

GAS LEAKAGE MONITORING AND ALERTING SYSTEM FOR INDUSTRIES

A PROJECT REPORT

Submitted by

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In partial fulfilment for the award for the degree

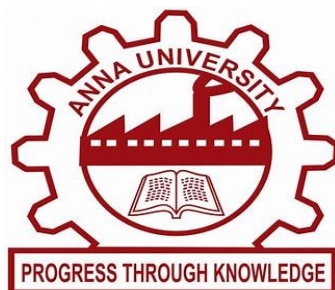
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IN

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SOLAMALAI COLLEGE OF ENGINEERING, MADURAI



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BONAFIDE CERTIFICATE

Certified that this project report “**GAS LEAKAGE MONITORING AND ALERTING SYSTEM FOR INDUSTRIES**” is the bonofide work of “**RAMKUMAR T D(912219106016), PRASANNA R M(912219106013), PRIYANKA P(912219106015), SWETHA A (912219106019), NAGARAJAN B (912219106301)**” who carried out the project under my supervision. Certified further that to the best of my knowledge the work reported here in does not from part of any other thesis or dissertation on the basis of which a degree or award was conferred on an earlier occasion on this or any other candidate.

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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. 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. The presence of hazardous gas leakage in a domestic, work place, also, stored gases container gas which exhibits ideal characteristic is use. For that sake, an alarm unit is used to vibrate an alarm which is buzzer. Buzzer gives an audible sign of the presence of gas volume. The sensors are widely used to detect essence of propane, iso-butane, LPG and even smoke. The sensor has an advantage to combine a sensitivity response time. If the LPG sensor senses gas leak from work place or home, sensor output goes to active low (logic-0) condition. Arduino UNO is used in the project; low signals are overlooked by the Arduino and gas leakage is been noticed by the Arduino. The Arduino UNO turns on the LCD and buzzer. It even turns on the GSM modem after that, it continues to send messages SMS to mobile number specifically mentioned in the program of the source code for alerting danger to the people. Keywords: IOT, MQ5 Sensors, Arduino, GSM Module.

Introduction

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. 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 work places by taken correct precaution at correct time. This system provides the information such as when a gas leakage is noticed, sensors of in the project are used to notice the gas leakage and immediately turns ON the buzzer for the danger indication. Buzzer is a clear indication of gas leakage. By the detection of the hazardous gas the alerting message reached to the person who has control over it from the GSM. 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 been send to the responsible person for preparatory safety calculations. The usage of gas for each user each day may be tracked with the aid of this cloud storage solution. At the end of the day, this procedure will assist in detecting per user natural gas usage. The system has been tested and it is able to monitor gas wastage, leakage and send a SMS to the user. The resulting performance indicated its effectiveness toward saving a significant portion of the wasted gas in domestic.

Project Overview:

The design of a sensor-based automatic gas leakage detector with an alert and control system has been proposed. This is an affordable, less power using, lightweight, portable, safe, user friendly, efficient, multi featured and simple system device for detecting gas. Gas leakage detection will not only provide us with significance in the health department but it will also lead to raise our economy, because when gas leaks it not only contaminates the atmosphere, but also wastage of gases will hurt our economy. The need for ensuring safety in workplaces is expected to be the key driving force for the market over the coming years.

Purpose:

Gas leakage is nothing but the leak of any gaseous molecule from a stove, or a 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 colour less, poisonous and flammable liquid is something that human beings have to be away from. However harmful and dangerous it can be, the detector could be attached with certain parameters that could help to prevent the issue.

Literature Survey

S.N O	Paper Title	Author Name	Year	Result
1	Internet of Things (IOT) Based Gas Leakage Monitoring and Alerting System with MQ-2 Sensor	Rohan Chandra Pandey, Manish Verma, Lumesh Kumar Sahu	2017	This paper choice of using a real time gas leakage monitoring and sensing the output levels of gas has been clearly observed by the help of this system.
2	Gas Leakage Detection and Smart Alerting and Prediction Using IoT	Asmita Varma, Prabhakar S, Kayalvizhi Jayavel	2017	The proposed gas leakage detector is promising in the Field of safety.
3	IOT Based Gas Leakage Detection System with Database Logging, Prediction and Smart Alerting	Chaitali Bagwe, Vidya Ghadi, Vinayshri Naik, Neha Kunte	2018	The system provides constant monitoring and detection of gas leakage along with storage of data in database for predictions and analysis. The IOT components used helps in making the system much more cost effective in comparison with traditional Gas detector systems.
4	Internet of Things (IoT) Based Gas Leakage Monitoring and Alerting System with Mq-6 Sensor	Rohan Chandra Pandey, Manish Verma, Lumesh Kumar Sahu, Saurabh Deshmukh	2018	A discussion on how the aims and objectives are met is presented. An overall conclusion IOT based toxic gas detector is it has become more efficient, more applicable to today's applications and smarter.
5	Gas Leakage Detection and Smart Alerting System Using IoT	Shital Imade, Priyanka Rajmanes, Aishwarya Gavali	2018	In this paper 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

Problem Statement:



Problem Statement (PS)	I am (Customer)	I am trying to	But	Because	Which makes me feel
PS-1	Industrialist	Control the gas leakage	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	Monitor gas leakage in the industry	Also, the installation process is too complicated	The number of sensors is unpredictable and the positioning of equipment is Improper	Disastrous

Proposed System:

Figure represents the block diagram of the gas leakage detection and alerting system. Arduino UNO (Atmega-328) is the main unit of the system which performs the following tasks.

A signal conditioning of the Arduino UNO is done by output signal of the sensor, provided input to Arduino. The detection results displayed on LCD.

Indicates the people of danger in work place, factory, home. Buzzer activity with beep (siren) sound is made.

Also send alert SMS to the in charge of the plant whose number is saved in SIM card by using GSM modem. The SMS received depends upon the leak of gas in the detection area of the sensor.

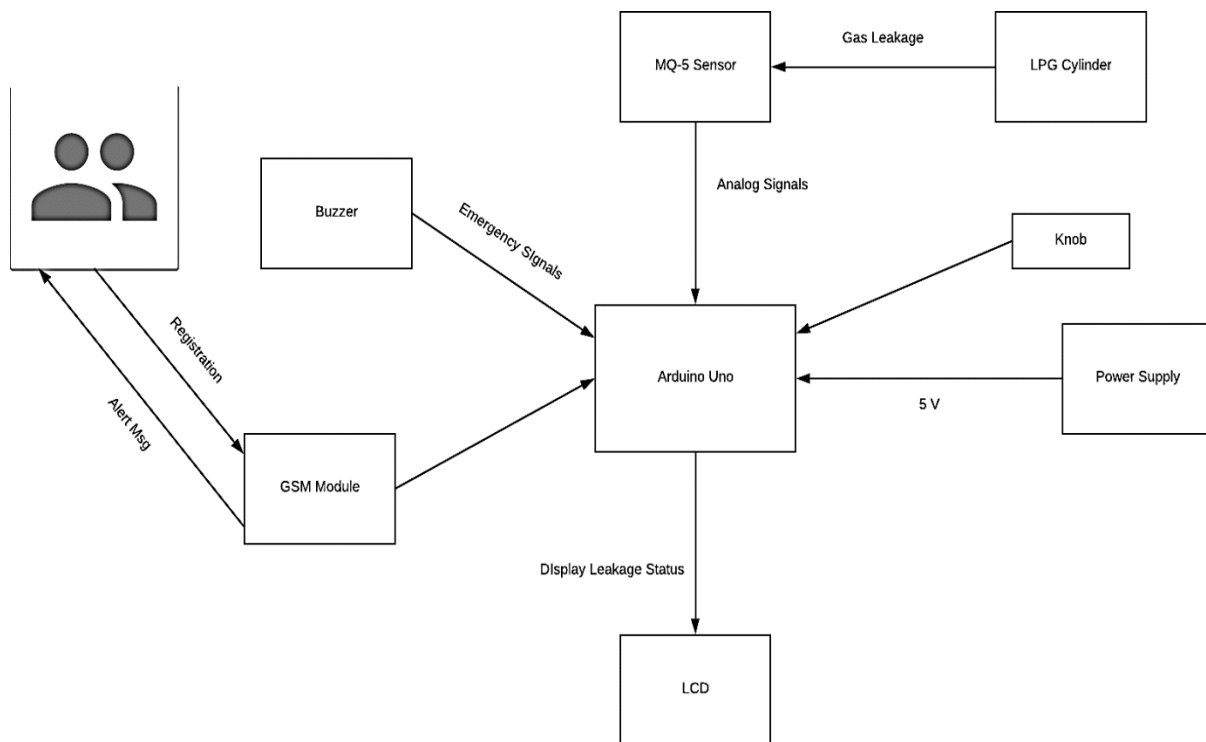


Fig.1: System Architecture

Methods and Material:

System: Input, Output, Function, Success, Failure

Input: Sensor data signal which is not regular or Change in Signal

Output: End User get informed with alert buzzer and Display to LCD

Functions:

Access: - In this module we are going to access the feature provided by the module which Will include Sensor data access.

Control: -In this module we are controlling the Alert System by using System which is connected to hardware or sensor data.

Broadcast: -In this module we are going to broadcast the alert Display to LCD.

Success Conditions: If such data which is received through sensors are not stable or are more than threshold it will predict that there is leakage situation


Failure Conditions: Desired output is not generated due to following failures.

Software Failure, Hardware Failure and Network Connection Failure.

Ideation

Empathy Map:

Template



Gas Leakage Monitoring System

Product School

[Share template feedback](#)

Reflect on the topic

What went well?
What's could we keep doing?
What's could we celebrate?
Where did we make progress?

Attain

No Rain
No Flowers

Get real-time alerts the about gaseous presence in the atmosphere

Cost - effective Installation

Prevent fire hazards & explosions

It measures toxic gases in very low concentration

It is difficult to know failure modes unless very advanced

We can't detect the accurate place, where gas started to leak.

What went poorly?
Where did we have problems?
What was frustrating to us or others?
What held us back?

Misery

No Winter Lost Forever
No Spring
Skips its Turn

We have to progress in the mission that we are taking

Things should go out well

Discussion should be made with team members

We can easily overcome the gas leakage problem in a easy way without human power

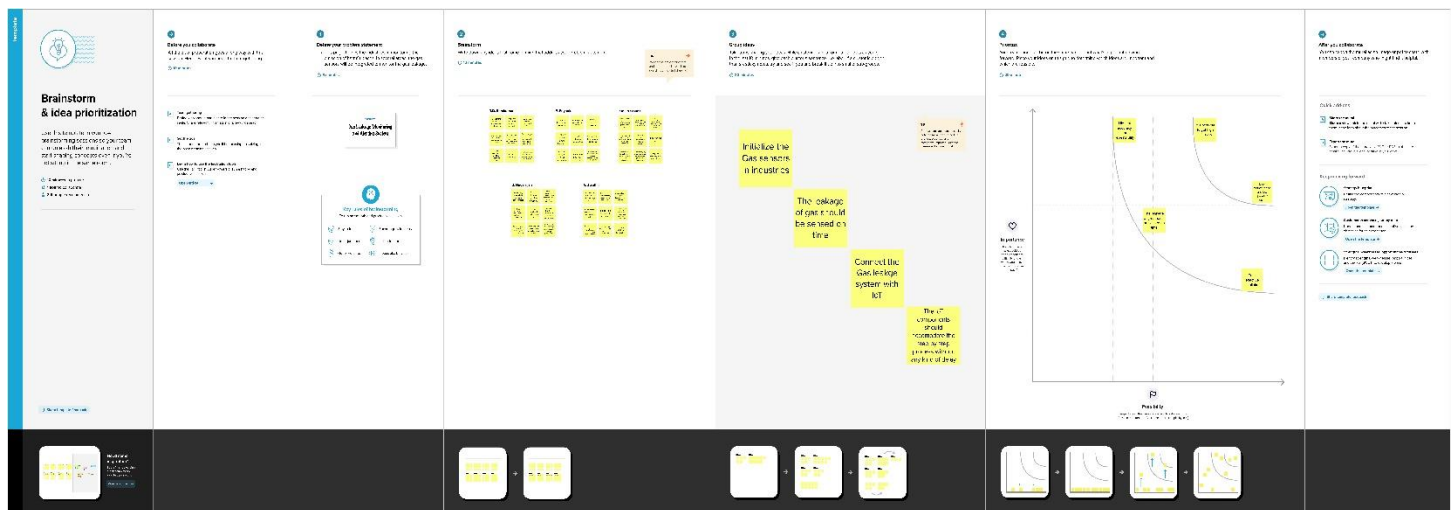
The IoT technology senses and that works to shut the gas leakage

This gas leakage prevention creates a massive response among the society and gives an eye opening solution

What ideas do you have?
What's best do you have to future use's together?
Where do you see opportunities to improve?
What's has untapped potential?

How should we take action?
What do you believe we should do next?
What's specific things should we change?
What's could enter beyond this meet up?

Brainstroming:



Proposed Solution:

S. No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	This project helps the industries identify the gas leakage beforehand to take necessary precautions to stop them.
2.	Idea / Solution description	The operating principle is that the escape of gas from a high-pressure pipeline or other pressurised systems generates ultrasound, which when detected by an acoustic sensor, can provide a measure of the leak rate.
3.	Novelty / Uniqueness	In several areas, the gas sensors will be integrated to monitor the gas leakage. If any area gas leakage is detected the admins will be notified along with the location. In the web application, admins can view the sensor parameters.
4.	Social Impact / Customer Satisfaction	<p>The sensing of toxic gases such as H₂S, Methane, and CO is of great importance in any industry to avoid unwanted leakage and consequences like poisoning or explosions.</p> <p>The presence of these gases can be easily detected in the industrial facilities and commercial buildings with the help of IoT-powered gas monitoring solution.</p> <p>Moreover, a gas detector or sensor device is a crucial part to carry out safe industrial operations. The</p>

sensor-enabled solution helps prevent the high risk of gas explosions and affecting any casualties within and outside the premises.

5. Business Model (Revenue Model) Business – To – Business Model (B2B)
Business – To – Customer Model (B2C)
6. Scalability of the Solution Most of Gas explosions are caused by undetected gas leakage in the pre-detection condition. So that, Gas leakage monitoring and alerting system is needed. The purpose of this system is to detect gas leakage, neutralize it, and prevent the explosion.

Proposed Solution Fit:

Define CS, fit into CC	<div>1. CUSTOMER SEGMENT(S)<div>CS</div><p>In the automotive industries like oil and gas, hotels, and places where flammable gases are used in abundance, a gas detection system is a basic requirement for safety.</p></div>	<div>6. CUSTOMER LIMITATIONS<div>CL</div><p>This law, LD346, now requires “at least one approved fuel gas detector in every room containing an appliance fueled by propane, natural gas or any liquified petroleum gas” in commercial businesses, hotels, non-profit organizations, shelters, and rental properties</p></div>	<div>5. AVAILABLE SOLUTIONS<div>AS</div><p>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.</p></div>	Explore AS, differentiate
Focus on J&P, tap into BE, understand	<div>2. JOBS-TO-BE-DONE / PROBLEMS<div>PR</div><ul style="list-style-type: none">➤ Most of GAS explosions are caused by undetected gas leakage in the pre-detection condition.➤ So that, Gas Leakage Monitoring and Alerting detection system is needed.➤ The purpose of this system is to detect gas leakage, neutralize it, and prevent the explosion.</div>	<div>9. PROBLEM ROOT CAUSE<div>RC</div><ul style="list-style-type: none">• 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.</div>	<div>7. BEHAVIOUR<div>BE</div><p>Using manpower as the source of monitoring the leakage causes high hazards. If the gas leaked is heavily toxic, there is a chance of causing hereditary health issues too.</p></div>	Focus on J&P, tap into BE, understand
Identify Strong TR & EM	<div>3. TRIGGERS TO ACT<div>TR</div><p>Most of Gas explosions are caused by undetected gas leakage in the pre-detection condition. So that, Gas leakage monitoring and alerting system is needed.</p></div> <div>4. EMOTIONS BEFORE/AFTER<div></div><p>Before: The heavy losses due to the leakages made them feel of guilt due to reduced reputation of their products. After: Increased the level of confidence and feel</p></div>	<div>10. YOUR SOLUTION<div>SL</div><p>In several areas, the gas sensors will be integrated to monitor the gas leakage. If any area gas leakage is detected the admins will be notified along with the location. In the web application, admins can view the sensor parameters.</p></div>	<div>7. CHANNELS of BEHAVIOUR<div>CH</div><div>ONLINE</div><p>Promoting through social media. With the help of social media entrepreneurs/influencer.</p><div>OFFLINE</div><ul style="list-style-type: none">• Newspaper advertisements.</div>	Extract Online and Offline CH of BE

Hardware Information

Arduino Uno:

Microcontroller Arduino UNO is employed is shown in fig. The central unit of the system is Arduino board, where all the components are interfaced externally on the board and programmed as per their functionality to work in synchronization. it's an electronic prototyping platform/ board supported Atmega-328 which is of 8-bit, 16 Mhz. during this serial communication is enabled and has 14 digital input /output pins (out of which 6 are PWM) and 6 analog input pins. It operates at 5v. every pin contains a specific function to control. The storage is non-volatile storage and EEPROM. The key comparison of a non-volatile storage with the EEPROM is that the incontrovertible fact that non-volatile storage contents are erasable. In contrast to a EEPROM, the entire device is erased. where one can erase and judge on bases of Byte and section. The availability of the non-volatile memory during which the blocks of the contains are divided and therefore block by block the portion is erased, where an no erased option is provided for the EEPROM byte. thanks to the actual fact that the programming of the non-volatile storage performed while it's on the system board socket. BIOSROM of the PCB is the new upgrade which is immensely used.



Figure. Arduino Uno

MQ2 Sensor:

MQ-2 gas sensor module is shown in fig. It is a sensor detector used to detects the flammable gas and smoke concentration of the combustible gas in the air, and output is read in the analog voltage and digital value output. Supply input voltage is 5v. it is very sensitive to H₂, LPG, CH₄, CO, SMOKE, PROPANE. It has three pins for transmitter, receiver, ground and sensitivity can be adjust by the potentiometer. Detects LPG from 200ppm to 10000ppm.



Figure. MQ-2 Gas sensor

GSM Module:

SIM900 GSM module is employed to send SMS alerting on gas detection. GSM is meant as a device used for exchanging the information. SIM card is recovered from the GSM to control the wireless node 5 volts of the DC supply is required by the GSM for functioning. The modem needs only three connections (transmitter, receiver, ground) to interface with Arduino controller Atmega-328 the excess power supply is used. Arduino microcontroller is connected with the receiver pin to the device. The Arduino provide information to the GSM device [2]. The GSM will send an output to through the SIM inserted into its SIM slot to number written into the code to alert about the leakage of the LPG gas or the other gas sensed by the sensor. AT commands are accustomed communicate with GSM module and it's shown in figure.

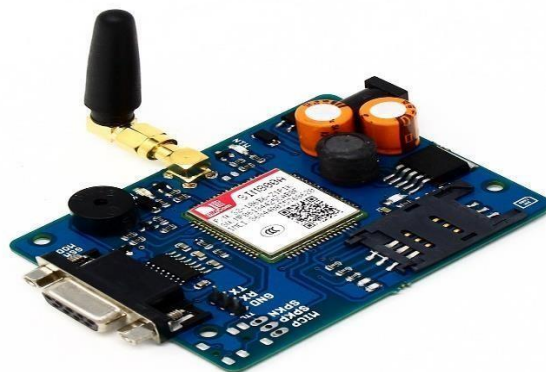


Figure: GSM Module

LCD:

LCD is employed for displaying the message indicating that "gas detected at zone" into the display, which is initially coded in program to display the danger. The message been displayed on the LCD, data and command both are register of LCD and it's shown in fig. The register selects are employed to modify the registers. data register RS=1, whereas for the command register RS=0 is employed.



Figure: 16x2 LCD display

Buzzer:

Buzzer is used to alarm the beep sound to indicate and warn the danger to the people working around. The buzzer is the output of the system. The sound of the buzzer is beep-beep, which indicates the danger.



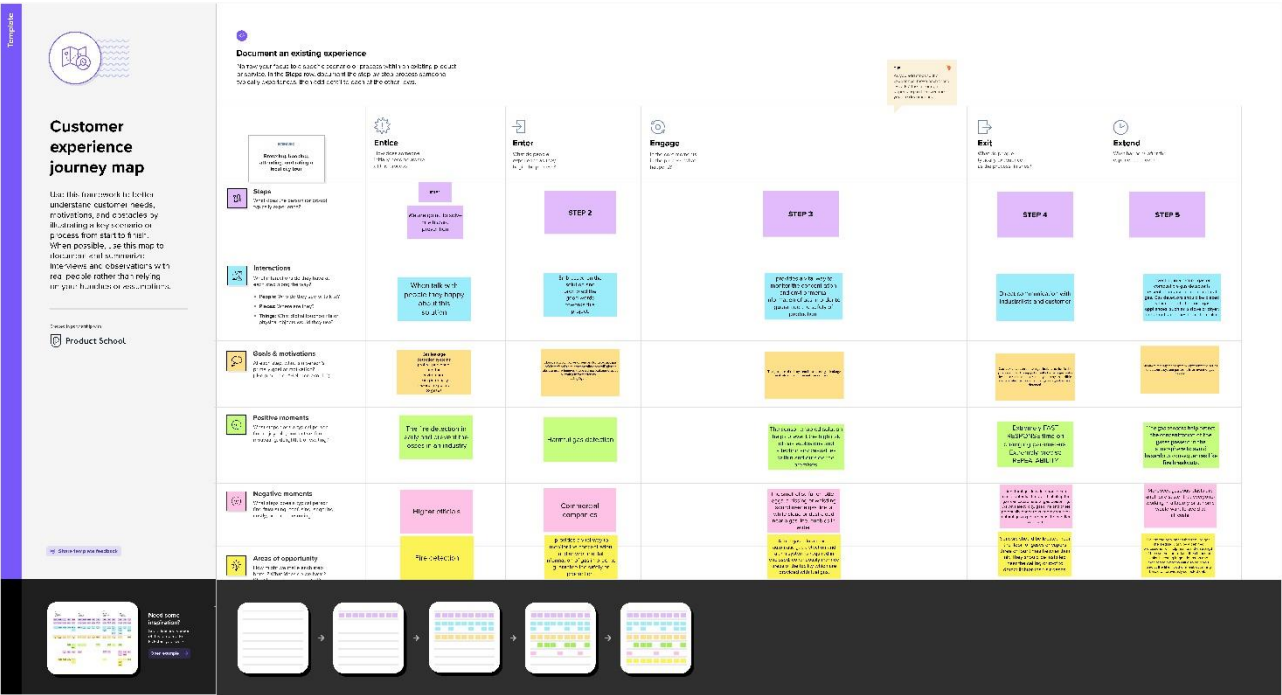
Figure 4. Buzzer

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.

Project Design

Customer Journey Map:



Technology Architecture:

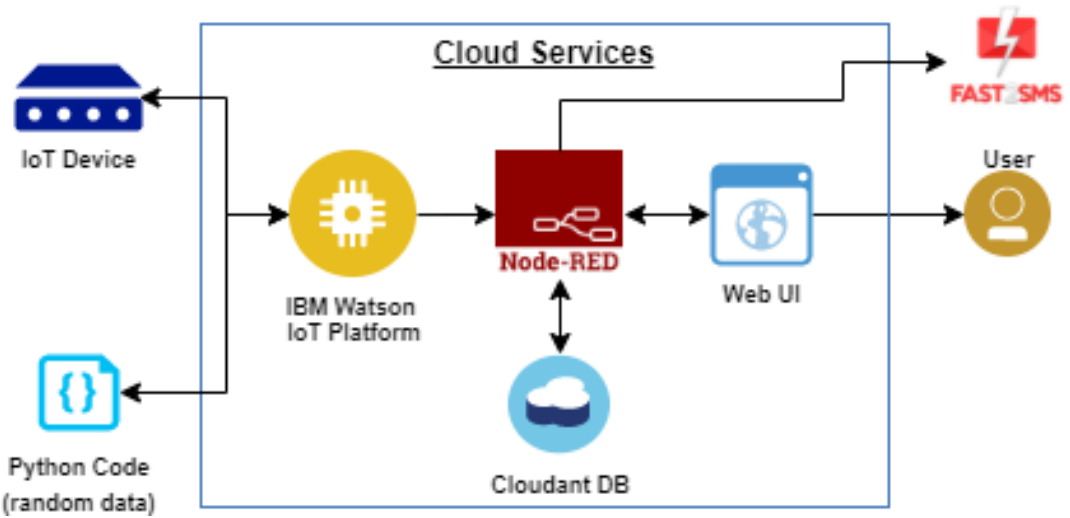


Table-1: Components & Technologies:

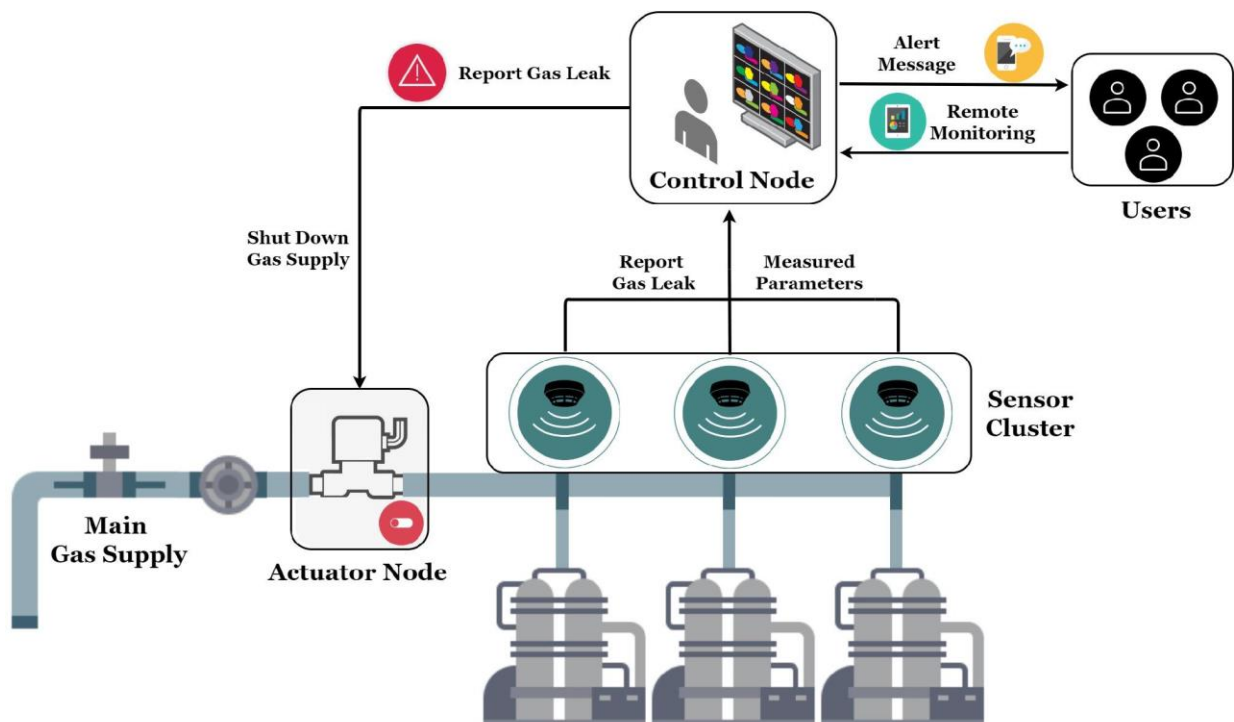
S. No	Component	Description	Technology
1.	User Interface	Web UI, Node-RED, MIT app	IBM IoT Platform, IBM Node red, IBM Cloud
2.	Application Logic-1	Create IBM Watson IoT platform and create node-red service	IBM Watson, IBM cloud ant service, IBM node red
3.	Application Logic-2	Develop python script to publish and subscribe to IBM IoT Platform	Python
4.	Application Logic-3	Build a web application using node-red service	IBM Node-red
5.	Database	Data Type, Configurations etc	MySQL
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloud ant etc.
7.	File Storage	Developing mobile application to store and receive the sensors information and to react accordingly	Web UI, python
8.	External API-1	Using this IBM Gas Leakage management API, we can track the Gas of the incident place and where the Gas had been attacked.	IBM Gas Leakage management API
9.	External API-2	Using this IBM Sensors it detects the fire, gas leaks , temperature and provides the activation of sprinklers to web UI	IBM Sensor
10.	Machine Learning Model	Using this we can derive the object recognition model	Object Recognition Model

11.	Infrastructure (Server / Cloud)	Application Deployment on LocalSystem / Cloud Server Configuration	IBM cloud ant, IBM IoT Platform
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Table-2: Application Characteristics:

S. No	Characteristics	Description	Technology
1.	Open-Source Frameworks	MIT app Inventor	MIT License
2.	Security Implementations	IBM Services	Encryptions, IBM Controls
3.	Scalable Architecture	sensor-IoT Cloud based architecture	cloud computing and AI
4.	Availability	Mobile, laptop, desktop	MIT app
5.	Performance	Detects the Fire, gas leak, temperature	Sensors

Solution Architecture:



Requirement Analysis

Functional Requirements:

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
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.

Non – Functional Requirements:

FR No.	Non-Functional	Requirement Description
FR-1	Usability	It updates the data regularly as well as protects the workers.
FR-2	Security	As a result of emergency alert, we can be able to protect both the humans and properties. Precaution steps could be taken.
FR-3	Reliability	Can be able to provide accurate values. It might have a capacity to recognize

FR-4	Performance	the smoke accurately and does not give a false Sprinklers and exhaust fans are used in case of emergency
FR-5	Availability	It can be used for everyday; it includes day and nights.
FR-6	Scalability	Sensors can be replaced every time it fails

Project Planning & Scheduling

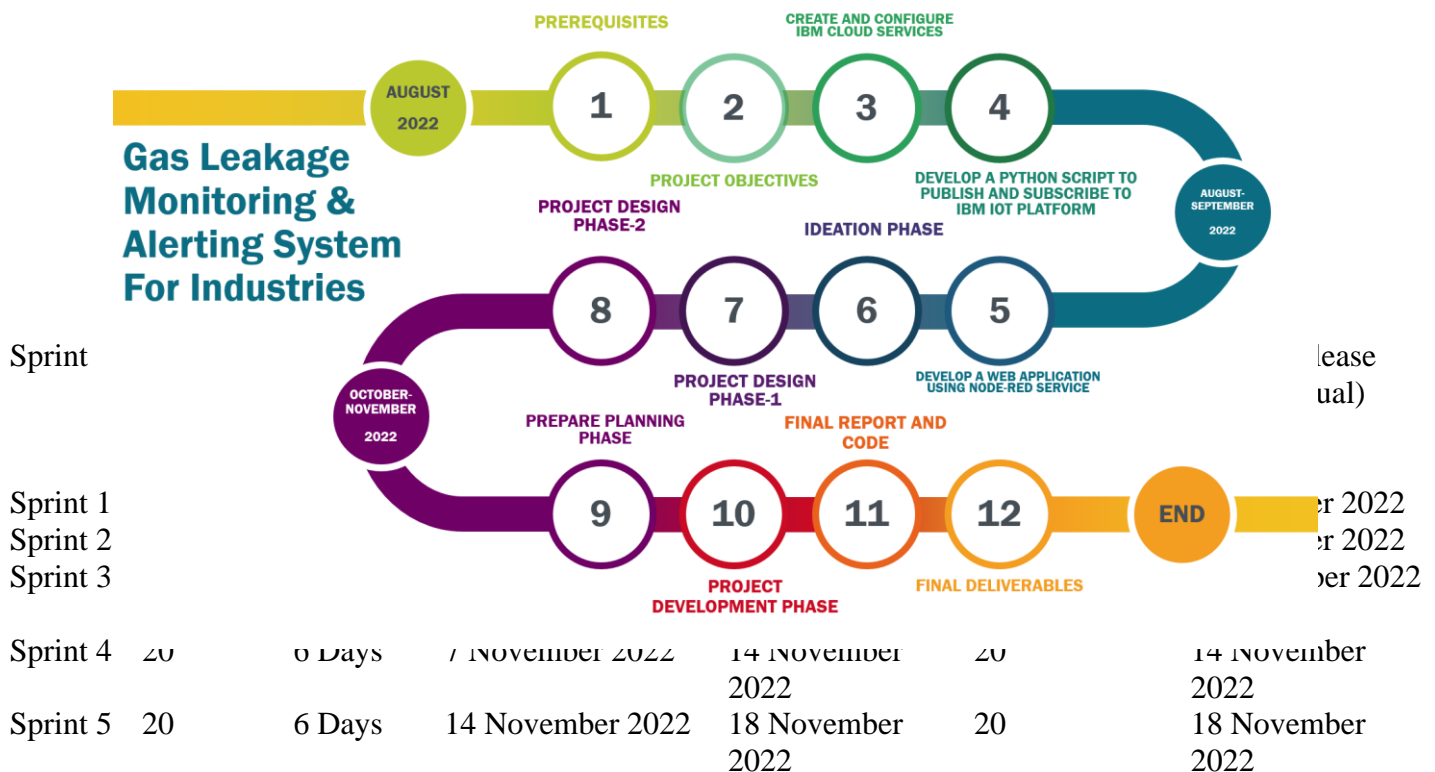
Sprint Delivery:

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Monitor the gas leakage	USN-1	The Industrialist have own industries so the industry owner must take of workers. The workers have family so the industries give security assurance of workers.	2	High	T.D. Ramkumar P. Priyanka R.M. Prasanna
Sprint-2	Avoid From Disaster	USN-2	The gas leakage occur at the time fire service will take care to protect the people from the disaster.	1	High	A. Swetha B. Nagarajan R.M. Prasanna
Sprint-3	Detect the gas	USN-3	We have monitored the gas by 24/7 hrs. To avoid leakage, the industry has quality pipes to transfer the gas and proper maintenance service once in a month.	2	Low	T.D. Ramkumar P. Priyanka A. Swetha

						R.M. Prasanna
Sprint-4	The model is trained and tested by sample dataset.	USN-4	The programmer designs the model to detect the gas leakage.	2	Medium	A. Swetha B. Nagarajan R.M. Prasanna T.D. Ramkumar
Sprint-5	Warning message	USN-5	In case any gas leakage occurs, the device gives the alarm and alert message to concerned user within a minute.	1	High	T.D. Ramkumar R.M. Prasanna P. Priyanka A. Swetha

Project Tracker, Velocity & Burndown Chart:

Milestone & Activity:



Project Development Phase

Circuit Diagram:

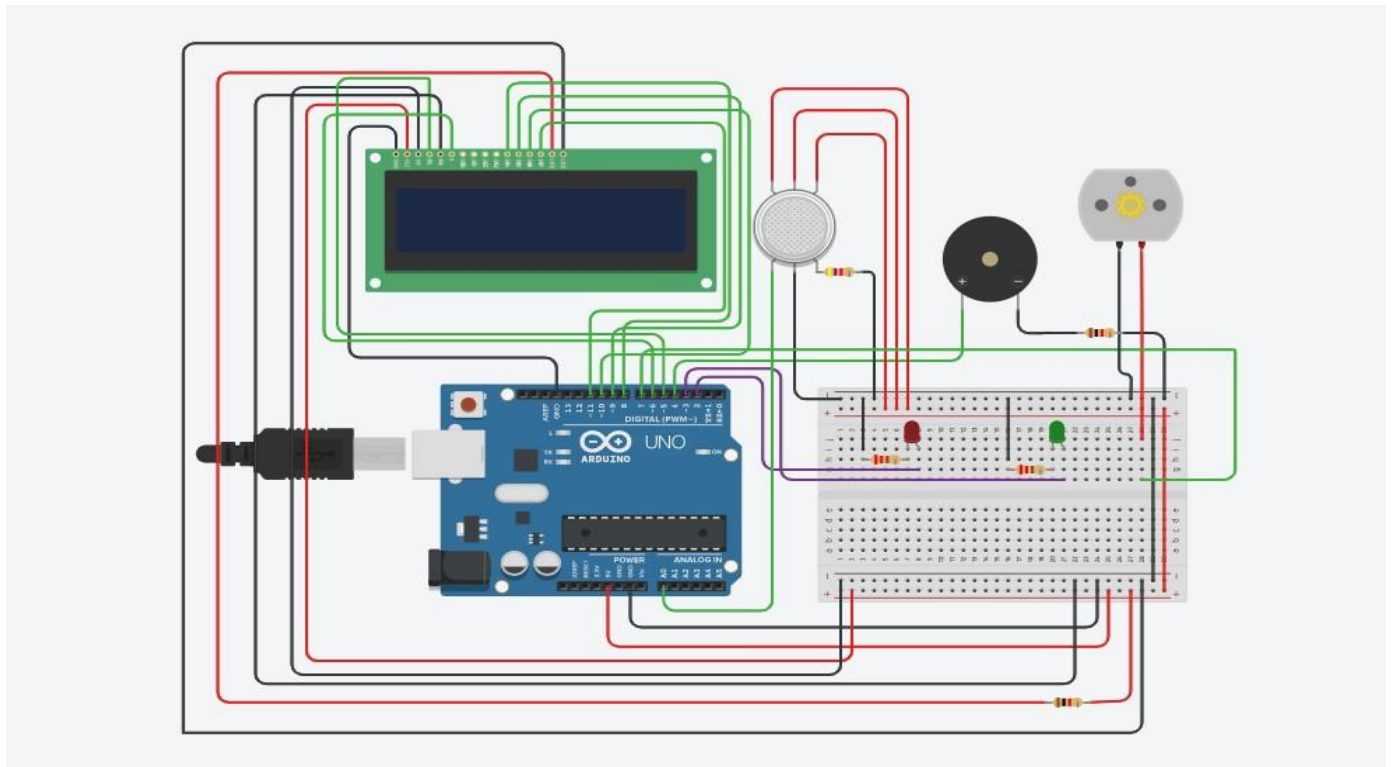
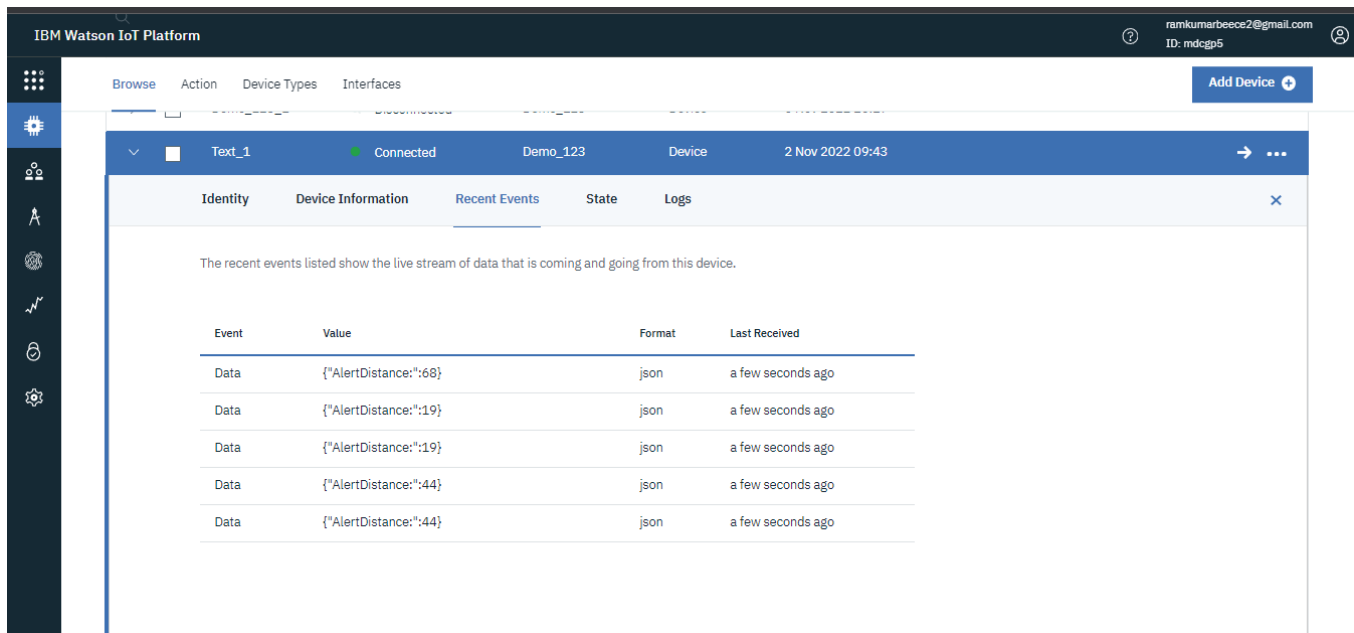


Figure 8 Schematic diagram of ProposedSystem

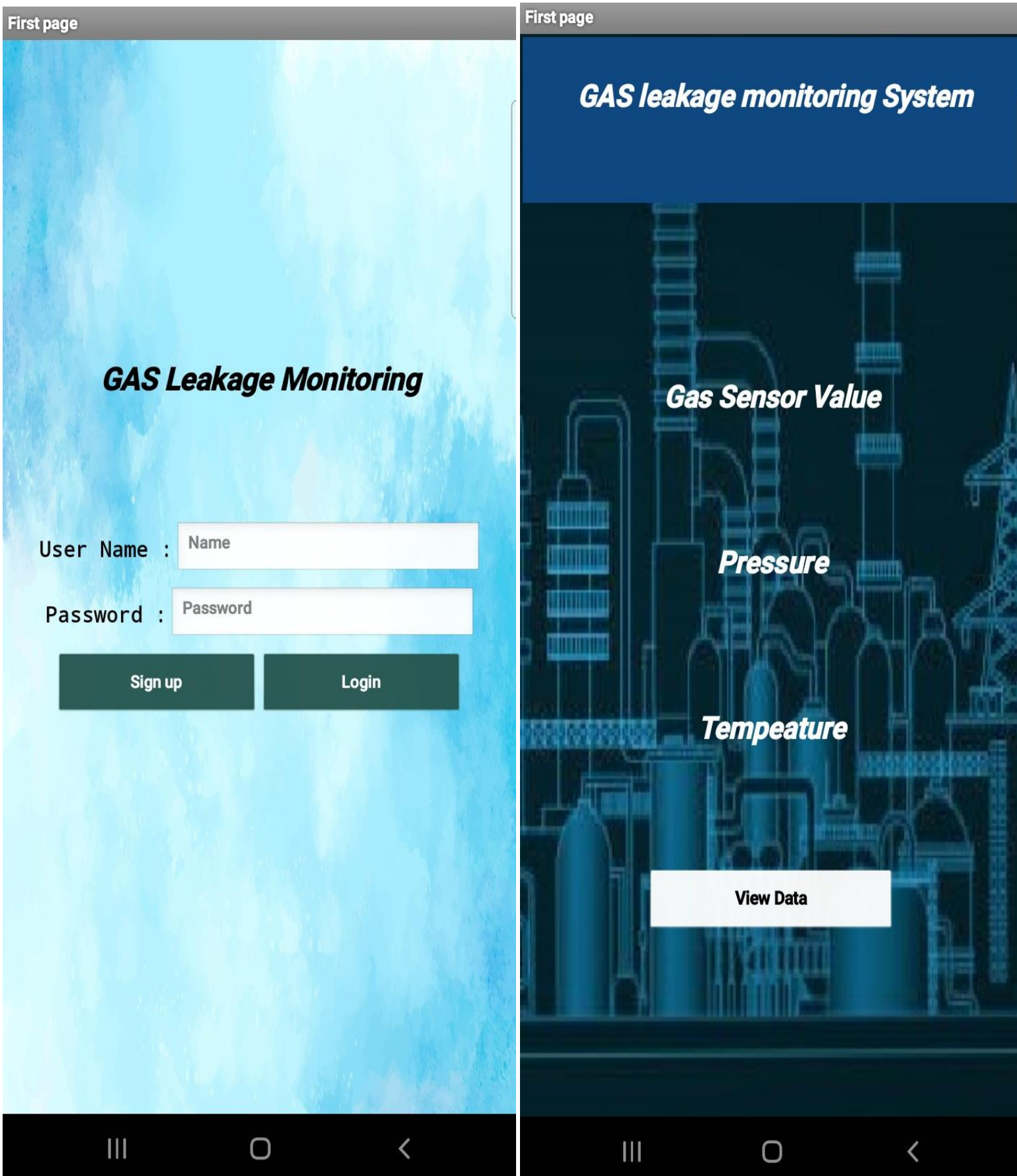
Figure 8 shows the schematic diagram of our project. This technique has been tested by leak of gas almost about sensors, MQ2 gas sensor sends the signal to the Arduino UNO after detecting the gas leakage. Arduino to other externally connected device such as LCD, buzzer and Motor send vigorous signals. 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.

IBM IoT Device:



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 Such as IBM IoT. The gases are sensed in an area of 1m radius of the rover and the sensor output data are continuously transferred to the local server. The accuracy of sensors is 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. Further the availability and storage of toxic gases like hydrogen sulphide also creates problems for testing the assembled hardware. As the system operates outside the pipeline, the complication of system maintenance and material selection of the system in case of corrosive gases is reduced. Thus, the system at this stage can only be used as a primary indicator of leakage inside a plant.

Mobile App Interface:



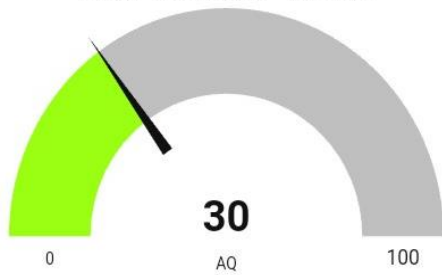
Home

Home

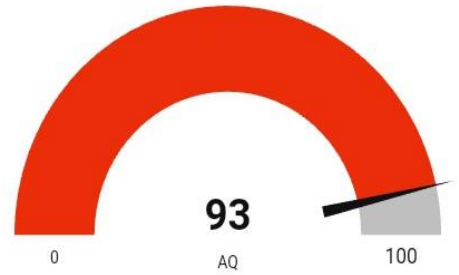
Default

Default

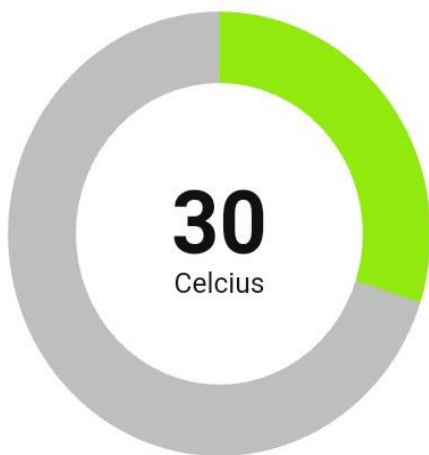
Gas Sensor Value



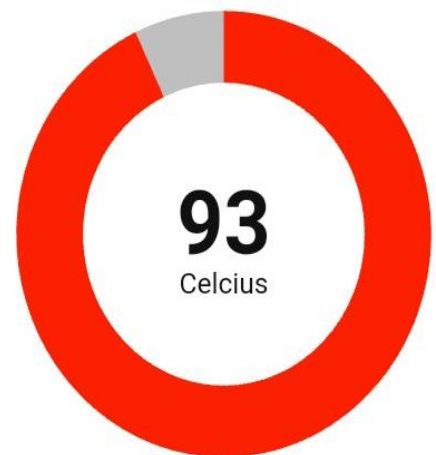
Gas Sensor Value



Temperature



Temperature



slider



slider



Fan Status



Fan Status



III

O

<

III

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<

The advantage of this simple gas leak detector is its simplicity and its ability to warn about the leakage of the LPG gas. This system uses GSM technique to send alert message to respective person if no one is there in the house and then gas leaks occurs, GSM module is there to send immediate messages to the respective person regarding the gas leak. The main advantage of this system is that it off the regulator knob of the cylinder automatically when gas leakage detected.

Final Deliverables

We design and develop an propose system which include some safety factors. A safety has been a major issue in today's day to day life. LPG and CNG i.e. petroleum gas and compressed natural gas are most commonly used in residential and commercial places for cooking purpose and in various vehicles as a replacement for costly fuels like diesel, petrol. These gases are filled in cylinders which are easily un-damageable. But leakage can take place through pipes or regulators or knobs which may cause accidents like suffocation, uneasiness or sometimes may catch fire and short circuit as well. The main 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.

Component Lists:

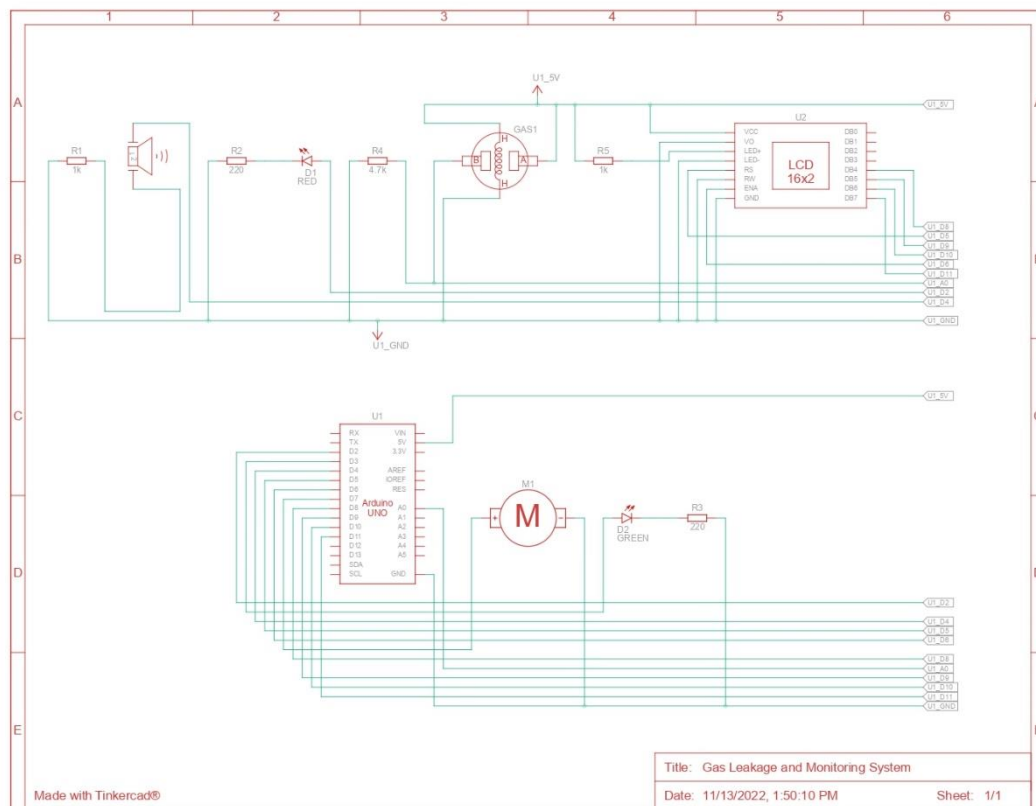

Gas Leakage and Monitoring System
Saved





Component List

Download CSV

Name	Quantity	Component
GAS1	1	Gas Sensor
U1	1	Arduino Uno R3
PIEZO1	1	Piezo
U2	1	LCD 16 x 2
R1 R5	2	1 k Ω Resistor
R2 R3	2	220 Ω Resistor
D1	1	Red LED
D2	1	Green LED
R4	1	4.7 k Ω Resistor
M1	1	DC Motor

Schematic View:



IBM IOT Watson is an IoT analytics platform service that allows you to aggregate visualize and analyse live information streams in the cloud. IBM Cloud provides instant visualization of information posted by your devices to IBM Watson with the ability to execute PYTHON code in IBM Watson you can perform online analysis and processing of the information as it comes in IBM Cloud is often used for prototyping and proof of concept IoT systems that need analytics.

Coding:

```
#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;
int fan = 7;

void setup()
{
  pinMode(redled, OUTPUT);
  pinMode(greenled,OUTPUT);
  pinMode(buzzer,OUTPUT);
  pinMode(sensor,INPUT);
  pinMode(fan,OUTPUT);
  Serial.begin(9600);
  lcd.begin(16,2);
  lcd.setCursor(0,0);
  lcd.print("Welcome To Gas");
  lcd.setCursor(0,2);
  lcd.print("Leakage Monitor");
  delay(1000);
  lcd.clear();
}

void loop()
{
  int analogValue = analogRead(sensor);
  Serial.print(analogValue);
  if(analogValue>sensorThresh)

```

```

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

```

```

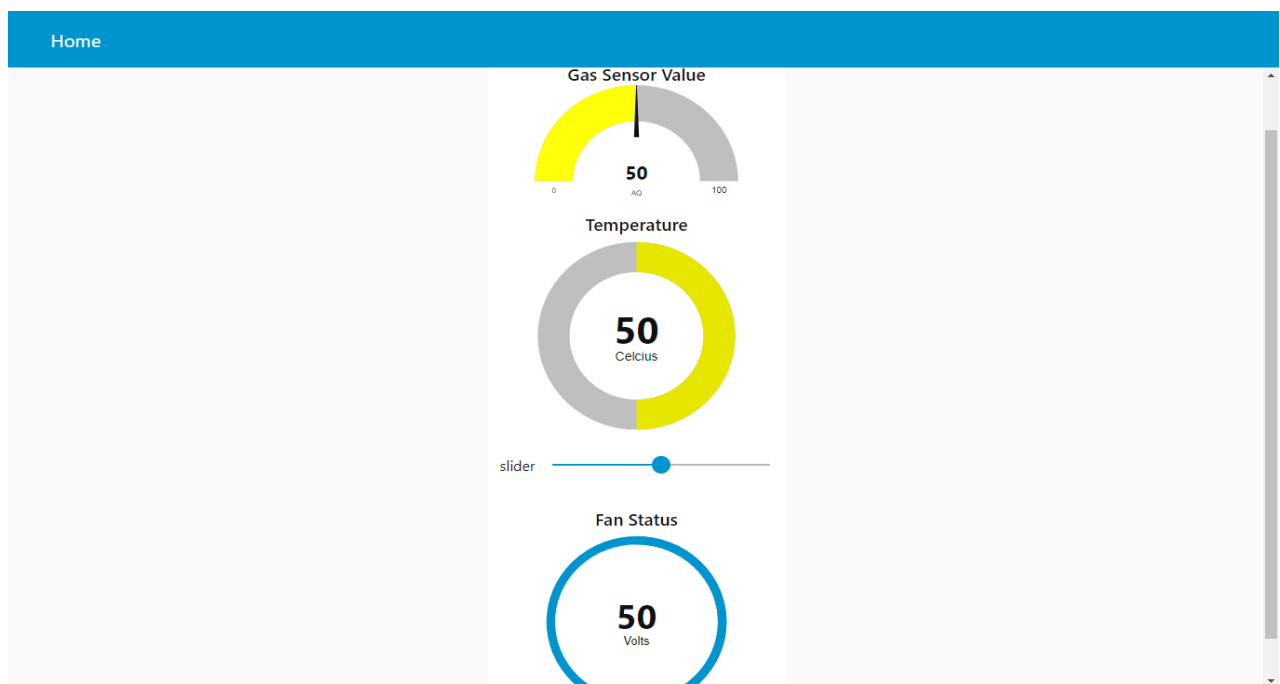
    lcd.print("ALL CLEAR");
    delay(1000);
}

}

```

Results

Monitoring and detection system are planned and when a small leakage occurs, the system sensors detect the leakage and the sends the alert message to the user and activates the alarm. On the other hand, the system monitors the amount of leakage occurred.



If the gas leakage is sensed more than the Threshold, the warning alarm will be generated by the buzzer and also the GSM modem gets command message, “Gas Leaking” from the microcontroller, it will send the message to the mobile number which is already stored in the microcontroller. This alarms the user that there is gas leakage in the particular area. Alternatively, the main power supply is turned off by the relay and the exhaust fan is turned on to prevent further leakage.

Conclusion

In the nutshell, gases are essential in our surrounding due to today's developments. Gases are everywhere. Gases helps human and gases also can harm human if not handle properly. From this project the hope is very high to make it successful because this innovation can bring benefits to human life. This project enables collection of the data about the gas leakage and analyses it and prevent the leakage occurred. The estimated source location of gas leakage can be determined by analysing the gas leakage level reading detected on different gas sensor position. Besides, by merging IoT system, the gas leakage can be easily analysed anywhere in the world. At the end of this project, the user can easily monitor the safety of the house or industry in case of gas leakage even from far place. 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. Its ability to warn its stakeholders about the leakage of the LPG gas. The future aspects of this detector include the GSM module and a tripper circuit which increases the efficiency of the system and provides more safety to the users. This detector is implemented successfully and is easy to use and also a low-cost product. Another advantage of this device is that even though if no one is there in the house and then gas leaks occurs, GSM module is there to send immediate messages to the stakeholders regarding the gas leak and thus it lowers the intensity of accidents. GSM module in this device ensures better safety regarding the gas leaks.

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