(SPEAKER, OUTPUT);
  lcd.begin(14, 2);
  delay(100);
  pinMode(SensorPin1, INPUT);
  pinMode(SensorPin2, INPUT);
  pinMode(SPEAKER, OUTPUT);

pinMode(LED_RED, OUTPUT);
pinMode(LED_YELLOW, OUTPUT); //Set control pins to be outputs
digitalWrite(LED_RED, LOW);
digitalWrite(LED_YELLOW, LOW);//set both motors off for start-up
mySerial.begin(9600);
Serial.begin(9600); //Start the serial connection with the computer
}
void loop()
{
  int tempC_1 = analogRead(SensorPin1);
  int SmkC_1 = analogRead(SensorPin2);
  tempC_1 = analogRead(SensorPin1); //read the value from the LM35 sensor
  tempC_1 = (5.0 * tempC_1 * 100.0) / 1024.0; //convert the analog data to temperature
  smkC_1 = analogRead(SensorPin2); //read the value from the MQ 2 sensor
  smkC_1 = (5.0 * smkC_1 * 100.0) / 1024.0; //convert the analog data to temperature
  delay(50);

  bool newData = false;
```

```
unsigned long chars;
unsigned short sentences, failed;
for (unsigned long start = millis(); millis() -start < 1000;)
{
  while (Serial.available())
  {
    char c = Serial.read();
    if (gps.encode(c))
    newData = true;
    }
  }

  if (tempC_1 >= 50 || smkC_1 >= 50)
  {
    digitalWrite(Relay,HIGH);
    val = analogRead(pos);
    val = map(val, 0, 1023, 0, 180);
    myservo.write(val);
    delay(50);
    digitalWrite(motor, HIGH);
    digitalWrite(LED_RED, HIGH);
    digitalWrite(LED_YELLOW, HIGH);
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print(" THERE IS FIRE ");
    lcd.setCursor(0, 1);
    lcd.print(" NOT SAFE HERE ");
    delay(100);
    lcd.clear();
    lcd.print("Sending SMS...");
    delay(100);

    tone(SPEAKER, 1047, 500);
    delay(200);
    tone(SPEAKER, 1109, 1000);
    delay(200);
```

```
tone(SPEAKER, 1175, 100);
delay(5);

float flat, flon;
unsigned long age;
gps.f_get_position(&flat, &flon, &age);
Serial.print("AT+CMGF=1\r");
delay(100);
Serial.print("AT+CMGS=\"+233266302607\"\r");
Serial.print("FIRE ALERT!\r");
delay(100);
Serial.print("AT+CMGS=\"+233266302607\"\r");
Serial.print("FIRE OCCURED!\r");
delay(100);
Serial.print("AT+CMGS=\"+233266302607\"\r");
Serial.print("FIRE OCCURED! in\r");
delay(200);
Serial.print("Latitude = ");
Serial.print(flat == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flat, 6);
Serial.print(" Longitude = ");
Serial.print(flon == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flon, 6);
delay(200);
Serial.println((char)26); // End AT command with a ^Z, ASCII code 26
delay(200);
Serial.println();
}
else
{
  digitalWrite(Relay,LOW);
  delay(50);
  digitalWrite(LED_RED, LOW);
  digitalWrite(LED_YELLOW, LOW);
  digitalWrite(motor, LOW);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("    NO FIRE    ");
```

```
  lcd.setCursor(0, 1);
  lcd.print("  ALL SAFE  ");
   }
}
```

CIRCUIT DIAGRAM:



8. RESULTS

This technique has been tested by leak of gas almost about sensors,
MQ2 gas sensor sends the signal to the Arduino UNO after detecting the gas leakage. Arduino to other externally connected device such as LCD, buzzer and GSM module. In practice, results for are noticed by the people surrounding by the area are displayed in the LCD and buzzer sound indicate the danger to the people by making beep sound and sends the notification message.

9. ADVANTAGES & DISADVANTAGES

- Get real-time alerts about the gaseous presence in the atmosphere
- Prevent fire hazards and explosions
- Supervise gas concentration levels
- Ensure worker's health
- Real-time updates about leakages
- Cost-effective installation
- Data analytics for improved decisions
- Measure oxygen level accuracy
- Get immediate gas leak alerts

DISADVANTAGES

Gas interference: Cross interference from other gases can compromise the performance of a gas sensor, altering the calibration curve will result in false or inaccurate readings.

10. CONCLUSION

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.

11. FUTURE SCOPE

The system can be taken as a small attempt in connecting the existing primary gas detection methods to a mobile platform integrated with IoT platforms. The gases are sensed in an area of 10m radius of the rover and the sensor output data's are continuously transferred to the local server. The accuracy of sensors are not up to the mark thus stray gases are also detected which creates an amount of error in the outputs of the sensors, especially in case of methane. Hence in the future we gonna come up with better solutions for these Problems

12. APPENDIX

SOURCECODE

TINKERCAD

```
#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);
  }

}
```

SOURCECODE

PROTEUS

```
#include<Servo.h>
Servo myservo;
int pos = 0;
int val;int motor = 8;
#include <LiquidCrystal.h>
LiquidCrystal lcd(12, 11, 5, 4, 3, 2);
#include <TinyGPS.h>
#include <SoftwareSerial.h>
SoftwareSerial mySerial(9, 10);
byte tx=1;
TinyGPS gps;  //Creates a new instance of the TinyGPS object

const int SPEAKER = 6;
const int LED_RED = 7;
const int LED_YELLOW = 10;
int Relay=7;
int tempC_1 = 0; //set initial tempC 0° for all LM35
int smkC_1 = 0; //set initial tempC 0º for all MQ 2
const int SensorPin1 = A0; //fire input sensor pin
const int SensorPin2 = A1;
String textForSMS;
void setup()
{
```

```
  pinMode(motor, OUTPUT);
  pinMode(tx, OUTPUT);
  pinMode(Relay, OUTPUT);
  myservo.attach(13);
  pinMode(SPEAKER, OUTPUT);
  lcd.begin(14, 2);
  delay(100);
  pinMode(SensorPin1, INPUT);
  pinMode(SensorPin2, INPUT);
  pinMode(SPEAKER, OUTPUT);

pinMode(LED_RED, OUTPUT);
pinMode(LED_YELLOW, OUTPUT); //Set control pins to be outputs
digitalWrite(LED_RED, LOW);
digitalWrite(LED_YELLOW, LOW);//set both motors off for start-up
mySerial.begin(9600);
Serial.begin(9600); //Start the serial connection with the computer
}
void loop()
{
  int tempC_1 = analogRead(SensorPin1);
  int SmkC_1 = analogRead(SensorPin2);
  tempC_1 = analogRead(SensorPin1); //read the value from the LM35 sensor
  tempC_1 = (5.0 * tempC_1 * 100.0) / 1024.0; //convert the analog data to temperature
  smkC_1 = analogRead(SensorPin2); //read the value from the MQ 2 sensor
  smkC_1 = (5.0 * smkC_1 * 100.0) / 1024.0; //convert the analog data to temperature
  delay(50);

  bool newData = false;
  unsigned long chars;
  unsigned short sentences, failed;
  for (unsigned long start = millis(); millis() -start < 1000;)
  {
    while (Serial.available())
    {
```

```
  char c = Serial.read();
  if (gps.encode(c))
  newData = true;
  }
}

if (tempC_1 >= 50 || smkC_1 >= 50)
{
  digitalWrite(Relay,HIGH);
  val = analogRead(pos);
  val = map(val, 0, 1023, 0, 180);
  myservo.write(val);
  delay(50);
  digitalWrite(motor, HIGH);
  digitalWrite(LED_RED, HIGH);
  digitalWrite(LED_YELLOW, HIGH);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("  THERE IS FIRE ");
  lcd.setCursor(0, 1);
  lcd.print(" NOT SAFE HERE ");
  delay(100);
  lcd.clear();
  lcd.print("Sending SMS...");
  delay(100);

  tone(SPEAKER, 1047, 500);
  delay(200);
  tone(SPEAKER, 1109, 1000);
  delay(200);
  tone(SPEAKER, 1175, 100);
  delay(5);

  float flat, flon;
  unsigned long age;
```

```
gps.f_get_position(&flat, &flon, &age);
Serial.print("AT+CMGF=1\r");
delay(100);
Serial.print("AT+CMGS=\"+233266302607\"\r");
Serial.print("FIRE ALERT!\r");
delay(100);
Serial.print("AT+CMGS=\"+233266302607\"\r");
Serial.print("FIRE OCCURED!\r");
delay(100);
Serial.print("AT+CMGS=\"+233266302607\"\r");
Serial.print("FIRE OCCURED! in\r");
delay(200);
Serial.print("Latitude = ");
Serial.print(flat == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flat, 6);
Serial.print(" Longitude = ");
Serial.print(flon == TinyGPS::GPS_INVALID_F_ANGLE ? 0.0 : flon, 6);
delay(200);
Serial.println((char)26); // End AT command with a ^Z, ASCII code 26
delay(200);
Serial.println();
}
else
{
  digitalWrite(Relay,LOW);
  delay(50);
  digitalWrite(LED_RED, LOW);
  digitalWrite(LED_YELLOW, LOW);
  digitalWrite(motor, LOW);
  lcd.clear();
  lcd.setCursor(0, 0);
  lcd.print("    NO FIRE    ");
  lcd.setCursor(0, 1);
  lcd.print("  ALL SAFE  ");
  }
}
```

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-22640-1659855524.git

PROJECT LINK :

https://www.tinkercad.com/things/dgmsD2r8Vgn-brilliant-bigery-hillar/editel?tenant=circuits