MAHENDRA INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

Mahendhirapuri, Mallasamudram,Namakkal- 637 503

Office of the Controller of Examinations

A PROJECT REPORT

Submitted by

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In partial fulfilment for the award of the degree

of

BACHELOR OF ENGINEERING

In

COMPUTER SCIENCE AND ENGINEERING

MAHENDRA INSTITUTE OF TECHNOLOGY

(AUTONOMOUS)

MAHENDHIRAPURI, MALLASAMUDRAM, NAMAKKAL- 637 503

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Departmentof Computer Science and Engineering

BONAFIDE CERTIFICATE

Certified that this project report **"IoT Based Specific Intelligent Fire Management System "** is the Bonafide work of our team**"GAUTHAM K(611619104033),GOKULAKRISHNAN A (611619104035),GOWTHAM A(611619104036), GOWTHAM S(611619104037) "**who carried out the project work under my supervision.

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…….	……
Internal Examiner	External Examiner

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CERTIFICATE OF PROJECT APPROVAL

This is to certify that the Project report titled **"IoT Based Specific Intelligent Fire Management System"** is the approved record of work done by **"GAUTHAM K (611619104033),GOKULAKRISHNAN A(611619104035), GOWTHAM A(611619104036), GOWTHAM S(611619104037)"**do in Partial fulfilment for the award of the Degree of B.E Computer Science Engineering during the academic year 2019-2023.

SUPERVISOR **HEAD OF THE DEPARTMENT**

Date: (Signature with seal)

Submitted for the end semester viva voce examination held on _____

Internal Examiner External Examiner

ACKNOWLEDGEMENT

We would like to take this opportunity to say our thanks to the people who have helped us make this project a reality.

We wish to express our sincere thanks to our honorable chairman, **Shri. M.G.Bharath Kumar B.Ed., M.A., M.I.S.T.E.,** of our Educational trust, Kalipatty andthe Managing Directors **Er.Ba.Mahendiran B.E.,** and **Er.Maha Ajay Prasad B.E.,** providing an extraordinary infrastructure.

We would like to express our sincere thanks to **Dr.T.Elango M.E., Ph.D.,** the principal of our college, for their kind encouragement and blessings to do this project.

We also thank **Dr.J.Stanly Jayaprakash M.E., Ph.D.,** Head of the Department, Department of Computer Science and Engineering for the encouragement, valuable suggestions and support in doing this project.

We would like to thank our project (**Divyabharathi G the Mentor and evaluator Durairam R),**Department of Computer Science and Engineering for the kind co-operative and support rendered in making our project as success.

We would like to say our sincere thanks to all other faculties, Department of Computer Science and Engineering for their active and kind guidance and advices for our project.

Above all we would like to express my sincere gratitude and thanks to our parents for their valuable comments and suggestions for making success

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ABSTRACT

The primary purpose of fire alarm system is to provide an early warning of fire so that people can be evacuated & immediate action can be taken to stop or eliminate of the fire effect as soon as possible. Alarm can be triggered by using detectors or by manual call point (Remotely). To alert/evacuate the occupants siren are used. With the Intelligent Building of the rapid development of technology applications, commercial fire alarm market demand growth, the key is to use the bus system intelligent distributed computer system fire alarm system, although installation in the system much easier than in the past , but still cannot meet the modern needs, the installation costs of equipment costs about 33% ~ 70. The suggested technique in Fire alarm system used the addressable detectors units besides using the wireless connection between the detector in zones as a slave units and the main control unit as the master unit. The system shall include a control panel, alarm initiating devices, notification appliances, and the accessory equipment necessary for a complete functioning fire alarm system. In the wireless fire alarm, individual units are powered by primary & secondary batteries for the communication.

1. INTRODUCTION

1.1 Project overview

Fire alarm systems are essential for the adequate detection and warning of a fire situation within commercial and residential premises. The detection, visual and audible requirements of a fire management system are dependent on the layout and use of the building. It is due to the diversity of these application that fire alarm panels and related accessories have been developed to meet these varying needs.

1.2 Purpose

A fire alarm system warns people when smoke, fire, carbon monoxide or other fire related or general notification emergencies are detected. A properly designed, installed, operated, and maintained fire alarm system can reduce the losses associated with an unwanted fire in any building. These losses include property and, more importantly, human life. The primary motivation for fire alarm system requirements in building and fire codes is to provide early notification to building occupants so they can exit the building, and to notify the fire service so it can respond to the fire. In settings such as hospitals the fire alarm system provides notification to staff so they can respond to the fire emergency. This module will explain the basic features of fire alarm systems and the inspection of these systems.

2. LITERATURE SURVEY

2.1 Existing problem

Fire monitoring systems have usually been based on a single sensor such as smoke or flame. These single sensor systems have been unable to distinguish between true and false presence of fire. Consuming energy all day long and being dependent on one sensor that might end with false alert is not efficient and environmentally friendly. We need a

system that is efficient not only in sensing fire accurately, but we also need a solution which is smart.

In order to improve upon the results of existing single sensor systems, the smart fire management system includes a Gas sensor, Flame sensor and a temperature sensor. This system also requires a proper network with individual smart devices connected to various panels.

2.2 References

[1] N N Mahzan, N I M Enzai, N M Zin and K S S K M Noh,"Design of an Arduino-based home fire alarm system with gSM module", 1st International conference on green and Sustainable computing (ICoGeS), 2017.

[2] ZHANG Ying-Cong, YU Jing, "Study on the Fire IOT Development Strategy", Shenyang Fire Research Institute --Radiant Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling, US: ANSI/FMRC, pp. FM32602004.

[3] Public Security, Shenyang 110034, China Shenyang Institute of Engineering, Shenyang 110136, China, 2019. Liu Yunhong Qi Meini,"The Design of Building Fire Monitoring System Based on ZigBee-WiFi Networks", Eighth International
Conference on Measuring Technology and Mechatronics Automation, IEEE, 2016, pp-733-735

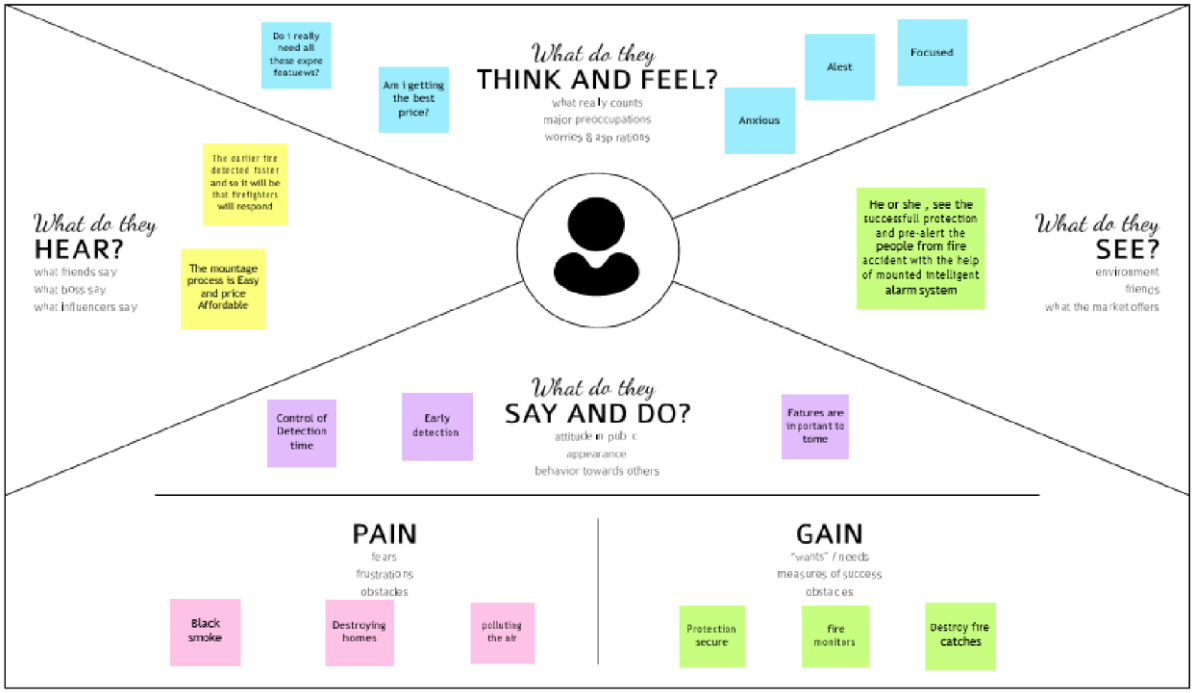
[4] R.A. Sowah, A.R. Ofoli, S.N. Krakani, S.Y. Fiawoo, hardware Design and Web-Based Communication Modules of a Real-Time multisensor Fire Detection and Notification System Using Fuzzy Logic, IEEE Transactions on Industry Applications, 53 (2016) 559-566.

2.3 Problem Statement Definition

Industry Specific Intelligent fire management system are designed to prevent fire accidents due to Gas leakage and flame in industry.

3. IDEATIOIN AND PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation and Brainstorming

1

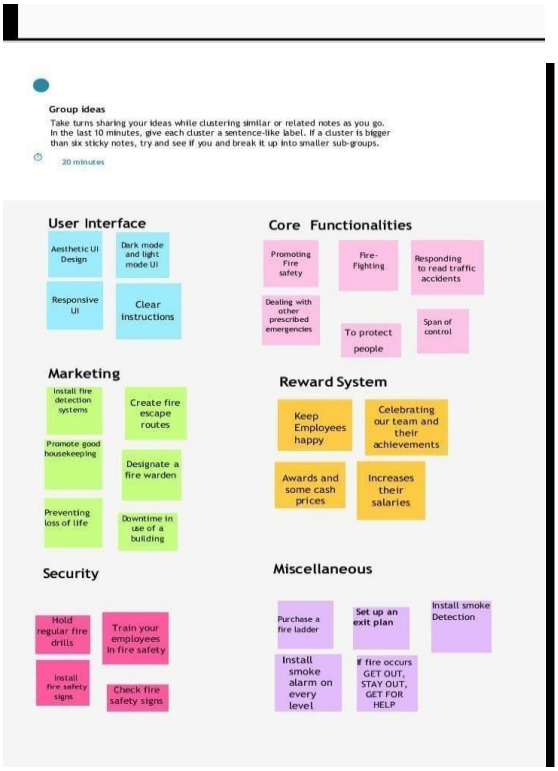
Define your problem statement

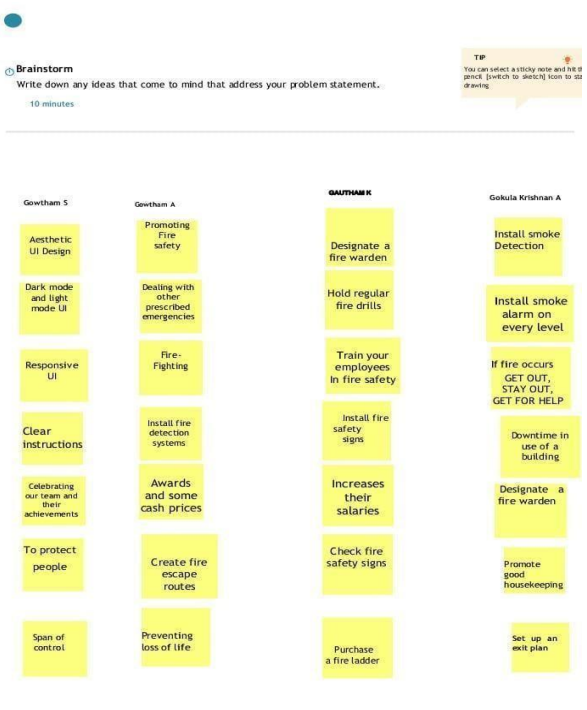
What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLEM

How might we help people from fire management system ?

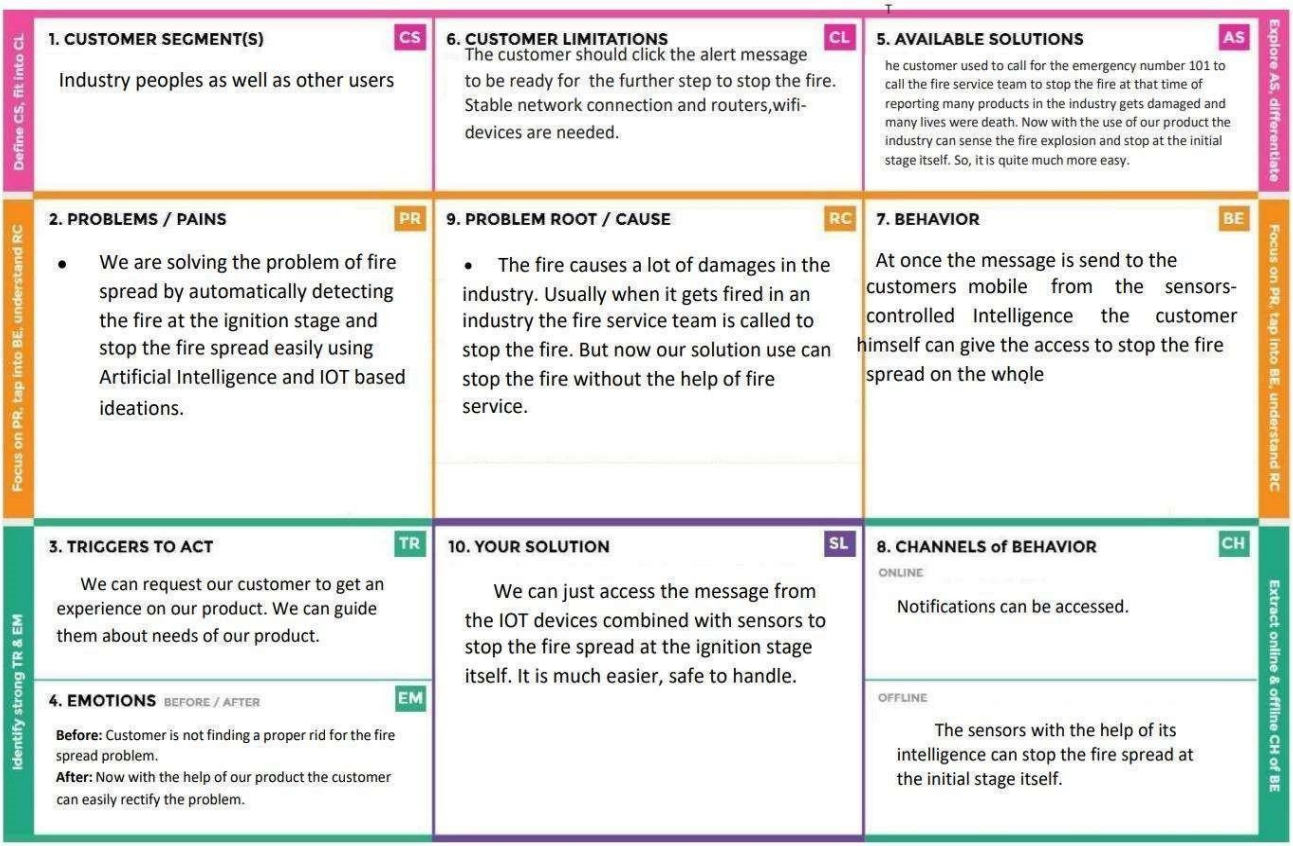




3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	1) We are ready to solve the unintended fire explosion in the industry level. 2) The smart fire management system includes a Gas sensor, Flame sensor and temperature sensors to detect any changes in the environment.
2.	Idea / Solution description	1) The exhaust fans are activated if the temperature readings exceed the threshold. 2) Sprinklers will be activated in the event of a flame detection. 3) An alarm will be activated to notify employees. 4) In the event that the flame cannot be contained, a message will be sent to the fire station along with the location.
3.	Novelty / Uniqueness	By using Latest Technology Artificial Intelligence to answer and solve the fire explosion without Human presence.
4.	Social Impact / Customer Satisfaction	It serves of value to users, Fire detection systems increase response times, as they are able to alert the correct people in order to extinguish the fire.
5.	Business Model (Revenue Model)	1) Fire detection systems can be connected to sprinklers that will automatically respond when a fire is detected. 2) We can learn more about how changes in one aspect of management can affect other aspects.
6.	Scalability of the Solution	1) The System is completely modular make it expandable and business efficiency in customized fire detection, with affordable price. 2) This can be used in any kind of industry.

3.4 Problem Solution Fit



4.REQUIREMENT ANALYSIS

4.1Functional requirement

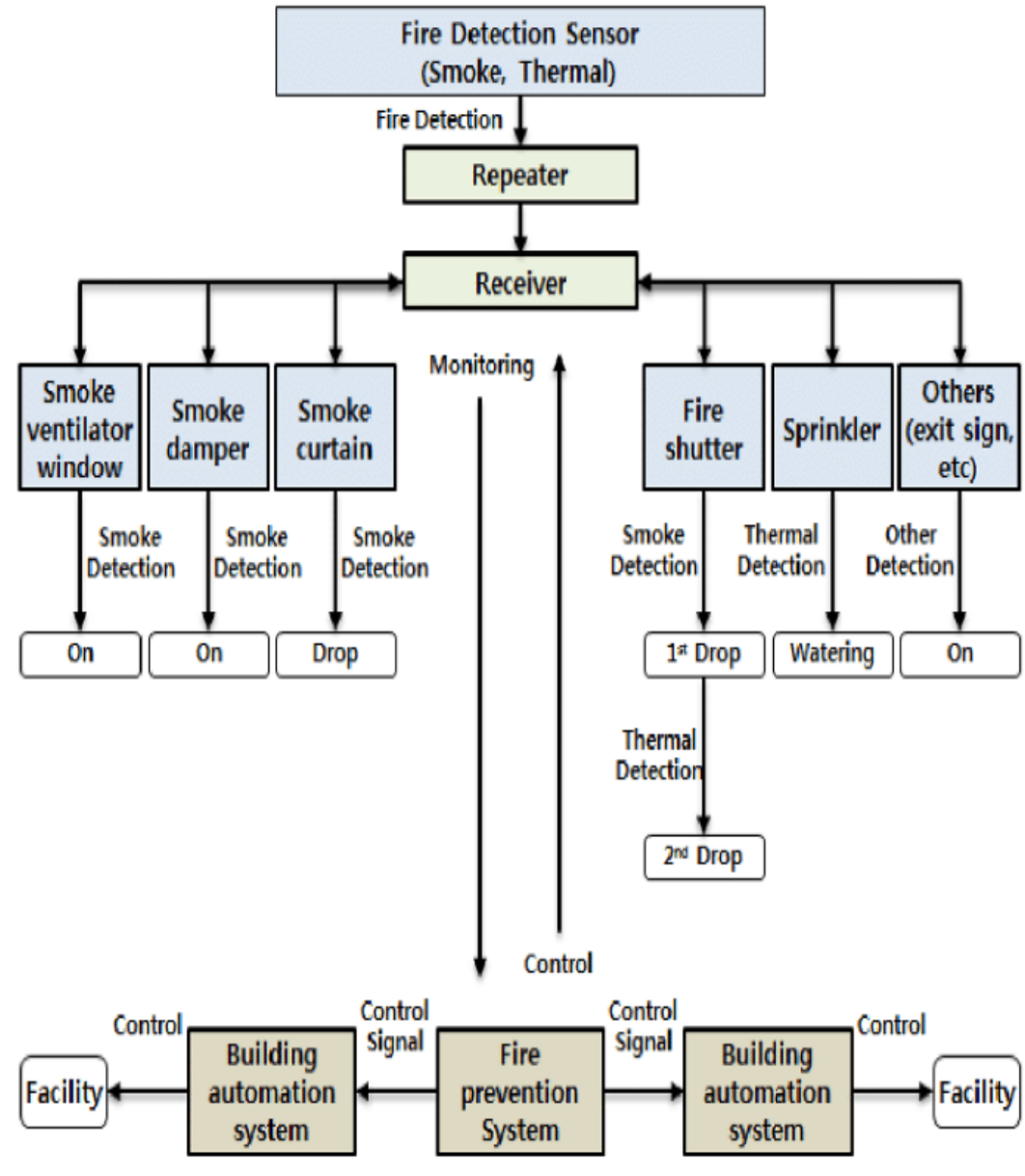
FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through website or application Registration through Social medias Registration through LinkedIN
FR-2	User Confirmation	Verification via Email or OTP
FR-3	User Login	Login through website or App using the respective username and password
FR-4	User Access	Access the app requirements
FR-5	User Upload	User should be able to upload the data
FR-6	User Solution	Data report should be generated and delivered to user for every 24 hours
FR-7	User Data Sync	API interface to increase to invoice system

4.2 Non-Functional requirement

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Usability requirements includes language barriers and localization tasks. Usability can be assessed by Efficiency of use.
NFR-2	**Security**	Access permissions for the particular system information may only be changed by the system' s data administrator.
NFR-3	**Reliability**	The database update process must roll back all related updates when any update fails.
NFR-4	**Performance**	The front-page load time must be no more than 4 seconds for users that access the website using an VoLTE mobile connection.
NFR-5	**Availability**	New module deployment must not impact front page, product pages, and check out pages availability and mustn't take longer than one hour.
NFR-6	**Scalability**	We can increase scalability by adding memory, servers, or disk space. On the other hand, we can compress data, use optimizing algorithms.

5.PROJECT DESIGN

5.1 Data Flow Diagram



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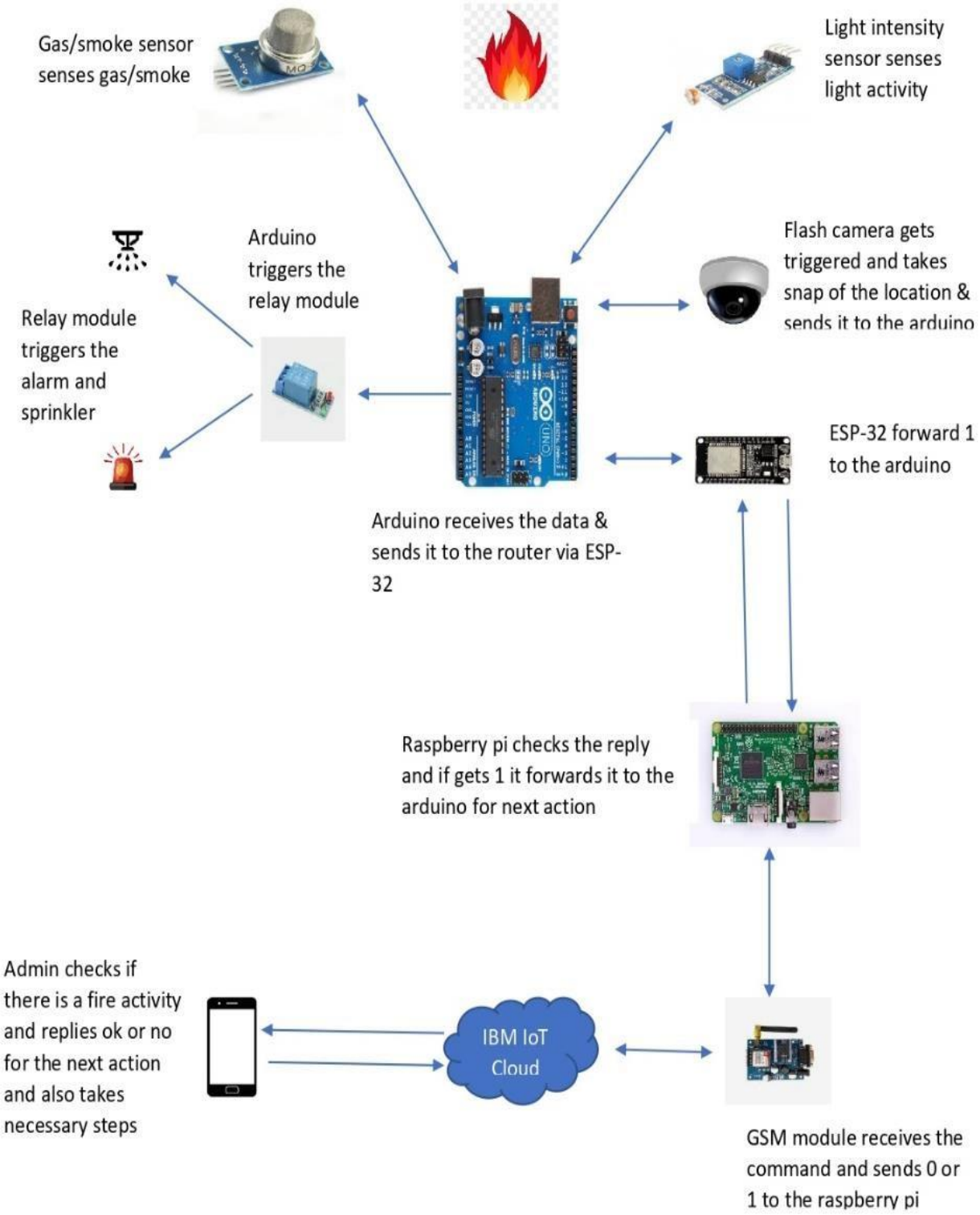
5.2Solution Architecture



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5.3 User Stories

User Type	Functional requirement	User story number	User story/task	Acceptance criteria	Priority	Release
Customer (Mobile user, Web user, Care executive, Administrator)	Registration	USN-1	As a user, I can register for the application by entering my mail, 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
	Dashboard	USN-3	As a user, I can register for the application through internet	I can register & access the dashboard with Internet login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can confirm the registration in Gmail	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	I can login with my id and password	High	Sprint-1

X

6.PROJECT PLANNING &SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority
Sprint-1	Resources Initialization	We have to create and initialize accounts in various public APIs like OpenWeatherMap API.	1	LOW
Sprint-1	Local Server/Software Run	Write a Python program that outputs results given the inputs like weather and location through the software	1	MEDIUM
Sprint-2	Push the server/software to cloud	Push the code from Sprint 1 to cloud so it can be accessed from anywhere	2	MEDIUM
Sprint-3	Hardware initialization	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	2	HIGH
Sprint-4	UI/UX Optimization & Debugging	Optimize all the shortcomings and provide better user experience.	2	LOW

7.CODING &SOLUTIONING

7.1 Feature 1

- IoT device
- IBM Watson Platform
- Node red
- Cloudant DB
- Web UI

- MIT App Inventor
- Python code

7.2 Feature 2

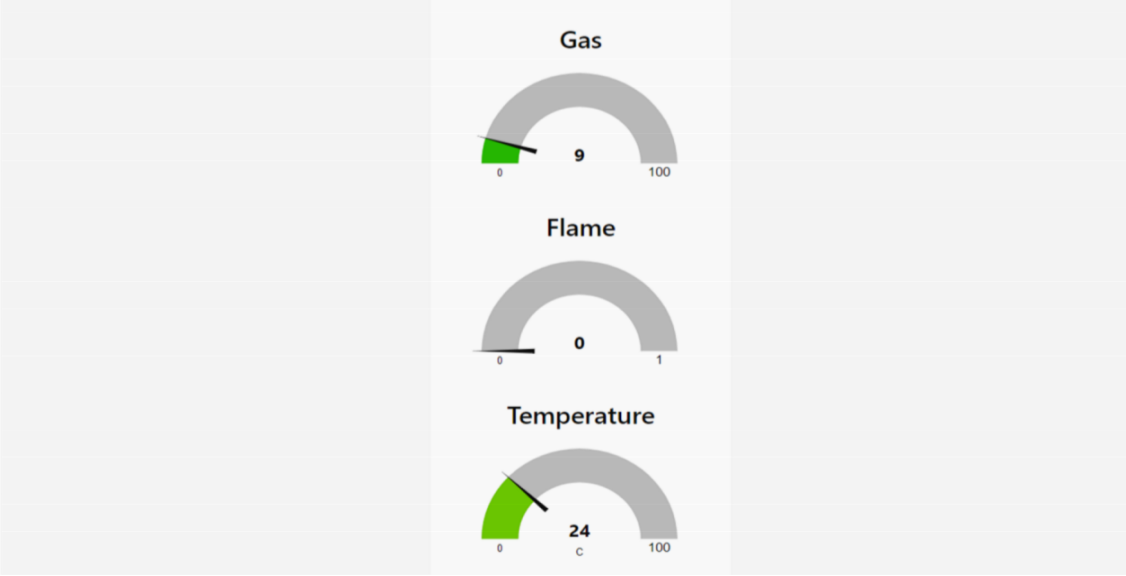
- Login
- Wokwi

8.TESTING AND RESULTS

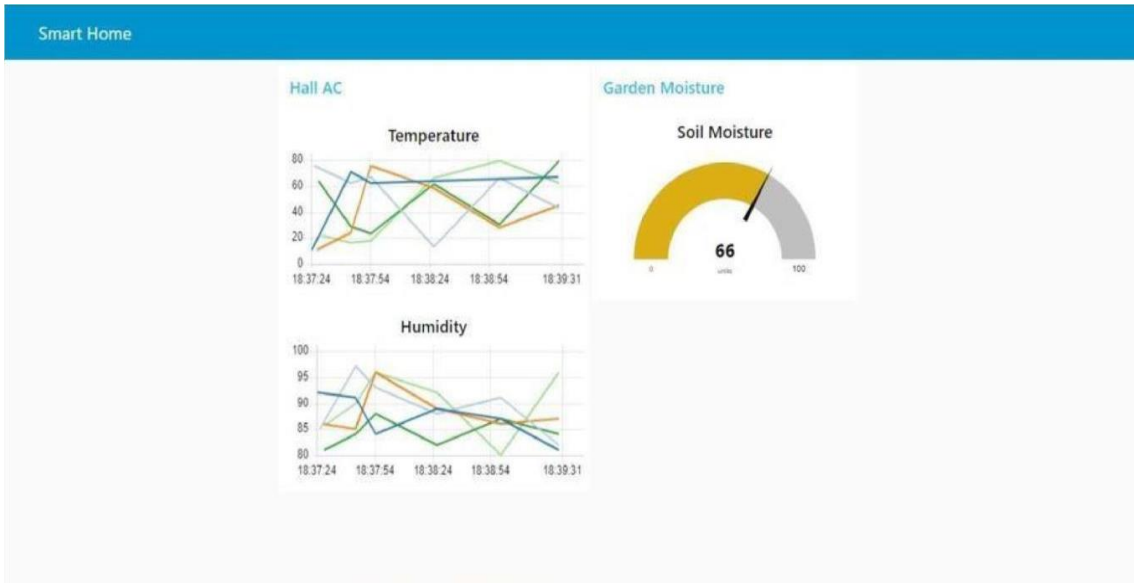
8.1 Test

Cases Test

case 1:



Test case 2:



9.ADVANTAGES

- This will reduced installation cost.
- It will monitor 24/7.
- Improved security in homes, industries and Offices.
- It pin points location of the fire.
- It will also reduce the use of chemicals and water due to the identification of exact fire region

10.DISADVANTAGES

- Heat detectors are not considered as life saving devices because they are sensitive only to heat.
- High battery or current consumption will need for these detectors.
- Control pannel may need to be replaced if it becomes damaged.
- Some times the over temperature leads to misunderstand as fire.

11.CONCLUSION

This gas leakage system can be applied for household safety and many other applications in the industry . Gas leakages and fire outbreaks in industries as well as houses have lead to wide destruction and losses

in the past. Gas leakages and fire outbreaks both spread widely and lead to even greater loss of life and property if proper action is not taken on time. So here we proposed a system that detects gas as well as fire outbreaks and alert us accordingly so that proper action may be taken to control it.

12.FUTURE SCOPE

Smoke detectors and alarms are migrating from just the detection of smoke, to combination detectors and multicriteria detector. The future will be with multicriteria detection in which the detector will be more of a sensor, with the detection more for the products of combustion, such as carbon monoxide, carbon dioxide,sulfur dioxide ,nitrogen dioxide in addition to heat and particulate matter. Within the next decade, video image detection (VID) will become more mainstream in which, through analytics, the image of either smoke or flame will be able to be isolated and detected from within a room or space. The VID system would also be able to detect if an individual is within the space and through the integration with the notification appliances, provide a path of exit.

13.APPENDIX

13.1 Source Code

```
#include <WiFi.h>//library for wifi
#include <PubSubClient.h>//library for MQtt
#include "DHT.h"// Library for dht11
#define DHTPIN 15     // what pin we're connected to
#define DHTTYPE DHT22   // define type of sensor DHT 11
```

#define LED 2

DHT dht (DHTPIN, DHTTYPE);// creating the instance by passing pin and typr of dht connected

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength);

//-------credentials of IBM Accounts------

#define ORG "i3869j"//IBM ORGANITION ID

#define DEVICE_TYPE "abcd"//Device type mentioned in ibm watson IOT Platform

#define DEVICE_ID "1234"//Device ID mentioned in ibm watson IOT Platform

#define TOKEN "12345678" //Token

String data3; float h, t;

//-------- Customise the above values --------

char server[] = ORG ".messaging.internetofthings.ibmcloud.com";// Server Name char publishTopic[] = "iot-2/evt/Data/fmt/json";// topic name and type of event
perform and format in which data to be send char subscribetopic[] = "iot2/cmd/command/fmt/String";// cmd REPRESENT command type AND COMMAND IS TEST OF FORMAT STRING

char authMethod[] = "use-token-auth";// authentication method char

token[] = TOKEN; char clientId[] = "d:" ORG ":" DEVICE_TYPE ":"

DEVICE_ID;//client id

X

//--

```
WiFiClient wifiClient; // creating the instance for wificlient
PubSubClient client(server, 1883, callback ,wifiClient); //calling the predefined client id by passing parameter like server id,portand wificredential


void setup()// configureing the ESP32
{
  Serial.begin(115200);
dht.begin();
  pinMode(LED,OUTPUT);
  delay(10);
Serial.println();
wificonnect();
mqttconnect();
}

void loop()// Recursive Function
{

  h                    =
dht.readHumidity();
t                      =
dht.readTemperatur
e();
  Serial.print("temp:");
  Serial.println(t);
  Serial.print("Humid:");
  Serial.println(h);
```

X

```
  PublishData(t, h);
delay(1000);   if
(!client.loop()) {
```

```
  }
   mqttconnect();

}



/.....................................retrieving to Cloud................................./

void PublishData(float temp, float humid) {
mqttconnect();//function call for connecting to ibm
 /*      creating the String in in form JSon to update the data to ibm cloud
 */
 String payload = "{\"temp\":";
payload += temp;   payload += ","
"\"Humid\":";   payload +=
humid;   payload += "}";



 Serial.print("Sending payload: ");
 Serial.println(payload);



 if (client.publish(publishTopic, (char*) payload.c_str())) {
   Serial.println("Publish ok");// if it sucessfully upload data on the cloud then it
will print publish ok in Serial monitor or else it will print publish failed   } else
{
```

```
  }
    Serial.println("Publish failed");



}



void mqttconnect() {    if (!client.connected())
{
   Serial.print("Reconnecting client to ");
Serial.println(server);      while (!!!client.connect(clientId,
authMethod, token)) {       Serial.print(".");
delay(500);
    }
     initManagedDevice();
     Serial.println();
  } }
void wificonnect() //function defination for wificonnect
{
  Serial.println();
  Serial.print("Connecting to ");


  WiFi.begin("Wokwi-GUEST", "", 6);//passing the wifi credentials to establish
the connection    while (WiFi.status() != WL_CONNECTED) {      delay(500);
    Serial.print(".");


  Serial.println("");
```

```
  }
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  Serial.println(WiFi.localIP());
}

void initManagedDevice() {   if
(client.subscribe(subscribetopic)) {     Serial.println((subscribetopic));
    Serial.println("subscribe to cmd OK");
  } else {
    Serial.println("subscribe to cmd FAILED");
  }
}

void callback(char* subscribetopic, byte* payload, unsigned int payloadLength)
{

  Serial.print("callback invoked for topic: ");
Serial.println(subscribetopic);   for (int i =
0; i < payloadLength; i++) {
//Serial.print((char)payload[i]);     data3 +=
(char)payload[i];
  }
  Serial.println("data: "+ data3);
```

```
  }
  if(data3=="lighton")
  {
Serial.println(data3); digitalWrite(LED,HIGH);
  }   else
  {
Serial.println(data3); digitalWrite(LED,LOW);
  } data3="";
}
```

13.2 GitHub GitHub

Link:

IBM-EPBL/**IBM-Project 29626-1660127853**