GAS LEAKAGE MONITORING AND ALERTING SYSTEM

PROJECT BASED LEARNING (NALAIYA THIRAN)

on

PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

Submitted by

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CHAPTER 1

INTRODUCTION

Gas leakage has become a threat and the security issue has to be considered with due importance. Gas leakages in open or closed areas can prove to be dangerous and lethal. The traditional gas leakage detector systems have great precision but fail to acknowledge a few factors in the field of alerting the people about the leakage. Therefore, we have used the IOT technology to make a gas leakage detector for smart alerting techniques. This system provides the information such as when a gas leakage is noticed, sensors in this 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. LCD display is used to display the status of the gas leak. Oil refiners, processing plants, storage farms, offshore platforms and many other industries which deal with chemicals either use utilities or make use of a wide range of hazardous, flammable or toxic gases. These gases are in most of the cases unavoidable part of the plants process. Thus storage, usage and transportation of these gases are given extreme care in industries to avoid hazards caused due to their leakage.

1.1 PROJECT OVERVIEW

The aim of this project is to propose and discuss a design of a gas leakage detection system that can automatically detect, alert and control gas leakage. One of the preventive measures to avoid the danger associated with gas leakage is to install a gas leakage detector at vulnerable locations. The objective of this work is to present the design of a cost-effective automatic alarming system, which can detect the gas leakage in various premises.

1.2 PURPOSE

- Gas leak detection is the process of identifying potentially hazardous gas leaks by sensors. These sensors usually employ an audible alarm to alert people when a dangerous gas has been detected.
- Gas leaks can be hazardous to health as well as the environment. Even a small leak into a building or other confined space may gradually build up an explosive or lethal concentration of gas.

CHAPTER 2

LITERATURE SURVEY

A Systematic and through search of all types of published literature as well as other sources including desertion, these in order to identify as many items as possible that are relevant to a particular topic.

INTRODUCTION		SURVEY/BODY OF REVIEW					CONCLUSION		
S.NO/Year	Title	Keywords	Problem Definition	Methodology (Algorithm, Protocol…Etc)	Input Parameters	Result	Advantages	Disadvantages/ Drawbacks	Research Gap / Research Question
1. 2022	Gas leakage detection using GSM Module & Arduino With SMS Alert	1.Arduino UNO 2.MQ - 2 Sensor 3.Buzzer 4.LCD 5.Exhaust Fan 6.GSM Module	To develop an examining system which finds the leak of LPG gas and protects the property by taken correct precaution at correct time. The project consists of Alarm unit which is Buzzer gives an audible sign of the presence of LPG volume.	The Gas sensors are used to detect essence of harmful gasses LPG and smoke. MQ sensor senses gas leakage, it send Information to Arduino UNO and it turns on LED, Exhaust Fan , GSM Module .	MQ - 2 sensor	By using this system we can reduce gas leakage accidents, save. Life and properties	It send Alert Message as an SMS to the Phone number and the exhaust fan will automatically once leakage is detected.	It does not have any mobile app or web pages app to monitor and store the data	1.What will the people over that area do if they do not get the proper signal in that area? 2.How will the alert SMS message reach the people in that area?
2. 2022	IOT Based Gas Leakage System Using ARDUINO	1.LPG-Gas Sensor 2.Node-MCU 3.Smartphones 4. IOT	The implementation for both industry and the society which will detect the leakage of gas and also monitor the gas availability. Alerting techniques that include sending messages to the applicable command as well as the ability to analyze sensor reading data.	Voltage rule sector is accountable for converting alternate power to direct current as well as lowering the transmitted signal. The sensors can detect a gas leak. The sensor MQ-2 is working here to detect LPG levels in the air. The gasses on the scale between 200 and 10000 ppm maybe identify as well as the reaction time is completely speedy	1.LPG-Gas Sensor module 2.Relay	1.MQ2 gas sensor sends the signal to the Arduino UNO after attentive the gas leakage. 2. Arduino the other visible Join devices such as LCD, buzzer and GSM convey active signals. 3.SMS is sent by the GSM module to the supplied mobile number	The advantage of the Arduino Uno-based LPG detector system project is that it gives remote indications to the user about the LPG leakage with the help of SMS sing	This monitoring system can be further increased by using Bluetooth in place of GSM to send the alert messages to the user, which abetment another real-time application .	1. During the bad weather conditions the internet facilities may get disconnected. In that case how will the message reach the people? 2. How will the people know about the gas leakage if the mobile network is not available?
3.2022	Sensor Based Gas Leakage Detector System	1.Arduino Uno 2.LPG gas sensor 3.MQ - 2 4.LCD 5.Exhaust fan 6.Micro-controller 7.Relay Board	To propose and discuss a design of a gas leakage detection system that can automatically detect, alert and control gas leakage.	1.Proposed design will have a MQ-2 sensor which will be used to detect gas to message the owner in the companies and homes etc. It will deliver message to the owner on the app and LCD as gas leakage detects. 2.In our system we are going to design gas leakage detector as well as delivering message. There will be a device to detects gas and turning on the fan and window and turn off the electricity. User will get a message	1.Arduino Uno 2.Exhaust fan	In Arduino Based LPG gas Monitoring System MQ-4 gas sensor, LM-35 Temperature sensor, (for prototype) as input devices and Piezoelectric buzzer,16x2 LCD display and IOT module used as output devices. These project gives alert message by buzzing the buzzer and trough SMS to the house holders. We also provide automatic doors and windows opening, so that the compressed gas can spread in to air freely. Hence a fire accident does not occurs.	1.Strong Shield 2.Continuous Monitoring 3.Displaying The Message On LCD 4.Alert on Mobile Application 5.High Accuracy 6.Low Power Consumption	1.Detected Any Moisture 2.Will not Find Very small Leak 3.Accuracy of Location of leakage need to be carefully verified	1.Why do this system does not shut off the control valve if the gas get leaked ?

4.2022	IoT Based Gas Leakage Detection and Alarming System using Blynk platforms	1.IoT 2.Gas leakage 3.Blynk platform 4.Thingspeak 5.LPG 6.Alarm system.	Gas leakageAQ causes many health issues. So, to prevent such catastrophes and in order to maintain a clean air environment the workspace atmosphere should be frequently monitored and controlled	MQ2 sensor will detect the concentration of the gas according to the voltage output of the sensor and the ESP8266 will send the data reading from the gas sensor to Blynk IoT platform over an IOS phone; data visualization is done using Thing Speak IoT Platform.	MQ 2 gas sensor	System records the value of the LPG leak level on an IoT platform –which could be a cloud platform of application platform-and the awareness message is sent to the smartphone through the wifi on an IoT application such as Blynk IoT application.	Blynk is an IoT Platform that supports both IOS and Android while being compatible with a plethora of microcontr ollers such as Node MCU (ESP), STM32, Arduino and Raspberry Pi over the Internet.	Ardunio UNO is better than the nodeMCU in all functionalities so they would have used that as the microcontroll er	1.Does a better IOT analytics can be used instead of Thingspeak platform ? 2.Why sensors like MQ6,MQ306,AQ3 gas sensors cannot be used here ?
5.2022	Gas Leakage Monitoring and HVAC Automatio n System	1.Leak 2.Hydrogen sulphide 3.Carbon monoxide 4.combustible gas.	Hazards due to gas leakage are a constant part of industries where storage and transportation facilities of flammable and toxic gases are involved.	The device measures the air and water quality, including every parameter that can have deviation as the result of gas leakage in the water or air.	1.5 v DC Motor 2.Wi-fi Module.	The HVAC System provides the interface between the Arduino microcontroller and the web.	The gases are sensed in an area of meter radius of the rover and the sensor output data are continuously transferred to the local server.	The accuracy of MQ sensors are not up to the mark thus stray gas are also detected which creates an amount of error in the output of the sensors.	Does Instead of using L293D Motor driver any other controller can be used for controlling?

6.2022	A Smart Building Fire and Gas Leakage Alert System with Edge Computing and NG112 Emergency Call Capabilities	1.Fire detection 2.Gas leakage detection 3.Smart cities 4.Smart building.	smart building sensor system, SB112, combines a small-size multi sensor-based (temperature, humidity, smoke, flame, CO, LPG, and CNG) scheme with an open-source edge computing framework and automated Next Generation (NG) 112 emergency call functionality.	The COP operator was considered to be the human 'in the loop' receiving and managing the smart city platform information. Apache Kafka is an effective and open-source distributed event streaming platform for high-performance data pipelines, streaming analytics, data integration, and mission-critical applications in real world conditions, such as smart cities	Gas sensor	The ability of fires or gas leaks to spread out extremely quickly in critical buildings or infrastructure makes their detection and suppression at an early stage a necessity. Public safety and the reduction of property loss are the two main crucial issues that a smart city seeks to address.	Low power consumption	1.Low latency 2.The unstable connection between the cloud and mobile devices	If there is an unstable connection between the cloud and mobile device , how will they get aware of this gas leakage?
7.2021	Arduino Based Gas Leakage Detection System Using IoT	1.Node MCU 2.LCD 3.Buzzer 4.Gas Sensor 5.Internet of Things	To build a Gas leakage detector using LPG gas sensor this device will continuously monitor the level of LPG gas present in the air and also connect it with IoT using ESP module for safety and security	LPG leakage detection and alert that provide user an easy way to monitor the LPG gas in cylinder with android application. The gas sensor detects the concentration of gas in ppm and outputs analog value which can be converted to a digital signal using inbuilt Analog to Digital Convertor of Node MCU .	Gas Sensor	The detection of leakage of LPG cylinders in particular areas like kitchen and alert the user regarding leakage	It is an economical system which can be installed in apartments, hotels LPG gas storage areas and wherever it is needed. The cost of the proposed system is lesser than the commercially available detectors in the market.	A Mobile Application was not created for this system	How will the people over that environment will come to know the monitor of the exact concentration of gas present in the air ?

2.1 EXISTING PROBLEM

Sensor which is used along with Arduino UNO detect the essence of gas in atmosphere of the industries and audible alarm sound is ones and automatically turn off the gas supply at the source when the gas detected and our solution also monitor the data and upload to the cloud regularly.

2.2 REFERENCE

[1] Mr.Sivaprasad Lebaka, N.V.Charan , 2022 Gas leakage detection using GSM Module & Arduino with SMS Alert .

[2] Saurabh Shambharkar, Neha Chourasia ,Papiha Ajmire, 2022 Sensor based Gas Leakage Detector System.

[3] Younus Mohammed Abdulkhaleq, Muntadher Asaad Nadhim , 2022 IOT Based Gas Leakage Detection and Alarming System using Blynk Platforms.

[4] Nwukor Frances Khem ,Meenakshi 2021 Gas Leakage Detector System with SMS Alert.

[5] Dr.Suma Christal Mary, Dr.Josphine Leela , 2021 IOT Based Home Safety Gas Leakage Detection and Automatic Booking System.

[6] Mr. Inamdar , Pratiksha , A. Smitha , 2021 Arduino based Gas Leakage Detection System Using IOT.

[7] Dr.Suma Christal Mary , Dr.Josphine Leela ,Dr.Vedhapriyavadhana , 2021 IOT Based Home Safety Gas Leakage Detection and Automatic Booking.

2.3 PROBLEM STATEMENT DEFINITION

- The presence of the hazardous gas leakage in work place of industries also stored gases contains gas which exhibits ideal characteristics is used. The sensors Arduino UNO are widely used to detect the essence of the gas in atmosphere of the industries.

- The usage of the gas brings great problem in industries which is excessively used in industries causes destructible impact to the lives and as well as to the hesitate of the people.

- When troublesome gases are involved, either the plant should be well maintained or a proper system for a quick leak detection has to be these so that fast safety action can be taken as soon as possible.

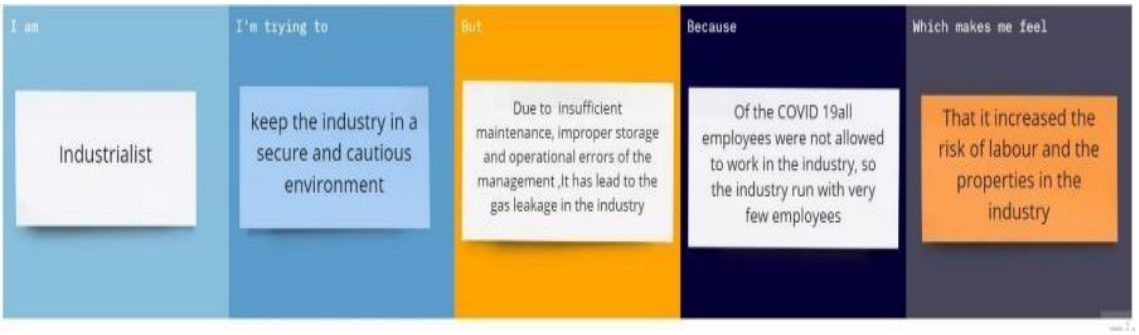

Fig 2.1 Problem Statement Definition

CHAPTER 3

IDEATION AND PROPOSED SOLUTION

Ideation is the process where you generate ideas and solutions through sessions such as Sketching, Prototyping, Brainstorming and a wealth of other ideation techniques.

3.1 EMPATHY MAP CANVAS

An empathy map canvas is here we say that,

- **What Do We Feel and think** - Fear of losing life, Damage to properties, Not to panic.
- **What do we see** - Air get polluted, People get panic, white cloud or dust.
- **What we say and do** - Block the gas leakage, bring people out from that place, move away frost the leakage zone.
- **What we hear** - Hear beep sound, off switches immediately, Search for exit.
- **Pain** – Damage to human life, Business loss, Productivity gets disturbed.
- **Gain** – Insurance Can be claimed, overcome issues, Expected outcome.

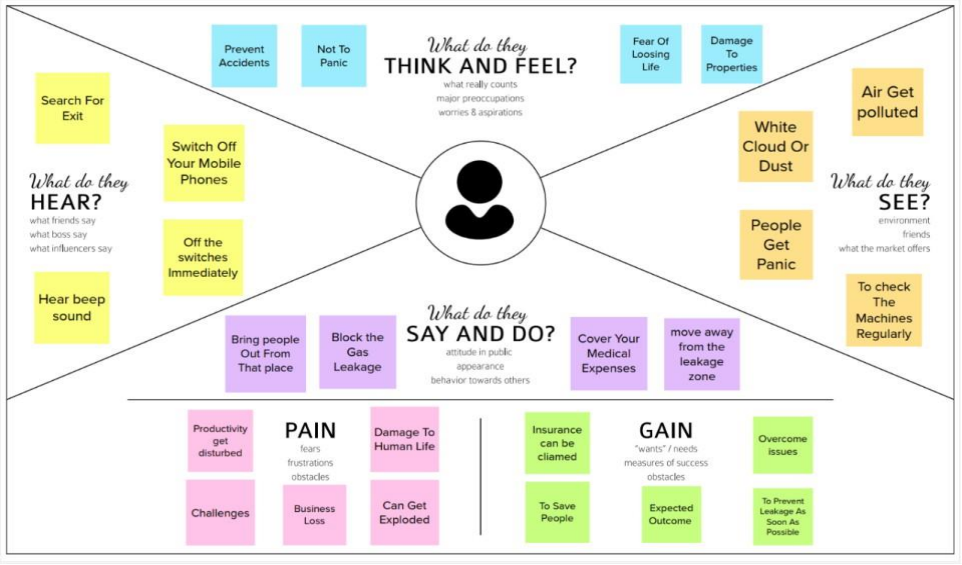

Fig 3.1 Empathy Map Canvas

SOURCE LINK:

https://app.mural.co/t/sakthimaheshwarim6402/m/sakthimaheshwarim6402/1661506610528/4550621913fa5a4cd3cf19070953e55e6c512718?sender=uf8bd3d0728a9da522dfe0307

3.2 IDEATION AND BRAINSTORMING

Initially we have collected ideas based on our problem definition from our teammates and we grouped ideas after that we had voting session where our teammates voted and finally, we got our problem solution. The Brainstorming Is the Process of Gather of The Ideas of The Stakeholder, That How to Prevent the Gas Leakage and Prevent People Being Exposed to The Hazardous Environment.

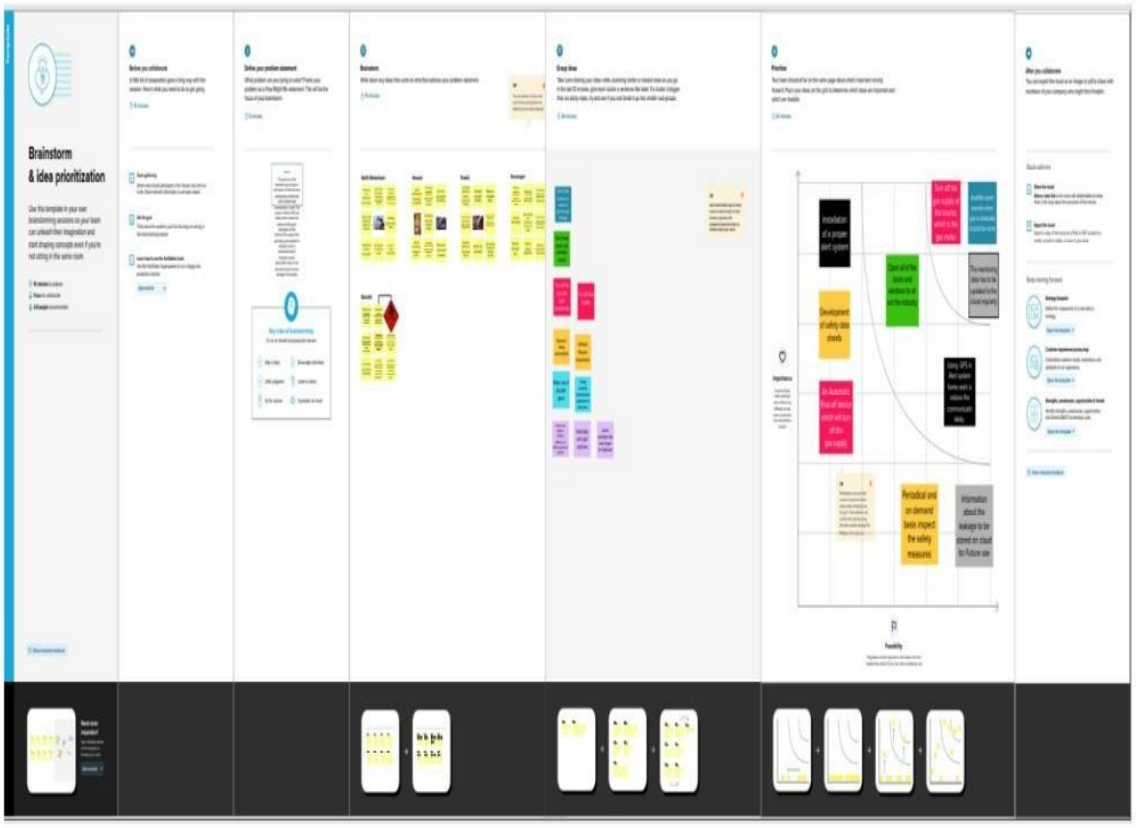

Fig 3.2 Brainstorming

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3.3 PROPOSED SOLUTION

- **Problem Statement (Problem to be solved):** Monitoring and Detecting the gas leakage in industries at unmanned zone.
- **Idea / Solution description:** Sensor which is used along with Arduino UNO detect the essence of gas in atmosphere of the industries and audible alarm sound is oned and automatically turn off the gas supply at the source when the gas detected and our solution also monitor the data and upload to the cloud regularly.
- **Novelty / Uniqueness:** We use advanced sensor called Monolithic sensor (MPS) Sensor.
- **Social Impact / Customer Satisfaction:**
    - Lost revenue and impact on finances
    - Brand value and reputation
- **Business Model (Revenue Model):** Gas leakage monitoring and alerting system is the most efficient and cost-effective technology for producing large quantities of gas in the industries and it helps them to increase the business growth.
- **Scalability of the Solution:** Our system is a reliable one and the installation is ease and the connectivity is well planned. It has extraordinary functionality.

3.3 PROBLEM SOLUTION FIT

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns and recognize what would work and why.

MURAL TEMPLATE

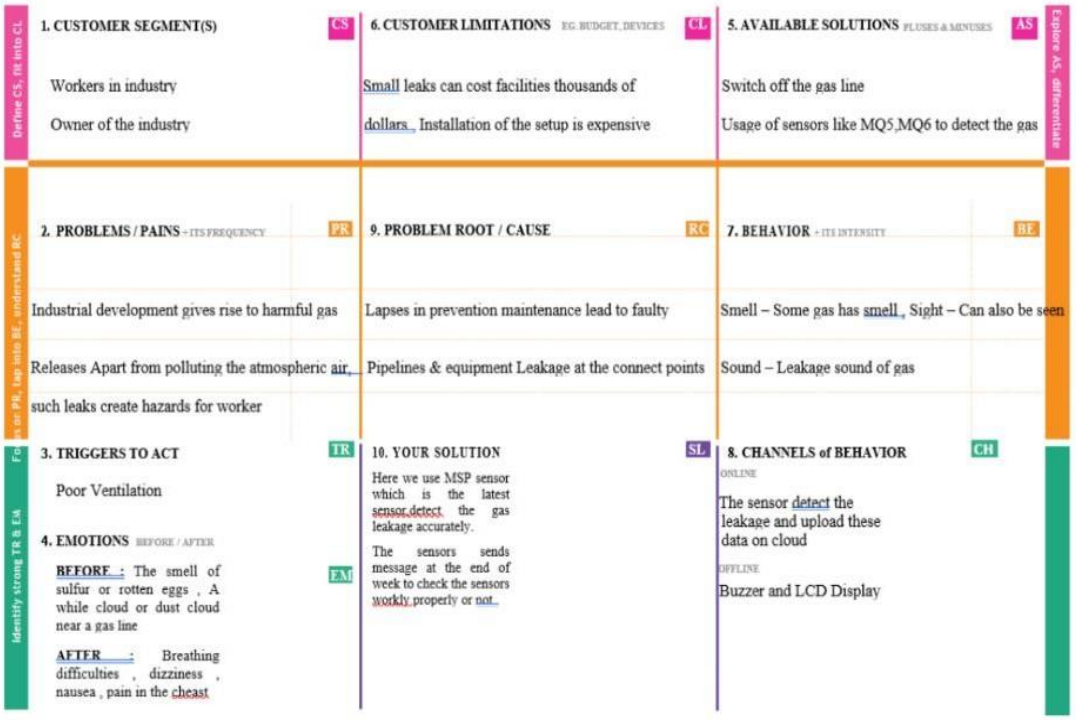

Fig 3.3 Problem Solution Fit

SOURCE LINK

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CHAPTER 4

REQUIREMENT ANALYSIS

Requirements analysis involves various tasks that help engineers understand stakeholder demands and explain them in simple and visual ways. It is essential to a software or system project's success.

4.1 FUNCTIONAL REQUIREMENTS

Functional requirements are the details and instructions that dictate how software performs and behaves.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Gas detection design coverage	The gas detection function shall provide reliable and fast detection of flammable and toxic leaks before a gas cloud reaches a concentration and size which could cause risk to personnel and installation.
FR-2	Leak detection	Flammable gas detection shall be provided in all areas where flammable gas leakages could occur. In these areas the smallest gas cloud that has the potential to cause unacceptable damage shall be specified as the minimum cloud size for confirmed gas detection.
FR-3	Gas detection location	Detectors should be positioned in different levels in an area or module.
FR-4	Gas detection actions	The alarm starts ringing when the gas gets leaked, Doors will be opened automatically and the data's will be stored in cloud and alert message will be displayed on the LCD display.
FR-5	Gas detection calibration	Gas detectors shall be individually identifiable with a self-test function. It shall ensure the presence of gas concentration and amount of gas leakage
FR-6	Gas detection levels	• Low alarm limit for IR open path detector is maximum 1 LELm . • High alarm limit for IR open path detector is maximum 2 LELm .

Table 4.1 Functional Requirements

4.2 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements are the criteria for evaluating how a software system should perform and a software system must have certain quality attributes in order to meet non-functional requirements.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Used to avoid accidents in industries and save life.
NFR-2	**Security**	To Protect Sensitive Data which is being monitored and stored in cloud for future needs.
NFR-3	**Reliability**	This system can perform consistently well in all circumstances.
NFR-4	**Performance**	It performs Speedy operation and it send response faster.
NFR-5	**Availability**	This device detects sensitive gases even to minor gas leaks.
NFR-6	**Scalability**	Any Sensors can be added depending upon the geographical region.

Table 4.2 Non-Functional Requirements

CHAPTER 5

PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

ZERO LEVEL DATA FLOW DIAGRAM

It gives you a quick overview of the system being modeled.

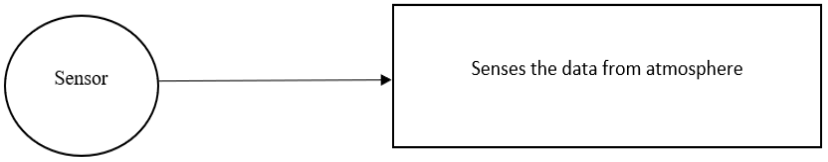

Fig 5.1 Zero Level Data Flow

FIRST LEVEL DATA FLOW DIAGRAM

A process receives input data and produces output with a different content or form.

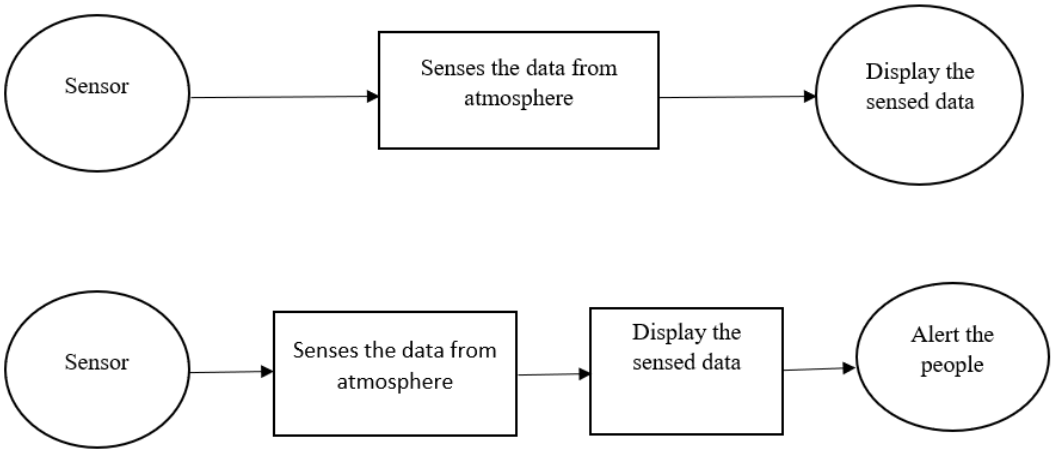

Fig 5.2 First Level Data Flow

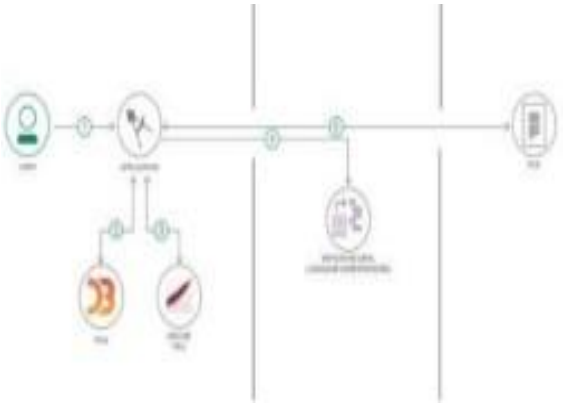

Fig 5.3 Data Flow Diagram

- User configure credentials for the Watson Natural Language understanding service and starts the app.
- Language understanding service and starts the top.
- User selects data file to process and load.
- Apache Tika extracts text from the data file.
- Extracted text is passed to Watson NLU for enrichment.
- Enriched data is visualized in the UI using the D3 .is library.

5.2 SOLUTION AND TECHNICAL ARCHITECTURE

- Technical Architecture (TA) is a form of IT architecture that is used to design computer systems.
- It involves the development of a technical blueprint with regard to the arrangement, interaction, and interdependence of all elements so that system-relevant requirements are met.

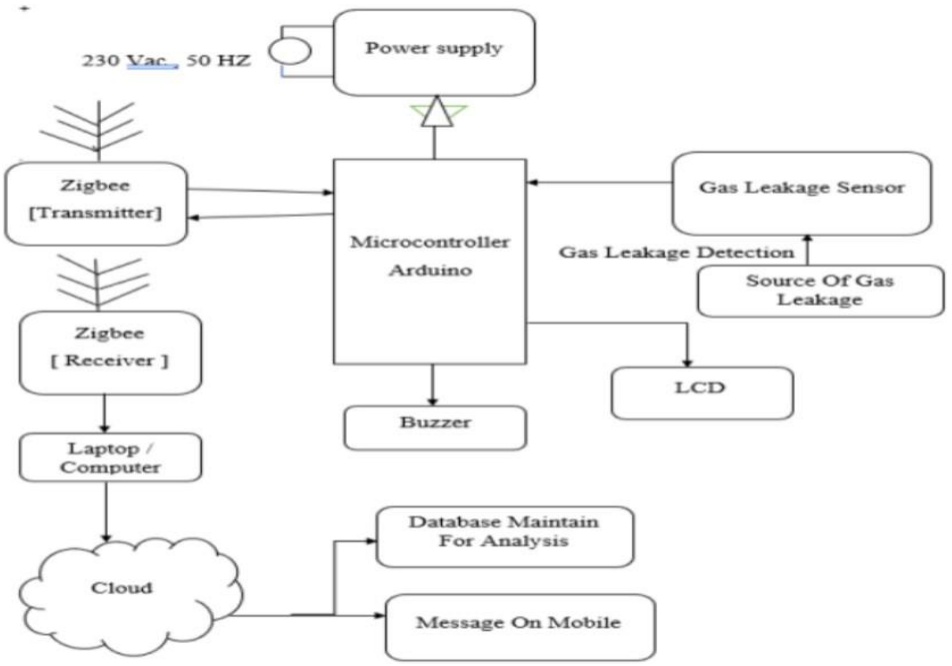

Fig 5.4 Technical Architecture

COMPONENTS AND TECHNOLOGIES

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application e.g., Web UI, MobileApp, Chatbot etc.	Node-Red
2.	Application Logic-1	Logic for a process in the application	Python
3.	Application Logic-2	Logic for a process in the application	IBM Watson Assistant
4.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Clouding

Table 5.1 Components and Technologies

APPLICATION CHARACTERISTICS

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	List the open-source frameworks used	Technology of Opensource framework
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc.	e.g., SHA-256, Encryptions,IAM Controls, OWASP etc.
3.	Scalable Architecture	Justify the scalability of architecture (3 – tier, Microservices)	Technology used
4.	Availability	Justify the availability of application (e.g. use of load balancers, distributed servers etc.)	Technology used
5.	Performance	Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc.	Technology used

Table 5.2 Application Characteristics

5.2 USER STORIES

- Gas detection design coverage (**Worker in industry**) - Area Coverage for Gas Detectors Like smoke detectors, a gas detector is capable of providing up to 75SQM area coverage based on a 5M radius of operation.
- Leak detection (**Owner in industry**) - In industrial settings leak detection is a routine procedure that is necessary for monitoring product movement.
- Gas detection actions (**Owner in industry**) - A gas detection system is usually connected with an alarm system, so as soon as the potentially dangerous gas is detected, the alarm is set to ON automatically, which warns the workers in time to safely evacuate.
- Gas detection levels (**Worker in industry**) - A gas detection levels programmed, typically 10-20% LEL for a first alarm (warning) and 20-40% LEL for a second stage alarm to evacuate or take further action.

CHAPTER 6

PROJECT PLANNING AND SCHEDULING

Project planning is the process of identifying all the activities necessary to successfully complete the project. Project scheduling is the process of determining the sequential order of the planned activities, assigning realistic durations to each activity, and determining the start and finish dates for each activity.

6.1 SPRINT PLANNING & ESTIMATION

OBJECTIVE

To detect and monitor the emission of harmful gases in industries. In several areas, the gas sensors will be integrated to monitor the gas leakage. If in any area leakage is detected the admins will be notified along with the location.

FEATURES

- 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.

FOCUS

The system is based on a microcontroller that employs a gas sensor as well as an LCD display.

DATA TRANSFER

Data leakage is the unauthorized transmission of data from within an organization to an external destination or recipient.

ALLOCATION

Resource allocation is the process of assigning the best available resource to tasks and projects. Resource allocation manages workloads to ensure under or overutilization doesn’t happen. Then, people are reassigned based on current resource availability and project timelines.

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority
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
Sprint -2	Avoid From Disaster	USN-2	The gas leakage occurs at the time fire servicewill take care to protect the people from the disaster.	1	High
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. The industry must take care of what are the necessary process to avoid the gas leakage.	2	Low
Sprint-4	The model is trained and tested by sample dataset &Warning message	USN-4	The programmer designs the model to detect the gas leakage. In case any gas leakage occurs, the device gives the alarm and alert message to concerned user within a minute.	2	Medium

Table 6.1 Sprint Planning

6.2 SPRINT DELIVERY SCHEDULE

Sprint delivery schedule is used to estimate when sprint has started and delivery date of the sprint. Due to estimation of the sprint delivery schedule, it helps the developer to complete their project within the estimated time.

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

Table 6.2 Sprint Delivery Schedule

Project Tracker, Velocity & Burndown chart:

Velocity:

Imagine we have a 10-days sprint duration, and the velocity of the team is 20 (Points per sprint).

Let's calculate the team's average velocity (AV)Per iteration unit (Story points per day).

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

6.3 REPORTS FROM JIRA

Roadmaps in Jira Software are team-level roadmaps useful for planning large pieces of work several months in advance at the Epic level within a single project.

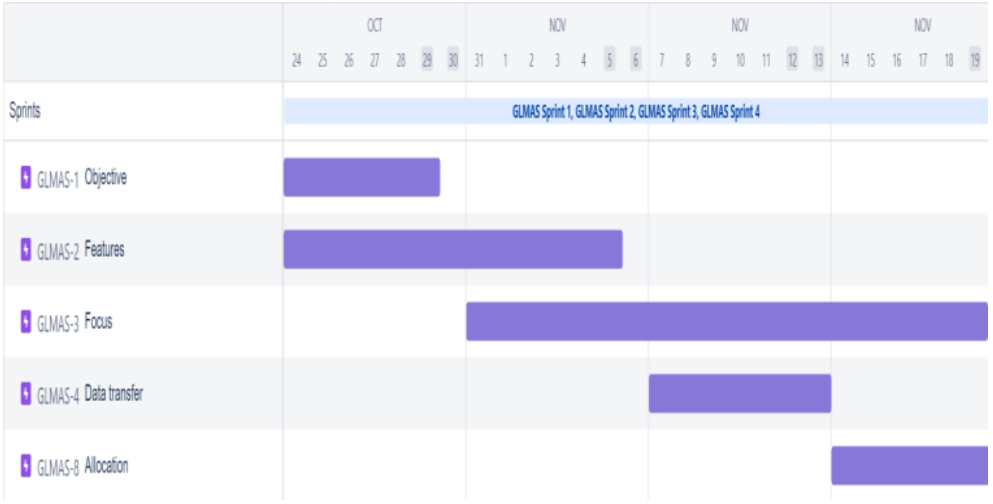

Fig 6.1 Reports from Jira

CHAPTER 7

CODING AND SOLUTIONING

SOLUTION

In coding and solution, we use four sprints they are python, IBM Watson iot platform cloud, node-red simulators MIT APP Invertor.

7.1FEATURE 1

SPRINT 1:(Python Data Generated)

```
import time
import sys
import ibmiotf.application
import  ibmiotf.device
import random
#Provide your IBM Watson Device Credentials
organization = "bd91hr"
deviceType = "android"
deviceId = "1902"
authMethod = "token"
authToken = "12345678"
# Initialize GPIO
        def mycommandCallback(cmd):
    print("Command received :%s" %cmd.data['command'])
    status = cmd.data['command']
    if status == "NO LEAKAGE":
        print("OPEN PIPELINE")
```

```
    elif status == "LEAKAGE":
        print("CLOSE PIPELINE")
    else:
        print("please send proper command ")
try:
        deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth-method": authMethod, "auth-token": authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)
        #.....................................
        except Exception as e:
        print("Caught exception connecting device: %s" % str(e))
        sys.exit()
# Connect and send a datapoint "hello" with value "world" into the cloud as an event of type "greeting" 10 times
deviceCli.connect()
while True:
        #Get Sensor Data from DHT11
          temp=random.randint(0,100)
    Humid=random.randint(0,100)
        Gas=random.randint(0,100)
          data = { 'temp' : temp, 'Humid': Humid, 'Gas':Gas }
     #print data
        def myOnPublishCallback():
            print ("Published Temperature = %s C" % temp, "Humidity = %s %%" % Humid, "Gas Concentration = %s"%Gas ,"to IBM Watson")
```

```
  success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)

        if not success:

            print("Not connected to IoTF")

        time.sleep(10)

            deviceCli.commandCallback = mycommandCallback

# Disconnect the device and application from the cloud

deviceCli.disconnect()
```

OUTPUT

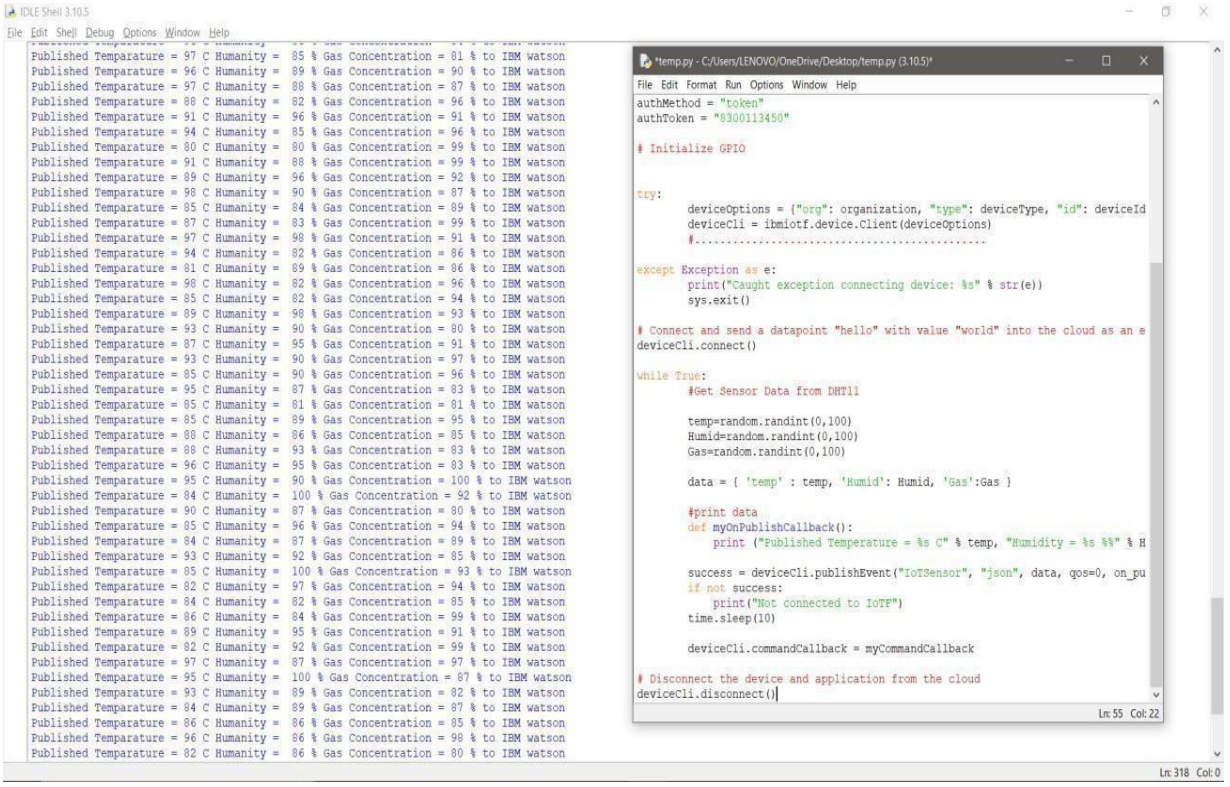

Fig 7.1 Python Data Generated

SPRINT-2 (IBM WHATSON IOT PLATFORM)

Payload is deployed on IBM Watson IoT platform to generate sensor data.

PAYLOAD

{

"gas": random(0, 100),

"Temp": random(0, 100),

"Humid": random(0, 100)

}

OUTPUT

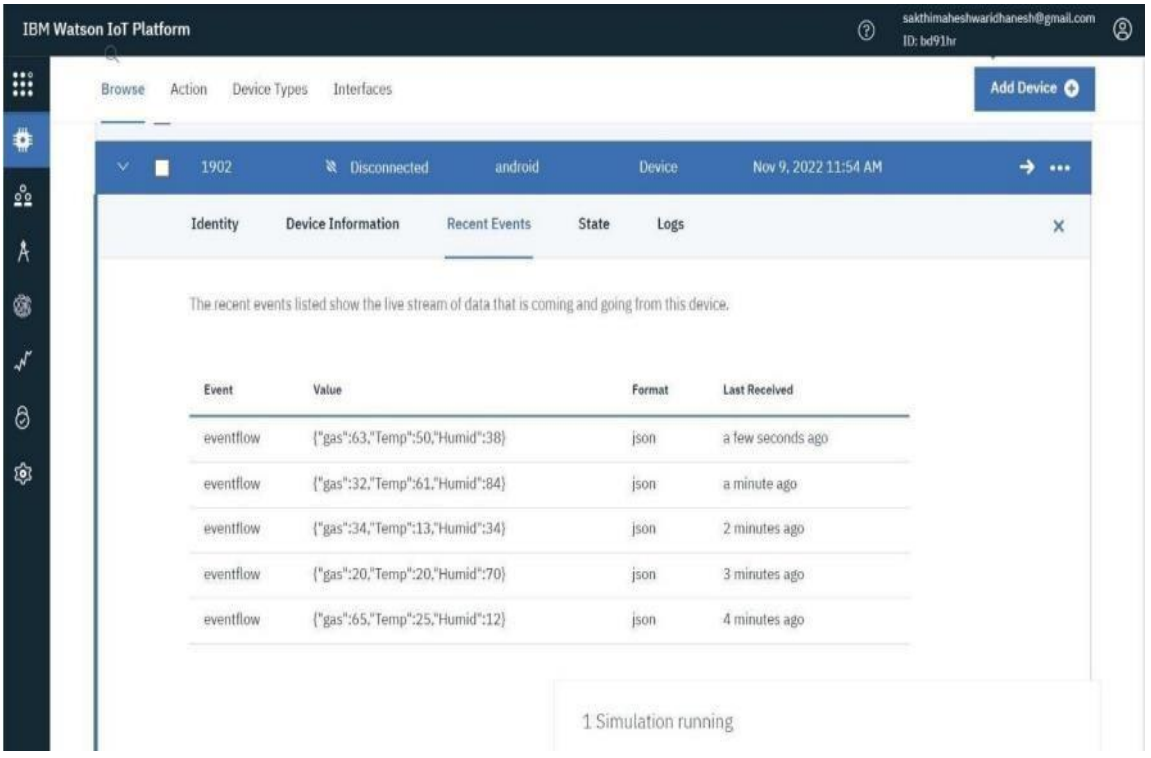

Fig 7.2 IBM Whatson IOT Platform

Board:

Line Chart This chart displays the payload in the graph that is displayed on the device for every minute.

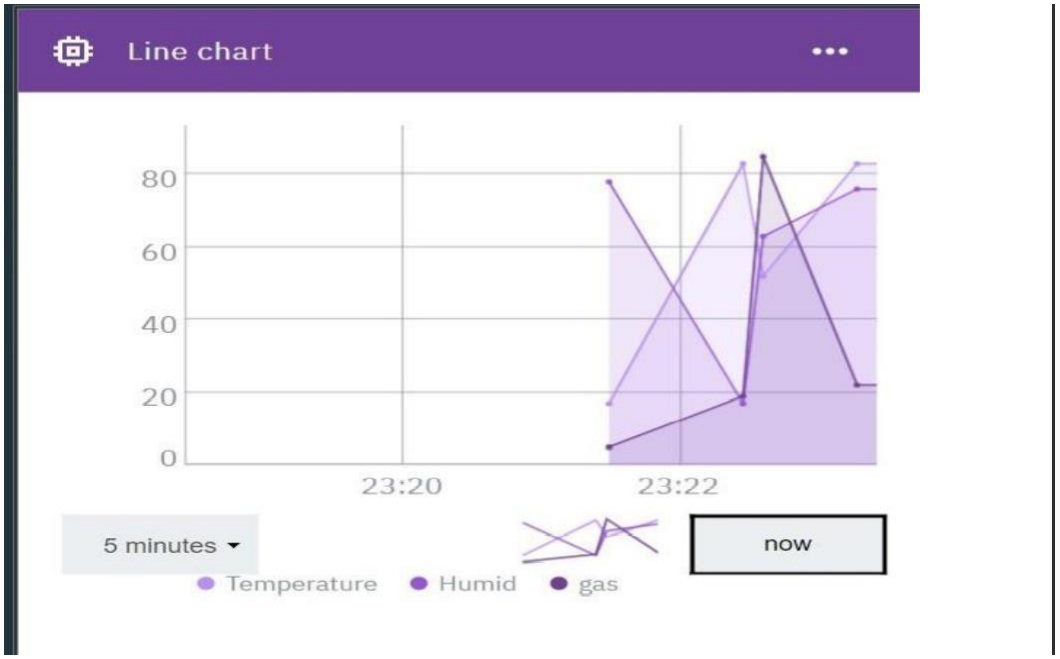

Fig 7.3 Line Chart

7.2 FEATURE 2

SPRINT 3: (NODE RED)

TASKS

Sensed data is brought to Node-RED and displayed in dashboard

STEPS

1) IBM IoT node is used to gather sensor data. a. Necessary API key is provided to establish connection.

2) Using functions namely Temperature, Humidity and Gas the data is obtained independently and displayed in dashboard.

3) Dashboard Nodes are used to display the sensed data to the user in a portal.

SOURCE CODE

Temperature: msg.payload =msg.payload.Temp;

return msg;

Humidity: msg.payload = msg.payload.Hum;

return msg;

Concentration of Gas: msg.payload = msg.payload.gas; return msg

OUTPUT

1) Data is brought to node red

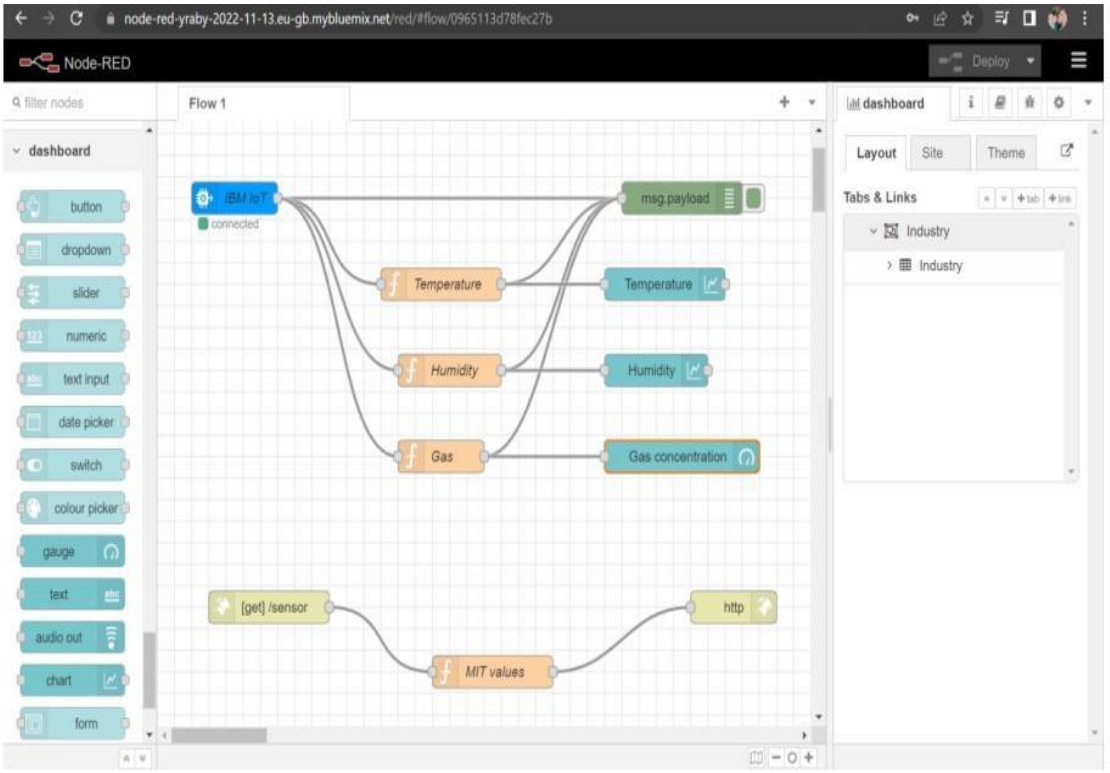

Fig 7.4 Node Red Data

2) Data is displayed in dashboard

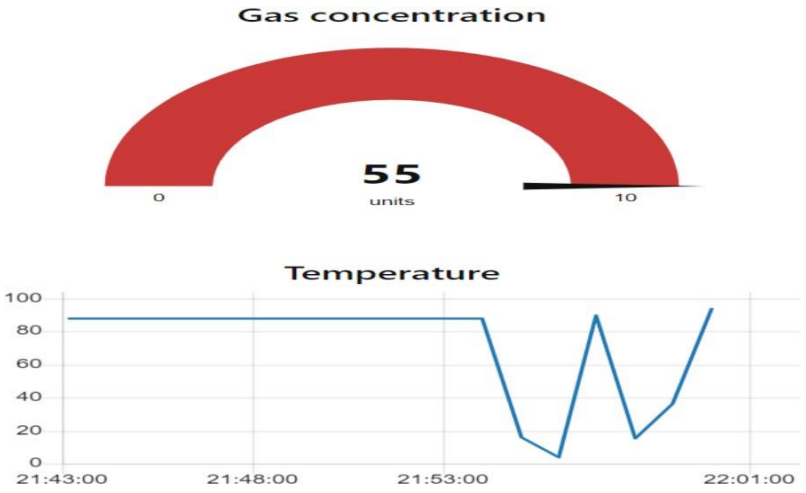

Fig 7.5 Node Red Dashboard

SPRINT 4: (MIT APP INVENTOR)

Creating the application of the project,

Fig 7.6 MIT App Inventor

CHAPTER 8

TESTING

A test case is a set of actions performed on a system to determine if it satisfies software requirements and functions correctly.

8.1 TEST CASES

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Result	Status
Test case ID	Gas detection	Gas sensor	Gas detector is a unit	Check this process	Detection is expected	Detect
Test case ID	Gas monitor	Gas sensor	Senses the sound	To monitor the gas level	Monitor is expected	Monitor

Table 8.1 Test Cases

8.2 PERFORMANCE TESTING

Our system has low risk during the testing the simulation as well as the python code, so the justification is that the system has a good performance in many scenarios as well.

			NFT - Risk Assessment						
S.No	Project Name	Scope/feature	Functional Changes	Hardware Changes	Software Changes	Impact of Downtime	Load/Volueм Changes	Risk Score	Justification
1	Gas Leakgae Monito	Existing	Low	No Changes	No Changes	Downtime due to server or ne	No Changes	GREEN	

Fig 8.1 User acceptance Testing

CHAPTER 9

RESULTS

A result is the final consequence of a sequence of actions or events expressed quantitatively.

9.1 PERFORMANCE METRICS

As intended, the MQ5 sensor does detect the gas and lets the Arduino UNO. The Arduino board efficiently sends the signal to the software. As we have programmed in the software, it does run the program and hence the output is seen as the buzzer sound is heard. Hence, the harmful gas can be distinguished by this monitor, alerted to the people in the industries, preventfrom danger and achieve a friendly and safety environment**.** These metrics are used to track and measure the effectiveness and profitability of various projects. Each stage of the project is tracked and measured against the goals that the project set out to achieve. The data compiled from the metrics can be used to plan future projects and gives insight on how to make projects more efficient. The gas detection system monitors the surroundings continuously and prevents further gas leakage. The IoT-powered gas leakage detection utilizes an MQ6 sensor for the same. It detects the malfunctioning of the pressurized gas system to prevent the accumulation of gasses so that the explosion does not happen.

CHAPTER 10

ADVANTAGES AND DISADVANTAGE

ADVANTAGES

- It is a cost effective, portable lightweight, friendly for user, efficient and simple monitoring unit for detecting gas in the industries.
- Monitored data are displayed in the Mobile Application.
- Highly efficient system.
- Response with quick reaction.
- Displaying the message on LCD.
- High Accuracy.

DISADVANTAGES

- The unstable connection between the cloud and mobile devices.
- High power and internet consumption.
- Accuracy of Location of leakage need to be carefully verified.

CHAPTER 11

CONCLUSION & FUTURE WORK

CONCLUSION

Thus, we would like to conclude that our system mainly focuses on industrial safety. This, provides significance in the safety department. Also, it leads to raise the economy, because when gas leaks it not only contaminates the atmosphere, but also wastage of gases will hurt our economy. Moreover, when the workers get affected, the job in the industry or factory cannot be continued, hence, affecting the economy. The need for ensuring safety in workplaces is expected to be the key driving force for the market over the coming years. Therefore, this detector solely can prevent and ensure safety.

FUTURE SCOPE

- In further feature such as alerting by sending messages directly to safety department and also making installation further more easier.
- The present gas spillage recognition framework can be additionally improved. For modern purposes, versatile robot can be produced for recognizing numerous gas fixations. Expansion of load cell can likewise be utilized as weight sensor which identifies the measure of gas in the chamber and furthermore recognizes high weight gas in barrel pipe, showing the alarm messages by means of SMS and LCD Displays.

CHAPTER 12

APPENDIX

SOURCE CODE

```
#include <LiquidCrystal.h>

LiquidCrystal lcd(6, 7, 8, 9, 10,
11); float gasPin = A0;
float
gasLevel;
int ledPin =
2;
int buttonPin =
3; int buzzPin
= 4; int
buttonState; int
fan = 5;

void setup(){
pinMode(ledPin,
OUTPUT);
pinMode(buttonPin, INPUT);
pinMode(gasPin,INPUT);
pinMode(fan,OUTPUT);
Serial.begin(9600);
lcd.begin(16, 2);
lcd.setCursor(0,0);
lcd.print(" Welcome");
lcd.setCursor(0,2);
lcd.print(" Youtube");
delay(500);
lcd.clear();
}
```

```
void loop(){
// Read the value from gas sensor and button gas Level = analog Read(gasPin);


button State = digitalRead(button Pin);


// call the function for gas detection and button
Swork gasDetected(gasLevel);
buzzer(gasLevel);
exhaustFanOn(buttonState
);
}


// Gas Leakage Detection & Automatic Alarm and Fan
ON void gasDetected(float gasLevel){
if(gasLevel >= 300){
digitalWrite(buzzPin,HIGH)
;
 digitalWrite(ledPin,HIGH)
; digitalWrite(fan,HIGH);
lcd.setCursor(0,0);
lcd.print("GAS:");
lcd.print(gasLevel);
lcd.setCursor(0,2);
lcd.print("FAN ON");
delay(1000);
lcd.clear();
}else{
digitalWrite(ledPin,LOW);
digitalWrite(buzzPin,LOW)
; digitalWrite(fan,LOW);
lcd.setCursor(0,0);
```

```
 lcd.print("GAS:");
 lcd.print(gasLevel);
 lcd.setCursor(0,2);
 lcd.print("FAN OFF");
 delay(1000);
 lcd.clear();
 }
 }
 //BUZZER
 void buzzer(float
 gasLevel){
 if(gasLevel>=300)
 {
 for(int i=0; i<=30; i=i+10)
 {
 tone(4,i);
 delay(400
 );
 noTone(4)
 S;
 delay(400
 );
 }
 }
 }
 // Manually Exhaust FAN ON
void exhaustFanOn(int
buttonState){ if(buttonState ==
HIGH){ digitalWrite(fan,HIGH);
lcd.setCursor(0,0);
lcd.print("Button State:");
lcd.print(buttonState);
lcd.setCursor(0,2);
```

```
lcd.print("FAN ON");
delay(10000);
lcd.clear();
}
}
```

GITHUB & PROJECT DEMO LINK

GITHUB LINK

https://github.com/IBM-EPBL/IBM-Project-461-1658302375

PROJECT DEMO LINK

https://youtu.be/W39yo7hAzdU