Gas leakage Monitoring & Alerting System for Industries

TEAM ID: PNT2022TMID14029

PROJECT REPORT

Submitted by

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ABSTRACT

The Internet of things (IoT) is the system of gadgets, vehicles, and home machines that contain hardware, programming, actuators, and network which enables these things to interface, collaborate and trade information. IoT includes broadening Internet network past standard device, for example, work areas, workstations, cell phones and tablets, to any scope of generally stupid or non-web empowered physical device and ordinary articles. Installed with innovation, these gadgets can convey and connect over the Internet, and they can be remotely observed and controlled . The meaning of the Internet of things has advanced because of union of numerous innovations, ongoing examination, AI, ware sensors, and implanted frameworks. Conventional fields of installed frameworks, remote sensor systems, control frameworks computerization (counting home and building mechanics), and others all add to empowering the Internet of things. A gas spill alludes to a hole of petroleum gas or different vaporous item from a pipeline or other regulation into any territory where the gas ought not be available. Since a little hole may steadily develop a hazardous convergence of gas, spills are perilous. Notwithstanding causing flame and blast dangers, holes can slaughter vegetation, including huge trees, and may discharge amazing ozone harming substances to the environment.

1.INTRODUCTION

Gas leakage leads to various accidents resulting in both material loss and human injuries. Based on their physical characteristics, such as toxicity, flammability, etc., the risk of explosion, fire, and asphyxia exists. In recent years, there have been more fatalities brought on by gas cylinder explosions.The reason for such an explosion is due to substandard cylinders, old valves, worn out regulators and lack of awareness in handling gas cylinders. The LPG or propane is a flammable mixture of hydro carbon gases used as fuel in many applications like homes, hostels, industries, automobiles, vehicles because of its desirable properties which include high calorific value, less smoke, less soot, and measure harm to the environment. The leakage of the gas causes destructible impact to the lives and as well as to the heritage of the people. So, by keeping it in the concept of the project we have determined to develop an examining system which finds the leak of LPG gas and protects the workplaces by taking correct precautions at the correct time. This system gives details like how sensors in the project are used to detect gas leaks and switch on the buzzer for danger alert right away.. Buzzer is a clear indication of gas leakage. By the detection of the hazardous gas the alerting message reached the person who has control through SMS or Email. Detection of the gas leakage is important and halting leakage is important equally. The main objective of this project is that it is extremely accurate with a least cost, this project system is best to detect gas leakage and also warn people around by buzzer beep sound and an SMS is sent to the responsible person for preparatory safety calculations.

1.1 Project Overview

To achieve the goals of the study, three design models were used in this work.The LPG detection model and a literature review were used to achieve the initial goal, which was to develop a system that can recognize LPG gas.. The second goal is that ,Designing a system that can provide local and remote notice in both visible and auditory forms was successful. through the use of the notification mechanism and some research into the literature. The ultimate goalThrough the construction of a system that will stop additional gas leaks, another goal, the LPG leakage control model's implementation. The completed prototype was made with full functionality and possessed the ability to detect, keep an eye on, and exert control on LPG leakages from LPG storage tanks.

1.2 Purpose

The MQ5 gas sensor will be used to build the NodeMCU ESP8266 IoT based LPG Gas Leakage Alarm project. From your smartphone, you can keep an eye on the gas level or leaking. With a few simple components, this project is simple to construct. Let's look at how to create an IoT-based NodeMCU ESP8266 LPG Gas Leakage Alarm.

2. LITERATURE SURVEY

This section present the review of some studies that are related to gas leakages Monitoring and alert System.

2.1 Existing Problem

In [1], a gas leakage detection system was developed to warn the human from the gas toxic; the warning is a Short Message Service (SMS) goes to the corresponding person's cellphone using Arduino UNO and SIM900 IFTTT and Webhooks. In [2], the researcher designed a gas detection leakage they proposed that if any leakage is sensed through the gas sensor, a SMS will be sent automatically to the corresponding persons or family member using IFTTT and Webhooks. Their system has an added function to measure the weight of the LPG cylinder and displayed on the LCD. If the quantity of the gas cylinder is less or equal to10kg, it will automatically book the LPG cylinder by sending an SMS to the dealer. Also when the weight of the LPG cylinder comes down to 0.5 Kg, it alerts the persons in the house by SMS to change the cylinder. In [5], the author had developed a system capable of measuring the amount of gases in ppm and percentage to save the human body from the various toxic gases and hazardous elements or chemicals or compound consisting in the atmosphere. In his proposed system, he used Arduino Uno R3, nRF24L01Plus Wireless Transceiver Module, and the MQ2 gas sensor and the results was monitoring at the receiver side using Arduino IDE serial monitoring. In [6], the author proposed an IoT based gas detection prototype using Proteus design suite. He depends the Blink IoT platform for data visualization. He concludes the system said that the proposed technique wirelessly transfers alert notification to the user and therefore the user can easily connect the devices through a Smartphone from any location.

2.2 Reference

PAPER 1 : Prototype of Gas Leak Detector System Using Micro controller and SMS Gateway

AUTHORS: Marchel Thimoty Tombeng

YEAR : 2017

DESCRIPTION :

This gas leak detector system contains two features, this includes the SMS Gateway feature for only sending warning information regarding the gas leak to user, and the Alarm for the warning alert. There is some improvement which can be applied for the future work, such as regarding the SMS Gateway, it need to enhance with feature such as notifying the user whenever the remaining credit balance is insufficient. Another thing which can be enhanced is regarding the sensor, the sensors in this module do not include somewhat notification for notifying the user whenever the sensor not working properly or not connected to the micro controller for some cases, therefore, it is recommended to add this kind of features in the future work for better refinement.

PAPER 2 : LPG Leakage Detection and Autorefilling Using Arduino

AUTHORS : T Alex Stanley Raja, R Senthil Kumar, A Nandhakumar, K V Santhosh Kumar

YEAR : 2018

DESCRIPTION :

Gas leakages resulting into fatal inferno has become a serious problem in household leading to financial loss as well as human injuries. In our opinion a tragedy is a tragedy be it a personal or a public one. The first and main objective of our project is to design a system which detects gas leakage and exhaust it out as soon as detected .The second objective is to check for any fire accidents and intimate to fire brigade automatically. The third objective is to check for the filled gas in the cylinder and intimate to the user for refilling in case of less than half filled. Thus, the proposed system will be useful in upgrading the safety methods and comply with the regulatory standards that are set by the government and the environment safe to operate with the important use for the prevent of any untoward incidents by protecting the life and property from danger for leading a comfortable life.

PAPER 3 : A Review on Microcontroller based LPG Gas Leakage Detector

AUTHORS : Vasudev Yadav, Akhilesh Shukla, Sofiya Bandra, Vipin Kumar, Ubais Ansari, Suraj Khanna

YEAR : 2016

DESCRIPTION :

We shall use a new technology IOT (Internet of Things) to get the fastest notification of gas leakage. We shall use a stepper motor to OFF the knob of the cylinder regulator to avoid accidental cases due to gas leakage. We will also use a website or application under the IOT technology to get the fastest response from the module. The other module and things which are used in this project is GSM module, micro controller, exhaust fan, LED for indication, a buzzer to notify local peoples and MQ 5 or MQ 6 gas sensor module to sense the gas leakage

PAPER 4 : Internet of Thing Using FPGA

AUTHOR : Noor Kareem Jumaa

YEAR : 2017

DESCRIPTION :

FPGAs provide System on Chip (SoC) technique due to FPGAs scalability which enables the designer to implement and integrate large numbers of hardware clocks at single chip. FPGA can be deemed as a special

purpose re programmable processor since it can process signals at its input pins, manipulate them, and give off signals on the output pins. In this paper, using FPGA for IoT is the limelight. FPGA, Arduino, Raspberry Pi, and Orange Pi are suitable to implement IoT platforms. The popular FPGA manufactures like Altera and Xilinx have started working on IoT by designing many IoT systems like control systems, machine vision systems, Artificial Intelligence systems, and many other FPGAs based IoT systems while many prototypes are in their progress to be completed. FPGAs have flexibility to implement IoT extendable systems. There is an expectation that the whole world will become IoT world by 2020.

PAPER 5 :Toxic and hazardous gas detection, measurement and monitoring system for safety assurance in home and industrial application of wireless sensor node"

AUTHOR : Mobasshir Mahbub

YEAR : 2019

DESCRIPTION :

The developed system is capable of measuring the amount of gases in ppm and percentage. This system and all its codes and algorithms can be applicable in case of other MQ series gas sensors with a little portion of modification. The system will be highly effective for measuring toxic and flammable gases in areas where human lives can be vulnerable at any time. Moreover, as it is a wireless monitoring system, the risk of serious injuries and death will be minimized by its application and measuring the amount of gases from a safer distance. This system is usable in both houses and industries. It is an easier applicable and better monitoring and warning system against today's gas related serious accidents to save valuable human lives.There are options for optimizing and developing the system by more and more research in this field to make it more efficient

PAPER 6 :Iot based gas monitoring system using Arduino

AUTHORS : Guru rama gayathri, Yoga ananth

YEAR : 2020

DESCRIPTION :

This technique wirelessly transfers alert notification to the user and therefore the user can easily connect the devices through a Smartphone from any location. It's utilized in wide selection of applications in present day society and introducing a vast scope to the longer term . This easy control over the devices like exhaust fan makes the environment less accident- prone. Using the Arduino micro controller also makes the system cheaper. Quick access and control makes the system beneficial. Using an object detection sensor, it may also warn consumers about gas waste when removing utensils from the stove.

2.3 Problem Statement and Definition

Liquid Petroleum Gas (LPG) is a highly flammable chemical that consists of a 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 humans nearby and if there are no humans nearby, it cannot be detected. But sometimes it cannot be detected by humans that have a low sense of smell. Thus, this system will help to detect the presence of gas leakage.

Furthermore, gas leakage can cause fire that will lead to serious injury or death and it also can destroy human properties. This system was developed by using IoT to give real-time response to the user and the nearest fire station

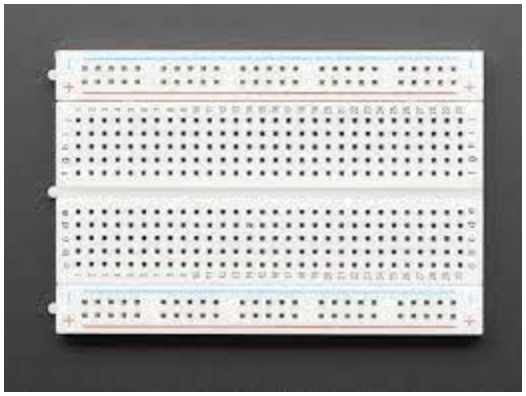
LIST OF COMPONENTS

S.No	Components	Quantity
1	Node MCU	1
2	Bread Board	1
3	LED	2
4	Resistor	5
5	Piezo	1
6	Gas Sensor	1
7	LCD 16*2	1

NODEMCU

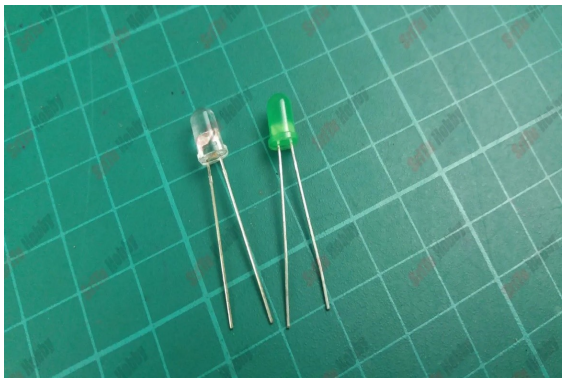
NodeMCU is a micro controller based on ESP8266 Wi-Fi module in which the Wi-Fi and Bluetooth are inbuild. this is mostly used in IOT domain it is very helpful in connecting to internet.NodeMCU is an open source Lua based firmware for the ESP8266 WiFi SOC from Espressif and uses an on-module flash-based SPIFFS file system. NodeMCU is implemented in C and is layered on the Espressif NON-OS SDK

Breadboard :-



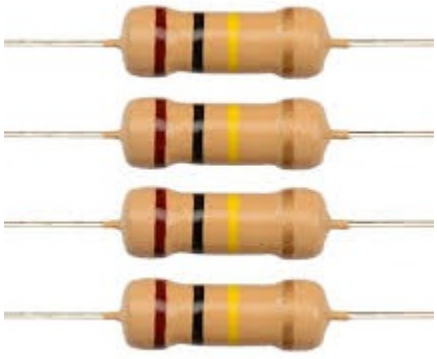
A breadboard is a widely used tool to design and test circuit. You do not need to solder wires and components to make a circuit while using a bread board. It is easier to mount components and reuse them. Since, components are not soldered you can change your circuit design at any point without any hassle. It consist of an array of conductive metal clips encased in a box made of white ABS plastic, where each clip is insulated with another clips.

LED



LED (Light Emitting Diode) is an optoelectronic device which works on the principle of electro-luminescence. Electro-luminescence 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 symbolize the light radiated by the light emitting diode

Resistor



A passive electrical component with two terminals that are used for either limiting or regulating the flow of electric current in electrical circuits.

Piezo

A Piezo buzzer is a type of electronic device that's used to produce a tone, alarm or sound. It is lightweight with a simple construction, and it is typically a low-cost product.

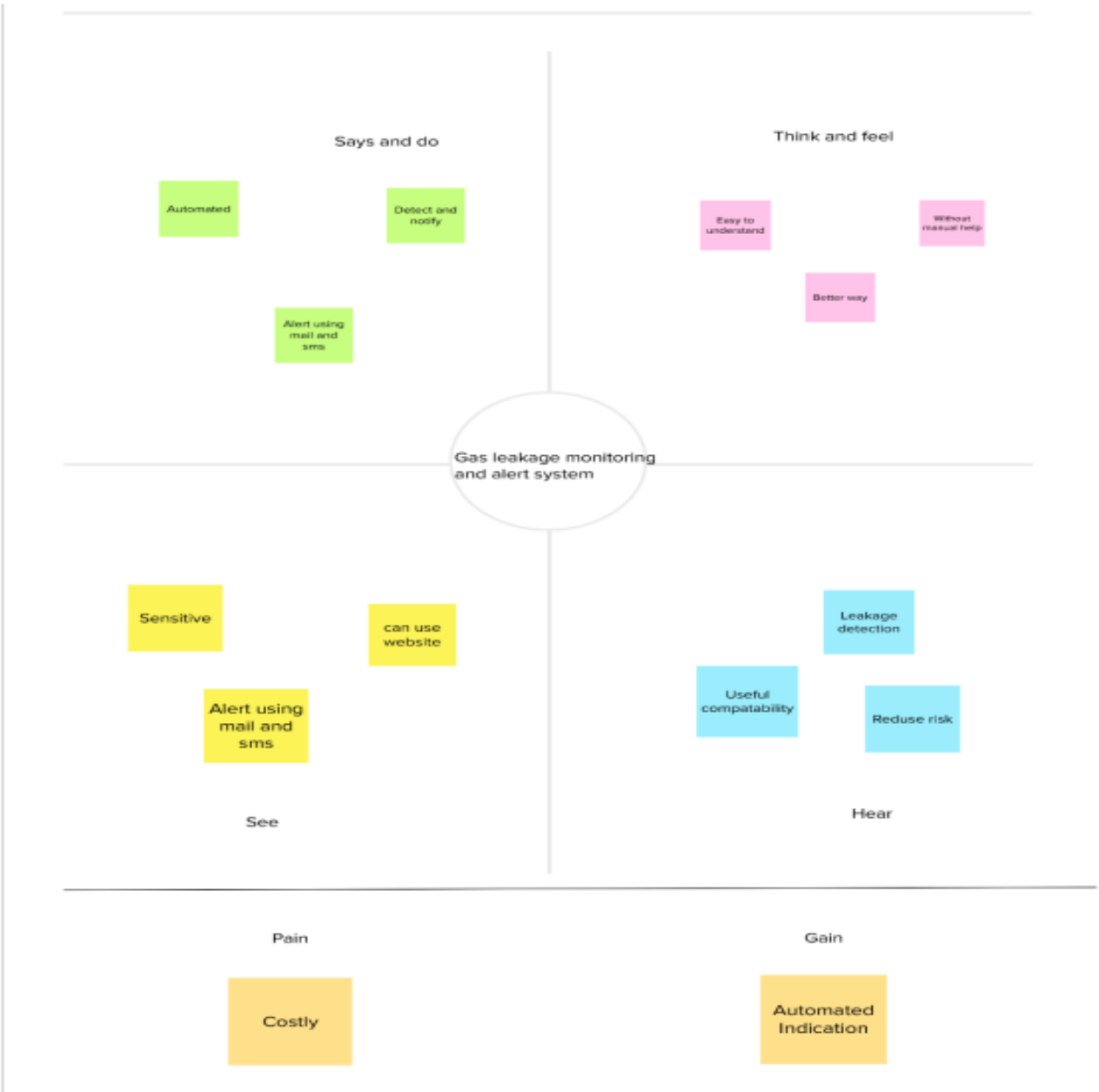
Gas Sensor

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 estimated.

3. IDEATION AND PROPOSED SOLUTION

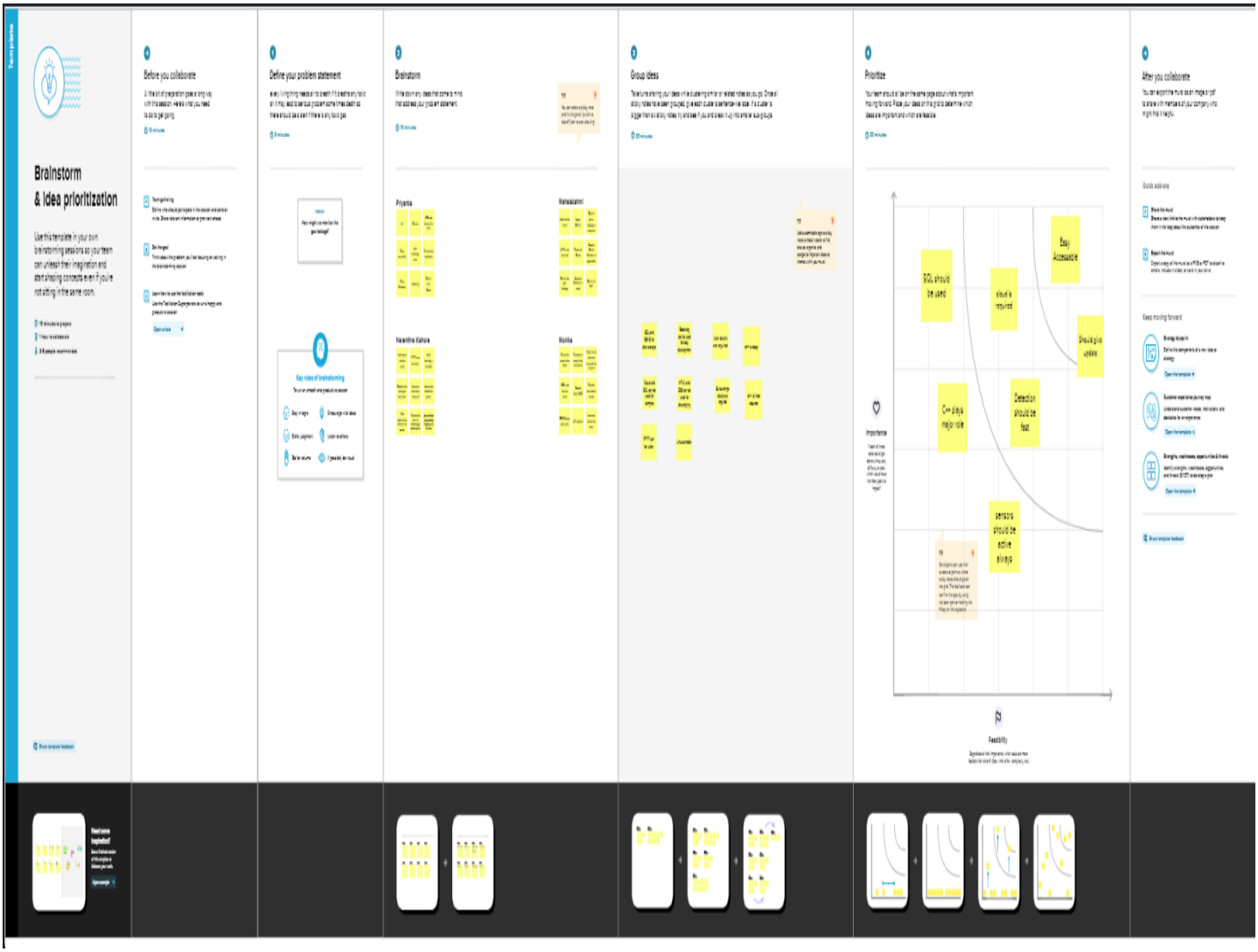
3.3 Empathy Map Canvas

An empathy map canvas is a more in depth version of the original empathy map,which helps identify and describe the users needs and pain points



3.2 Ideation and Brainstorming

Organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance

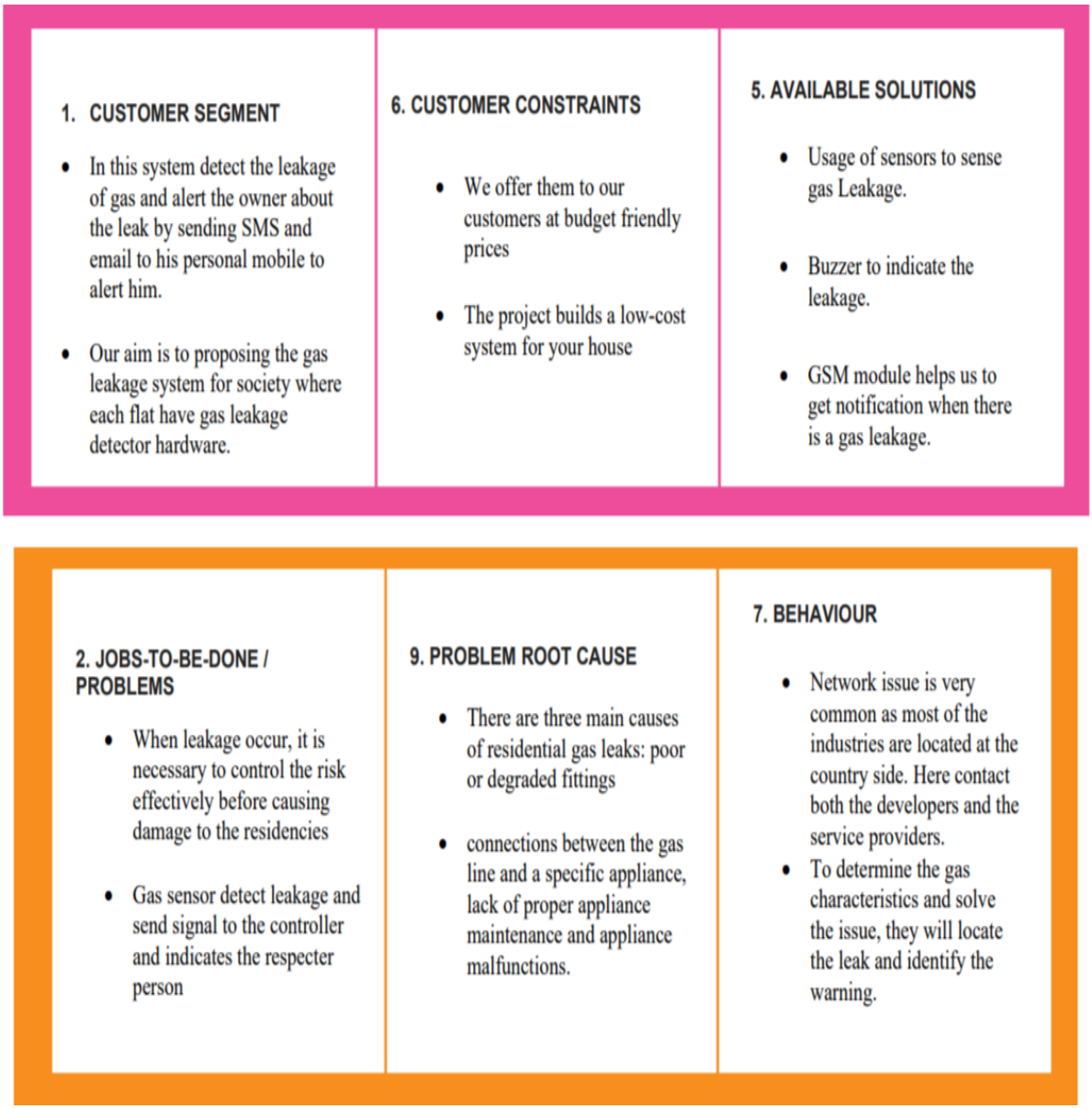


3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Gas leaks are considered to be very dangerous since they can build into an explosive concentration, So the proposed solution is used for the development for an efficient system & an application that can monitor and alert the workers.
2.	Idea / Solution description	The alarm, which includes a buzzer, will sound if the system detects a gas concentration in the air that is higher than the safety limit, alerting users in industrial settings to the anomalous situation and allowing them to take the appropriate action.
3.	Novelty / Uniqueness	The gas leakage is sensed with the help of MQ6 gas sensor. When any leakage is detected, it turns on the buzzer and also alerts the consumer through a message.
4.	Social Impact / Customer Satisfaction	These leaks cause safety threats and secondary accidents for those working in industry and the environment
5.	Business Model (Revenue Model)	The gas leakage model is used in industry or restaurants or the places where there is a chance of toxic gasses. It senses the gas and create an alert using buzzer and led lights and also sends an alert for the consumers mobile through email or SMS

6.	Scalability of the Solution	A wide range of industrial fixed gas detectors featuring flexible integration, simple installation, user-friendly operation

3.4 Problem Solution Fit



4. REQUIREMENT ANALYSIS

4.1 Functional Requirement

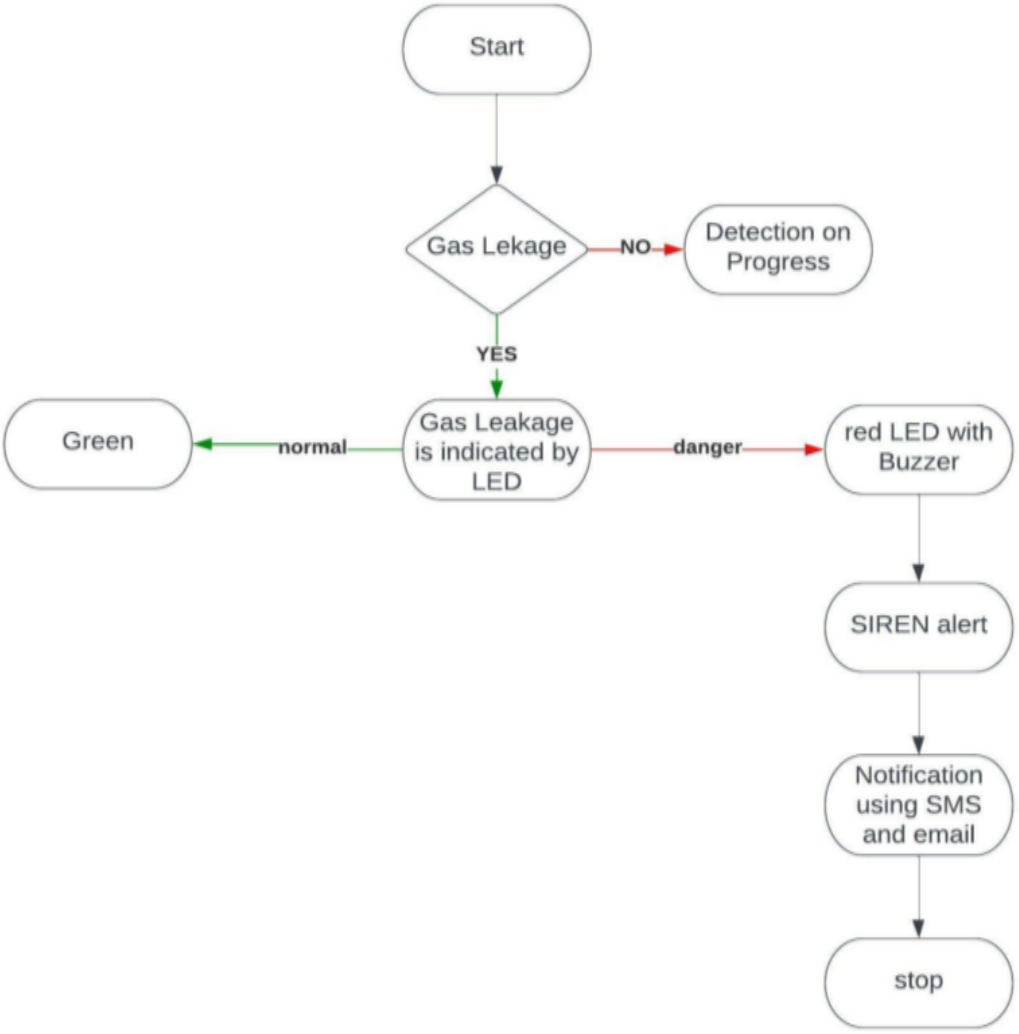
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	**Objective**	To design and develop a Gas leakage monitoring and alert system. send an alarm notification on SMS and Email to any predefined mobile number and email respectively.
FR-2	**Focus**	To alert the user immediately if any gas leakage is sensed.
FR-3	**Features**	Gas leakage level will be indicated by the LED lights and buzzer. It detects the different harmful gasses like methane, LPG etc., by using the required sensors. It updates the sensor parameters in web applications.
FR-4	**Essentiality**	Gas may be leaked at various levels in various factories or homes, requiring additional gas sensors to detect it.
FR-5	**Gas leakage location sent**	A signal to the microcontroller will go to the display and show gas leakage messages there. The signal from Buzzer will signal when the first step is completed. Lastly, through IFTTT, there will be a signal message that the gas has been leaked to a specific number or multiple

4.2 Non-Functional Requirement

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	This device is widely used in industry and can be found in home , factory ect,.
NFR-2	**Security**	We use IOT technology for enhancing the existing safety standards. While Making this prototype has been to bring a revolution in the field of safety against the leakage of harmful and toxic gases in the environment and hence nullify any major or minor hazard being caused due to them.
NFR-3	**Reliability**	This device offers a complete, low cost, powerful and user-friendly way of real-time monitoring and remote control of gas leakages and prevention mechanisms in household and industrial areas.
NFR-4	**Availability**	The application can be accessed at any time and anywhere

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution and Technical Architecture

Solution Architecture

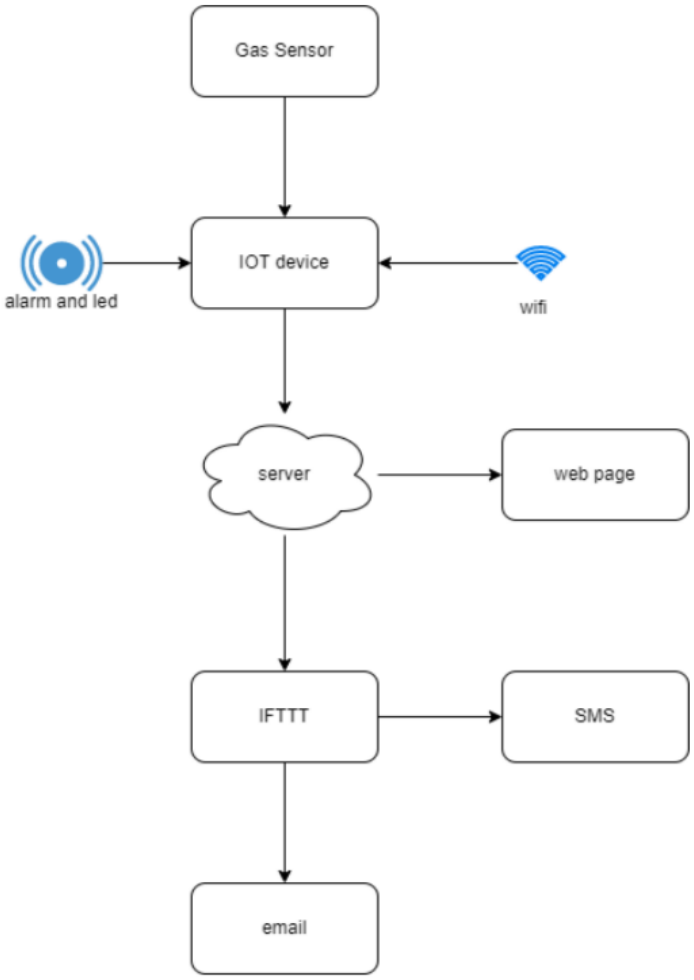
1. Gas sensor is used to find if there is any gas leakage in the surrounding and if any toxic gas found in the surrounding then it intimates the IOT device such as node mcu or raspberry pi

2. The IOT device is connected to wifi ,server,alarm and led once the gas sensor intimates the IOT device the it

triggers the alarm and led and send the data to the server

3. The server collects the data and stores the data in a database and the web page gets the data from the database and updates
4. IFTTT is used to collect the data from the database and alert the main person using sms and the email system

Technical Architecture



5.3 User Stories

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my 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	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
Customer(Web user)	Registeration	USN-1	As a user I can register for the application by Google	I can access confirmation email	High	Sprint-1
		USN - 2	As a user I can register for the application by firefox	I can access confirmation Login	Low	Sprint-2
	Login	USN-3	As a user I can register for the application through Gmail		Medium	Sprint-1
Administrator	Registration	USN - 1	As a user I can register for the application through Mobile app	I can access confirmation My account	High	Sprint-1
		USN-2	As a user I can register for the application through Mobile app	I can access confirmation email	Low	Sprint-2

6. PROJECT PLANNING & SCHEDULING

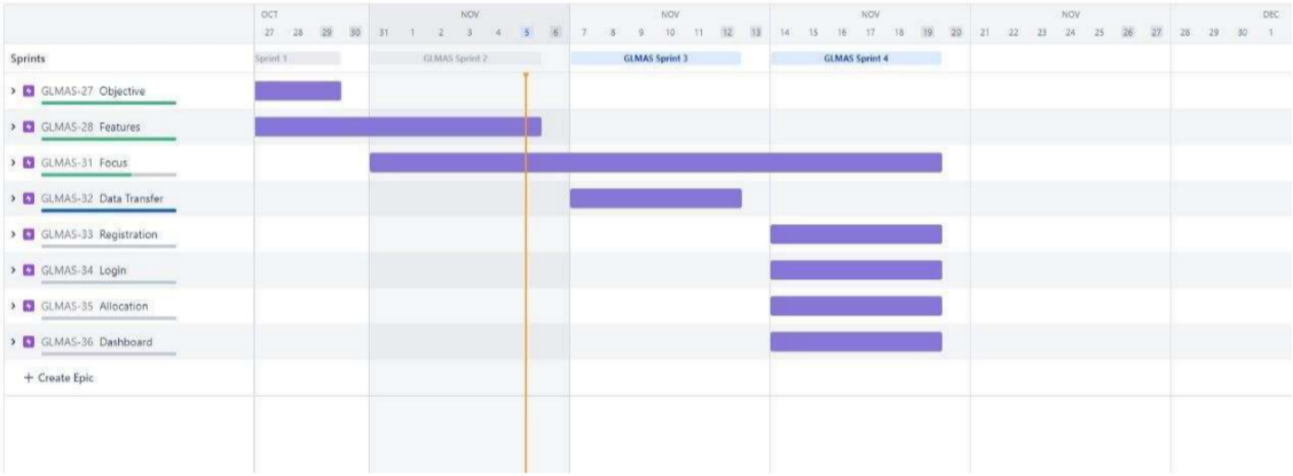
6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password	2	High	Mahalakshmi
Sprint-1	Registration	USN-2	As a user, I will receive confirmation email once I have registered for the application	1	High	Mahalakshmi
Sprint-2	Login	USN-3	As a user, I can register for the application through Gmail	2	Low	Monika M
Sprint-1	Registration	USN-5	As a user, I can log into the application by entering email & password	1	High	Monika M
Sprint -2	Dashboard	USN-1	As a user I can register for the application by Google	3	Low	Priyanka R
Sprint-3	Notification	USN-2	Using minimum time, we should be able to notify the owner or the authorised person	4	Low	Priyanka R
Sprint-1	Store data	USN-1	We need to continuously store location data into the database	3	Medium	Monika M
Sprint-4	Web UI	USN-3	The alert message will be sent to the predetermined mail ids and phone number	3	Normal	Narenthra Kishore R S

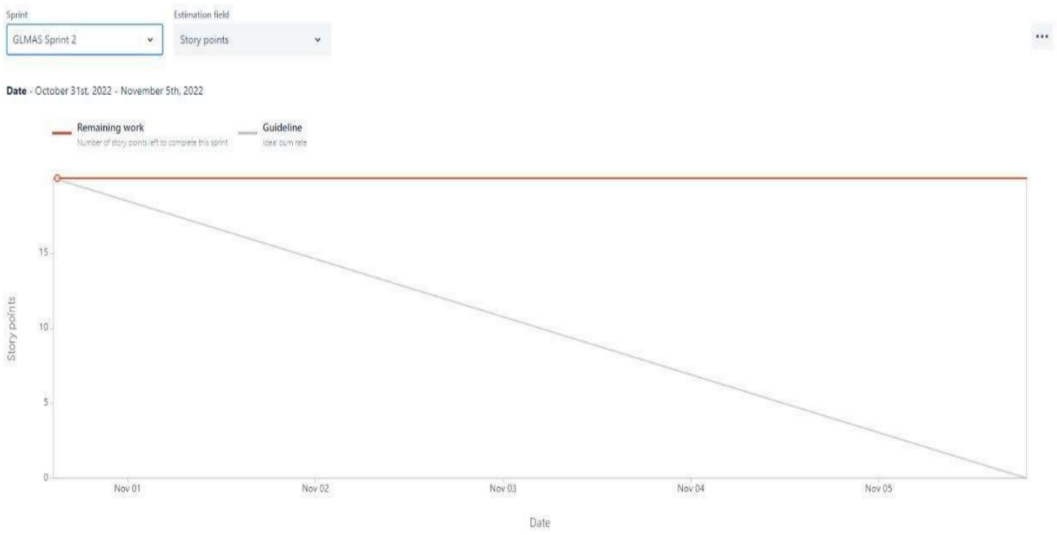
6.2 Sprint Delivery Schedule

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 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Oct 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.3 Reports from JIRA



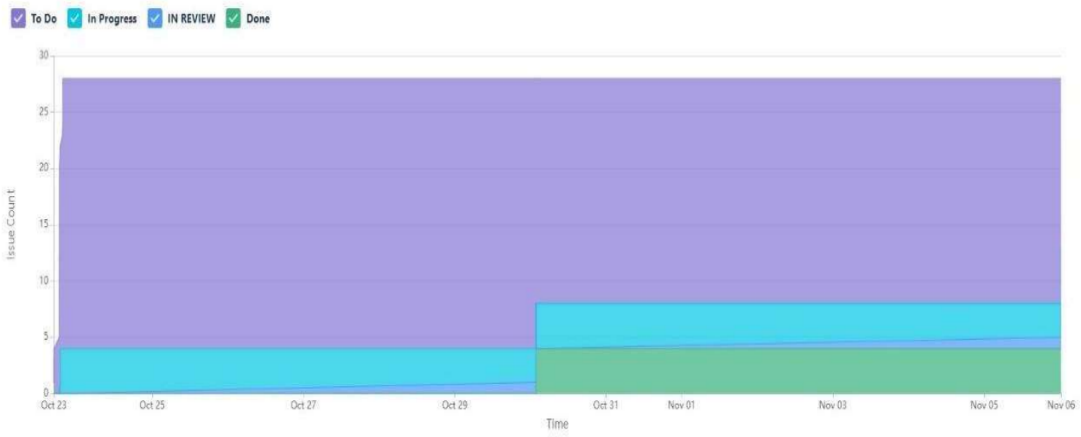
Sprint Burndown chart



Velocity Report

Sprint	Commitment	Completed
GLMAS Sprint 1	20	20
GLMAS Sprint 2	20	20

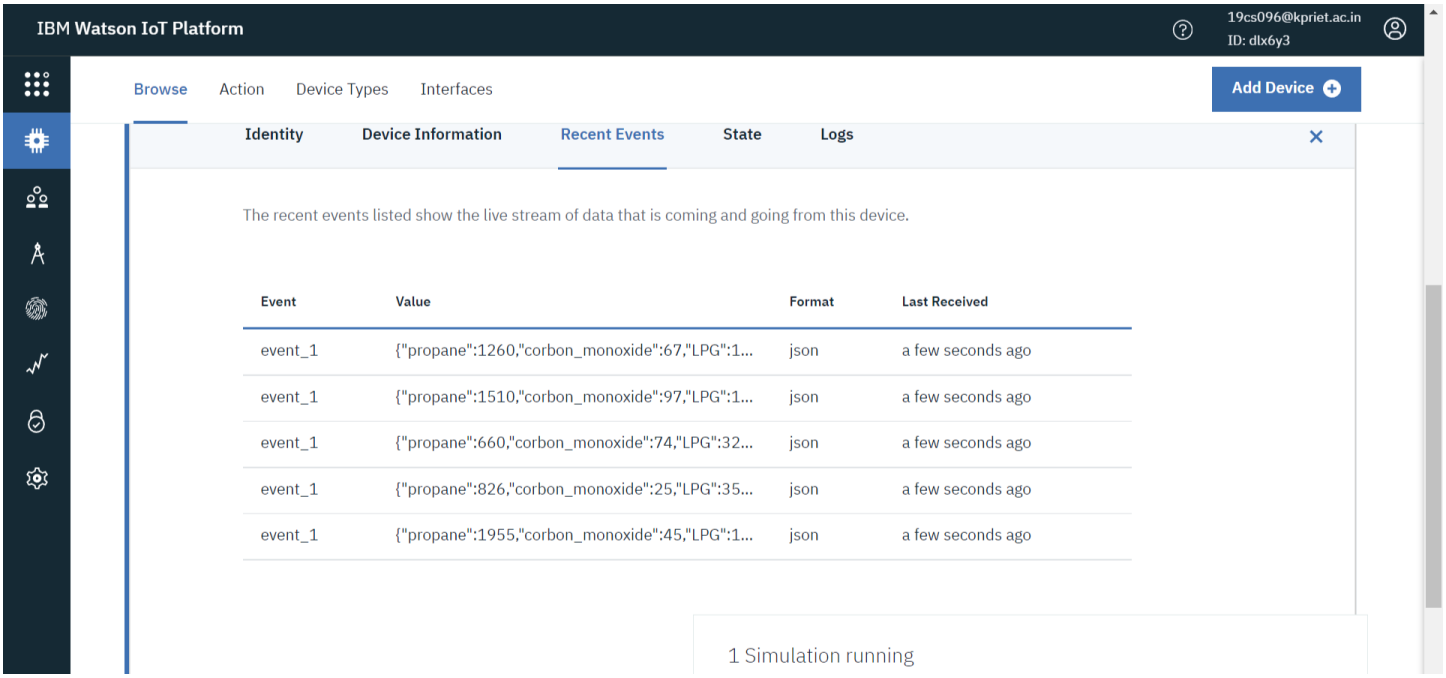
Cumilitave Flow Diagram

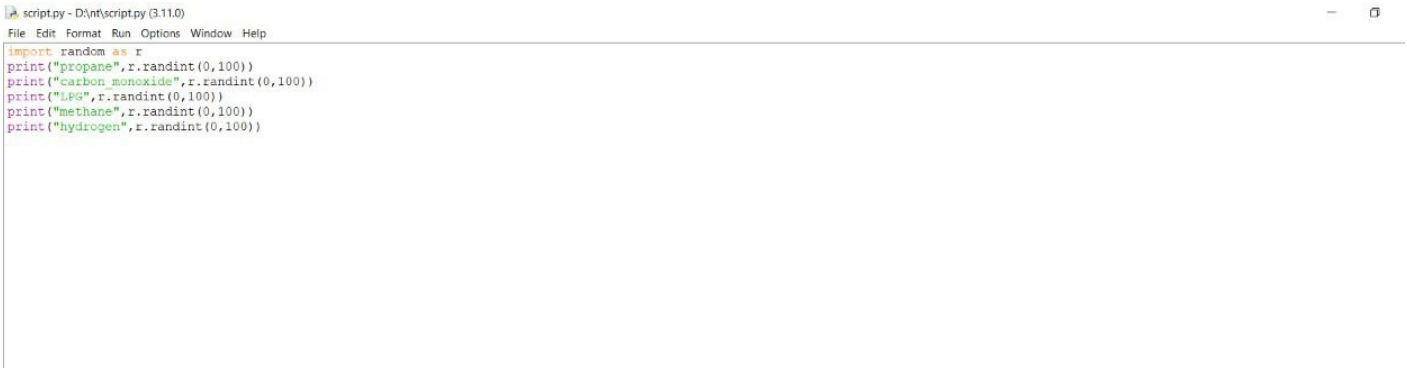


7. CODING AND SOLUTIONS

7.1 Feature 1

```
import random as r
print("propane",r.randint(0,100))
print("carbon_monoxide",r.randint(0,100))
print("LPG",r.randint(0,100))
print("methane",r.randint(0,100))
print("hydrogen",r.randint(0,100))
```





7.2 Feature 2

```
import wiotp.sdk.device
import time
import random
myConfig = { "identity": { "orgId": "dlx6y3", "typeId": "gas", "deviceId":"gas_2"
},"auth": { "token": "m(IoU(t9IBdIT-QuAH"
}
}
def myCommandCallback(cmd):
    m=cmd.data['randomNumber']
    client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
    client.connect()
    while True:
        gasAlert=random.randint(0,100)
        myData={'gasalert':gasAlert}
        client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
        print("Published data Successfully: %s", myData)
        client.commandCallback = myCommandCallback
        time.sleep(2)
        client.disconnect()
        print(*myData)
```

```
File  Edit  Format  Run  Options  Window  Help
import wiotp.sdk.device
import time
import random
myConfig = { "identity": { "orgId": "dlx6y3", "typeId": "gas", "deviceId":"gas_2"
},"auth": { "token": "m(IoU(t9IBdIT-QuAH"
}
}
def myCommandCallback(cmd):
    m=cmd.data['randomNumber']
    client = wiotp.sdk.device.DeviceClient(config=myConfig, logHandlers=None)
    client.connect()
    while True:
        gasAlert=random.randint(0,100)
        myData={'gasalert':gasAlert}
        client.publishEvent(eventId="status", msgFormat="json", data=myData, qos=0, onPublish=None)
        print("Published data Successfully: %s", myData)
        client.commandCallback = myCommandCallback
        time.sleep(2)
        client.disconnect()
        print(*myData)
```

Results

```
Published data Successfully: %s {'gasalert': 1}
Published data Successfully: %s {'gasalert': 1}
Published data Successfully: %s {'gasalert': 1}
Published data Successfully: %s {'gasalert': 0}
Published data Successfully: %s {'gasalert': 0}
Published data Successfully: %s {'gasalert': 1}
Published data Successfully: %s {'gasalert': 1}
Published data Successfully: %s {'gasalert': 0}
Published data Successfully: %s {'gasalert': 1}
```

7.3: Feature 3

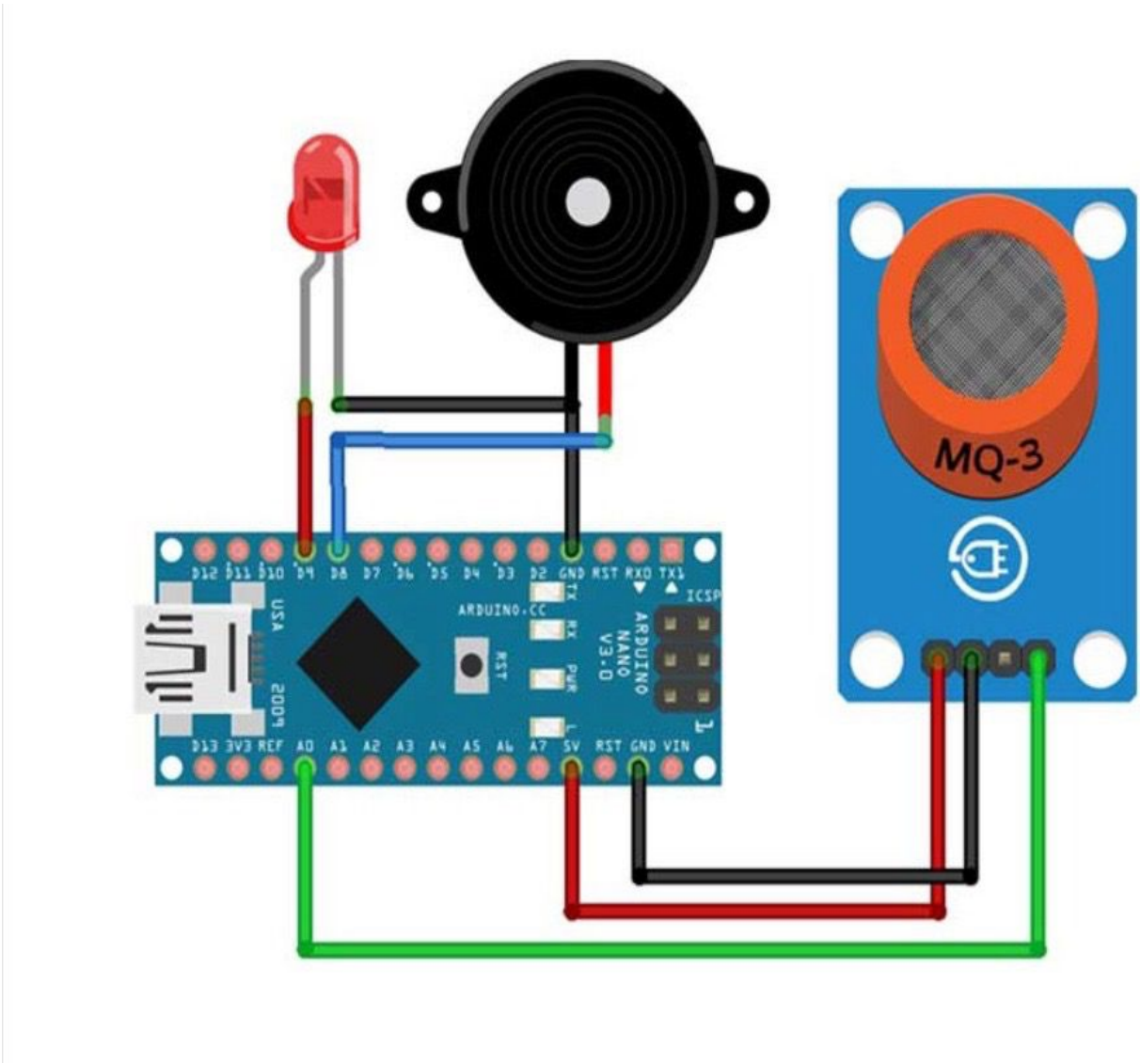
```
#include <ESP8266WiFi.h>
const char *ssid = "naren";
 // wifi name
const char *password = "1234567890";
 // wifi password
const char *host = "maker.ifttt.com";

int gas_sensor = 8;
// connect gas sensor
```

```
int buzzerNLed = 9;
// connect led and buzzer


void setup()
{
   pinMode(sensor, INPUT); // sensor pin INPUT
   pinMode(buzzerNLed, OOUTPUT)

      Serial.begin(115200);
   Serial.println("Email from Node Mcu");
   delay(100);
   delay(1000);
   connectWiFi();
}

void loop()
{
   WiFiClient client;
   const int httpPort = 80;
   if (!client.connect(host, httpPort))
   {
      Serial.println("connection failed");
      return;
   }
   if (digitalRead(sensor) == 1)
   {
      String url = "/trigger/gas sensor/with/key/ghy70ATSHWJ2kmWJaw-CJUNl9LSiPF-JEWxyMwRXsGU";
      Serial.print("Requesting URL: ");
      Serial.println(url);
      client.print(String("GET ") + url + " HTTP/1.1\r\n" + "Host: " + host + "\r\n" + "Connection: lose\r\n\r\n");
   }
   else
   {
      Serial.println("Object Not Detected");
}
 delay(5000);
while ((!(WiFi.status() == WL_CONNECTED)))
   {
```

```
        connectWiFi();
    }
}
void connectWiFi()
{
    pinMode(2, OUTPUT);
    int i = 0;
    WiFi.disconnect();
    // WiFi.mode(WIFI_STA);
    Serial.println("Connecting to wifi.....");
    WiFi.begin(ssid, password);
    while ((!(WiFi.status() == WL_CONNECTED)))
    {
        digitalWrite(2, HIGH);
        delay(300);
        digitalWrite(2, LOW);
        delay(200);
        Serial.println(" - ");
        i++;
        if (i > 10)
        {
            return;
        }
    }
    Serial.println("");
    Serial.println("WiFi connected");
    Serial.println("NodeMCU Local IP is : ");
    Serial.print((WiFi.localIP()));
digitalWrite(2, HIGH);
    delay(400);
    digitalWrite(2, LOW);
}
```

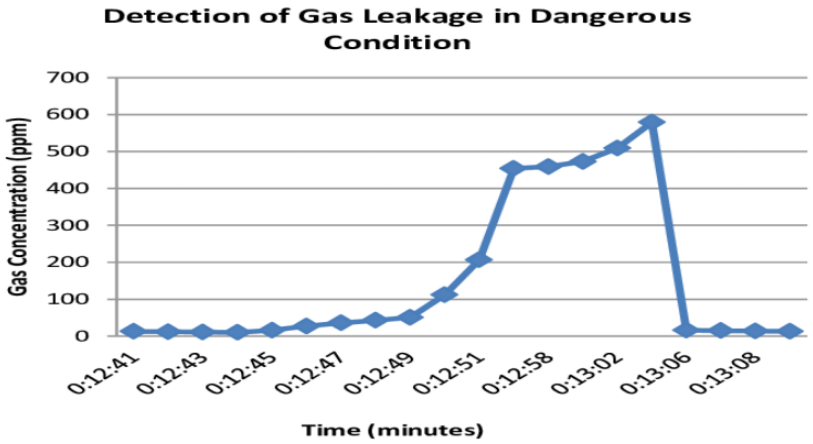
8. TESTING

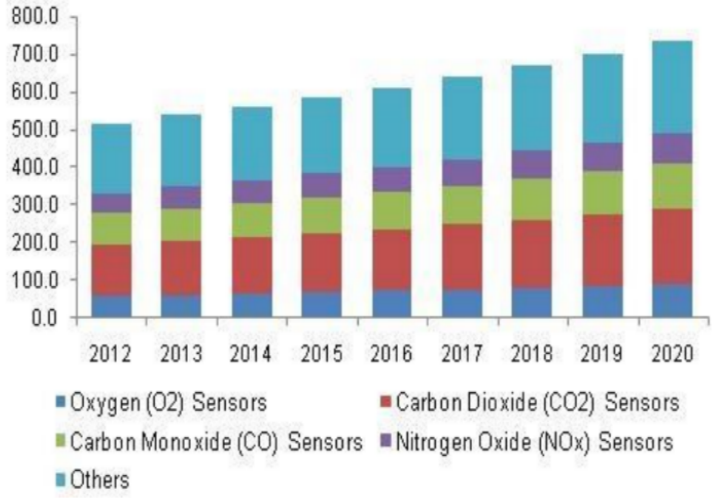
8.1 Test Cases & User Acceptance Testing



9. RESULTS

9.1 Performance Metrics





10. ADVANTAGES & DISADVANTAGES

Advantages

1. Response times are in the order of one second. This allow for fine resolution/control when making process measurements.
2. There is no ‘poisoning’ or degradation of the instrument with long term exposure to a gas.
3. Can easily be conformed to be ‘Intrinsically Safe’.
4. Low maintenance and low operating costs.
5. Reliable technology

Disadvantages

1. Only one gas can be measured with each instrument.
2. 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. CONCLUSION

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

12.FUTURE SCOPES

Overall, software and hardware parts of the systems have been developed and tested by introducing a small amount of LPG near gas sensor module. The authors of this paper are currently working to include multi functions with this device. One of the notable future functions of this system is to add a sub system where wastage of gas and the uses of gas can be monitored using this system. The system is flexible as a greater number of sensors and relays can be added to it according to the whole LPG supply setup in those premises. The author is adding more software based intelligent functions with this system. This is an automatic gas detection, control and alert system. In future this system will have a feature where it can notify the emergency services if any accidents happen. A mobile app and web-based app for real time monitoring also will be added. In the user app for this system many smart features will be added. The overall features will make the system more safe for the users. The system will be optimized for use in many places like the car, the home, industries

and many other places. After designing the final prototype with smart multi functional features, the system will be implemented in real life scenarios as a pilot project. A survey will be done soon before using the system and another one will be done after implementing the system to discover the KPI. Summarizing all the results, finding and analyzing a research article will be done and author has plans to submit it to the MDPI *sensors* journal for review. In the future paper the features of this final product will be compared with the available gas detector systems presented in other articles.

14. APPENDIX

Source Code:

```
#include <ESP8266WiFi.h>
const char *ssid = "naren";
 // wifi name
const char *password = "1234567890";
 // wifi password
const char *host = "maker.ifttt.com";

int gas_sensor = 8;
// connect gas sensor

int buzzerNLed = 9;
// connect led and buzzer


void setup()
{
   pinMode(sensor, INPUT); // sensor pin INPUT
   pinMode(buzzerNLed, OOUTPUT)

      Serial.begin(115200);
   Serial.println("Email from Node Mcu");
   delay(100);
   delay(1000);
   connectWiFi();
}

void loop()
{
   WiFiClient client;
```

```
    const int httpPort = 80;
    if (!client.connect(host, httpPort))
    {
        Serial.println("connection failed");
        return;
    }
    if (digitalRead(sensor) == 1)
    {
        String url = "/trigger/gas sensor/with/key/ghy70ATSHWJ2kmWJaw-CJUNl9LSiPF-JEWxyMwRXsGU";
        Serial.print("Requesting URL: ");
        Serial.println(url);
        client.print(String("GET ") + url + " HTTP/1.1\r\n" + "Host: " + host + "\r\n" + "Connection: lose\r\n\r\n");
    }
    else
    {
        Serial.println("Object Not Detected");
}
 delay(5000);
while ((!(WiFi.status() == WL_CONNECTED)))
    {
        connectWiFi();
    }
}
void connectWiFi()
{
    pinMode(2, OUTPUT);
    int i = 0;
    WiFi.disconnect();
    // WiFi.mode(WIFI_STA);
    Serial.println("Connecting to wifi.....");
    WiFi.begin(ssid, password);
    while ((!(WiFi.status() == WL_CONNECTED)))
    {
        digitalWrite(2, HIGH);
        delay(300);
        digitalWrite(2, LOW);
        delay(200);
        Serial.println(" - ");
        i++;
```

```
      if (i > 10)
      {
         return;
      }
   }
   Serial.println("");
   Serial.println("WiFi connected");
   Serial.println("NodeMCU Local IP is : ");
   Serial.print((WiFi.localIP()));
digitalWrite(2, HIGH);
   delay(400);
   digitalWrite(2, LOW);
}
```

Github: https://github.com/IBM-EPBL/IBM-Project-32170-1668781227

Demo Link: https://drive.google.com/drive/folders/1B9-uICvbgI-u0-LAqSUdzgrdkgYwEK-F?usp=sharing