INDUSTRY-SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM

NAALAIYA TIRAN PROJECT BASED LEARNING ON PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

A PROJECT REPORT

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(Accredited by NAAC with 'A' Grade)

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NOVEMBER 2022

BONAFIDE CERTIFICATE

Certify that the project report"**INDUSTRY-SPECIFIC INTELLIGENT FIRE MANAGEMENT SYSTEM"**is the bonafide record of a Nalaiya Thiran workdone by **DHINESH KUMAR.K(611819104010), MOHAN.R (611819104028), NIKESH.S(611819104031),UDHAYA KUMAR.K (611819104053)** who carried out the research under my supervision.

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Submitted for the Nalaiya Tiran Project Report Held on ……..

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INTERNAL EXAMINER **EXTERNAL EXAMINER**

ACKNOWLDGEMENT

At this pleasing moment of having successfully completed my Project, I wish to convey our sincere thanks and gratitude to our beloved Chairman, **Dr.P.SELVAM, M.A., B.Ed., M.Phil., Ph.D.,** who provided all the facilities And support tome.

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Last but not least the whole thing will be incomplete we don't acknowledge our beloved Parents who are everything for us.

DHINESH KUMAR.K

MOHAN.R

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UDHAYA KUMAR.K

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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. [HussamElbehiery. Developed Intelligent Fire alarm system. J Am Sci 2012;8(8):1016-1024]. (ISSN: 1545- 1003). http://www.jofamericanscience.org. 151

1.Keywords: Fire alarm systems, Fire Fighting systems, Building Management System,RF wireless, Smoke Detectors, Heat detectors, and embedded system.

CHAPTER 1

1. INTRODUCTION

1.1. Project Overview

A gas, flame, and temperature sensor is part of the smart fire management system to monitorany modifications in the environment. Based on the temperature data and the presence of any gases, the exhaust fans are turned on. The sprinklers will automatically turn on if a flame is found. The Fire Station and the authorities receive emergency alerts. An microcontroller ESP32 based house fire management system using a WiFi Module is described in this paper. An Microcontroller ESP32 based house fire alarm system using a Wi-fi Module is described in this paper. The project's primary goal is to keepindustries and their belongings safe from fires, which are a common hazard in industrial areas. It uses an ESP32 microcontroller with wifi connectivity.ESP32 can interface with other systems to provide WI-FI functionality through its SPI\SDIO and I2C/UART. The fire's heat is detected by a temperature sensor. The WI-FI module will send an alert notification to the user's mobile phone. A warning message or an alert message will be sent to the user's phone when the temperature rises above 35C.

It also send alert notification sounds because when people busy with their other works they can recognize the alert notification when it is in yhe form of voice. Here ,we have used WOKWI ,a simulation software to connect temperature sensor with microcintreoller which is ESP32.Then we have used IBM WATSON IOT PLATRFORM as a cloud platform to store temperature values .And then we created a software mobile application to display the temperature values and to indicate alert notification using MIT APP INVERTER.Then node red service used to connect IBM WATSON IOT to MIT APP INVERTER. This device can assist users enhance their safety standards by providing an early response in the event of a potential accident. Finally, users will be able to protect themselves, as well as those they care about, from the disaster so that industry can be prevented from huge loss.

1.2.purpose

Their alert notification in the building and to the fire department detect fires and alert building occupants, giving them ample time to evacuate in an orderly fashion.While alert notification and sirens don't actively put out fires, they alert the people who can. The fire control process begins with automatic water sprinkler.Monitored fire alarm systems automatically notify emergency responders and fire trucks dispatch to your location without delay. The faster these responses happen, the sooner the fire is extinguished and the less damage your industry sustains.Less industry damage means shorter downtime until you can reopen for business. This cuts your losses from the fire even more, allowing you to return to business as usual before

long. Most insurance carriers offer discounted rates on business insurance policy premiums if you have a code-compliant fire alarm system. In fact, some providers require you to install a fire alarm before they will insure your business.If you want to avoid fees and embarrassing PR problems, avoid getting caught up in code-compliance issues. One way to do this is to install a fire alarm in your commercial building.Fire alarm system saves many number of valuable properties and important documents in the industry.It also saves many human lives and high rated machineries in the industry.This is very essential thing need to be installed in all the industry to save valuable properties. The number one reason to install a fire alarm is to make the building safe for your employees, customers, and tenants.

CHAPTER 2

2.LITERATURE SURVEY

IOT BASED FIRE DETECTION AND AUTOMATIC WATER
SPRINKLER SYSTEM
Published year: 2022
Author name: D Teja,M.Suraj khan,k Jyothi
Journal name: International journal of engineering applied science and technology
Summary: In this paper, Fire detection systems, particularly vision-based systems, identify flames before any loss or destruction occurs. In this model, a novel vision-based technology is created that uses a camera to detect flames over long distances. An immediate alert is generated on android application. The goal of the proposed system is to notify the remote user when a fire accident occurs. By using camera method, the report is automatically generated and delivered to the person immediately following the fire is detected in any part of the frame using Wi-Fi/GSM.
Methodology: Following the detection of a fire, our technology will take real-time photos of the surrounding area. The flame sensor determines whetheror not there is a fire or flame present.A photo transistor is used in this explicit flame detector.

The infrared spectral band is used by flame detection systems. Carbon dioxide, which is produced by the combustion of organic compound materials, has a resonance frequency in this range. Put anything that can catch fire in front of the flame sensor. The flame sensor is triggered when it detects a fire or flame. As temperature increases the temperature sensor will detect and it will trigger the buzzer and buzzer will blow.

The water pump is connected to a IC. If a flame is detected, IC activates the dc motor and water pump. The sprinklers connected to the pump will sprinkle the water throughout the fire affected area.

Fire Detection, Monitoring and Alerting System based on IOT :
Published year: 2019
Author name : Shreya Gosrani, Abhishek Jadhav, Krutika Lekhak D Chheda
Journal name: International Journal of Research in Engineering, Science and Management.
Summary: Internet of Things refers to connecting things and people through internet, it has

imposed itself as the New business practices in different sectors. To make quick and efficient response in real time, IoT enhances the communication to make use of those assets. In this paper it is proposed that way and provides emergency managers with the necessary information and a quick response for fire hazards is evaluated and examined by using IoT based model. Fire is one of the major reasons of accidental deaths in the world. To implement this proposed system a low-cost Wi-Fi module, gas detection sensor, Flame detection sensor, buzzer to alert and temperature sensors are used.

The sensors detects and alerts the local emergency with the data collected by the system, and alerts organizations like fire departments, police stations and hospitals by sending the exact location to both user and operator through module which all are well connected with.
Methodology: IoT framework concentrates on public safety and livelihood service sector The fire detecting system with IoT standardized design methods The spark Detection sensor PT333B is used to sense the spark, the Flammable gas sensor MQ-6 is used to detect the gases like LPG/LNG and the GPS module is to obtain device location. These sensors along with Wi-Fi micro-controller are connected via Internet.

Paper 3: IoT Based Automatic Fire Alarm System
Published year: 2020
Author name: A.Jeevanandham, SivamuruganP
Journal name: Bulletin of scientific research
Summary: Fire identifiers are utilized to recognize the fire or smoke at a beginning time and can help in sparing lives. Right now, IOT based alarm has been planned utilizing temperature .
By utilizing the temperature sensor, smoke sensor and there is a simple to advanced convertor, which changes over the simple signs got at the sensor end to computerized and afterward transmits them to a smaller scale controller and to the Arduino. The small-scale controller is modified to turn on the ringer, when the temperature and the smoke arrive at an edge esteem. Simultaneously, Arduino sends the information to the Wi-Fi module ESP8266. ESP8266 will then the accompanying information to the IOT site, where, approved individuals can take fitting measure so as to check the fire. The gadget id is the one-of-a-kind id given to a gadget, which would enable the work force to get data identified with the area, where the fire is detected

Methodology: Iot must be self-contained for searchoperation, decision making based on the real-time data orcurrent condition (object detection), intelligent decision(software program) for the immediate surrounding environment or condition is to perform the task or mission.

2.1.Existing Problem

The scenario is not optimal since fire management systems in homes and corporation slack advanced processing and features ,such as an automatic alarm system for administration and authorities, and are not very dependable ,efficient, or cost-effective .They are deploying out dated fire protection technologies that can't even turn on the sprink system and can't effectively communicate with one an other to avoid false alerts. Applications are used to analyse the overall structure as well.

2.2..Reference

Rehman A, Qureshi MA, Ali T, Irfan M, Abdullah S, Yasin S, Draz U,Glowacz A, Nowakowski G, Alghamdi A,AlsulamiAA. Smart Fire Detection and Deterrent System forHuman Savior by Using Internet of Things(IoT).Energies.johnsaidaN,RahulLV,ShaliniT.IOTBasedSmartFireEmer gency Response System. International Journal for Advance Research and Development.

Mani V, Abhilasha G, Lavanya S. Iot based smart energymanagement system. International Journal of Applied Engineering Research.

WehmeierG,MitropetrosbK.Fire protectioninthechemical industry.CHEMICALENGINEERING. Zhang YC, Yu J. A study on the fire IOT development strategy. Procedia Engineering

SchultzCA,MclntyreKB,CyphersL,KooistraC,EllisonA,MoseleyC.Policydesigto support forestrestoration: The value offocused investment and collaboration.

MontorioR, Pérez-Cabello F, Alves DB, García- Martia.Unit emporal approach to fires everitym aping usingm ul tispecural synthetic databases and Random Forests. Remote Sensing of Environment.

Wehbe R, ShahrourI. A BIM-Based Smart Systemfor Fire Evacuation. Future Internet.

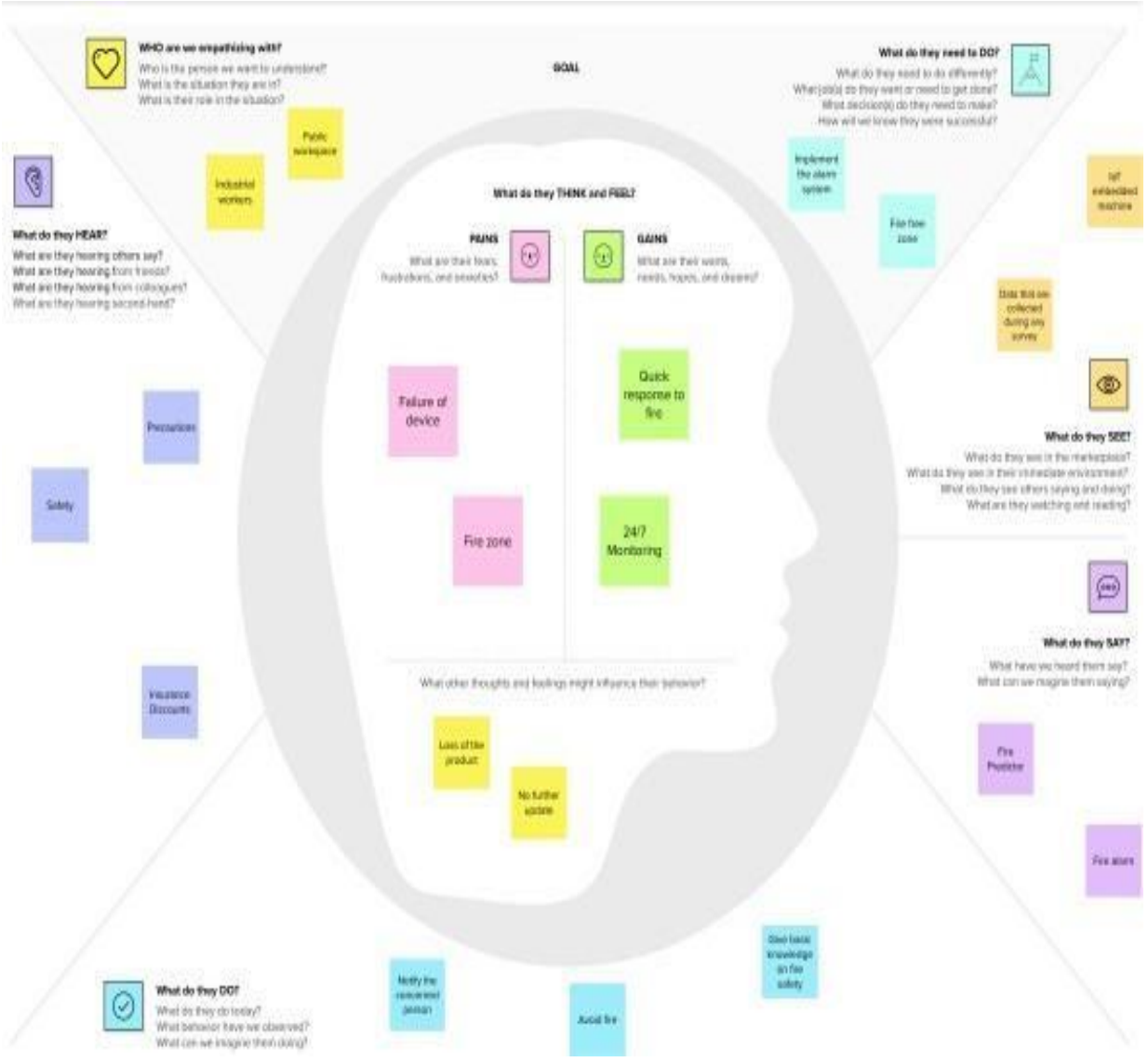
2.3.Problem Statement Definition

Many buildings still use outdated fire safety systems that cannot even activeate the sprinkler system ,and they all improperly communicate with one another to prevent false alarms. The fire management systems in home sand business are not very dependable ,efficient ,or cost-effective ,and the lack any feature slik automatical systems for adminand authories.

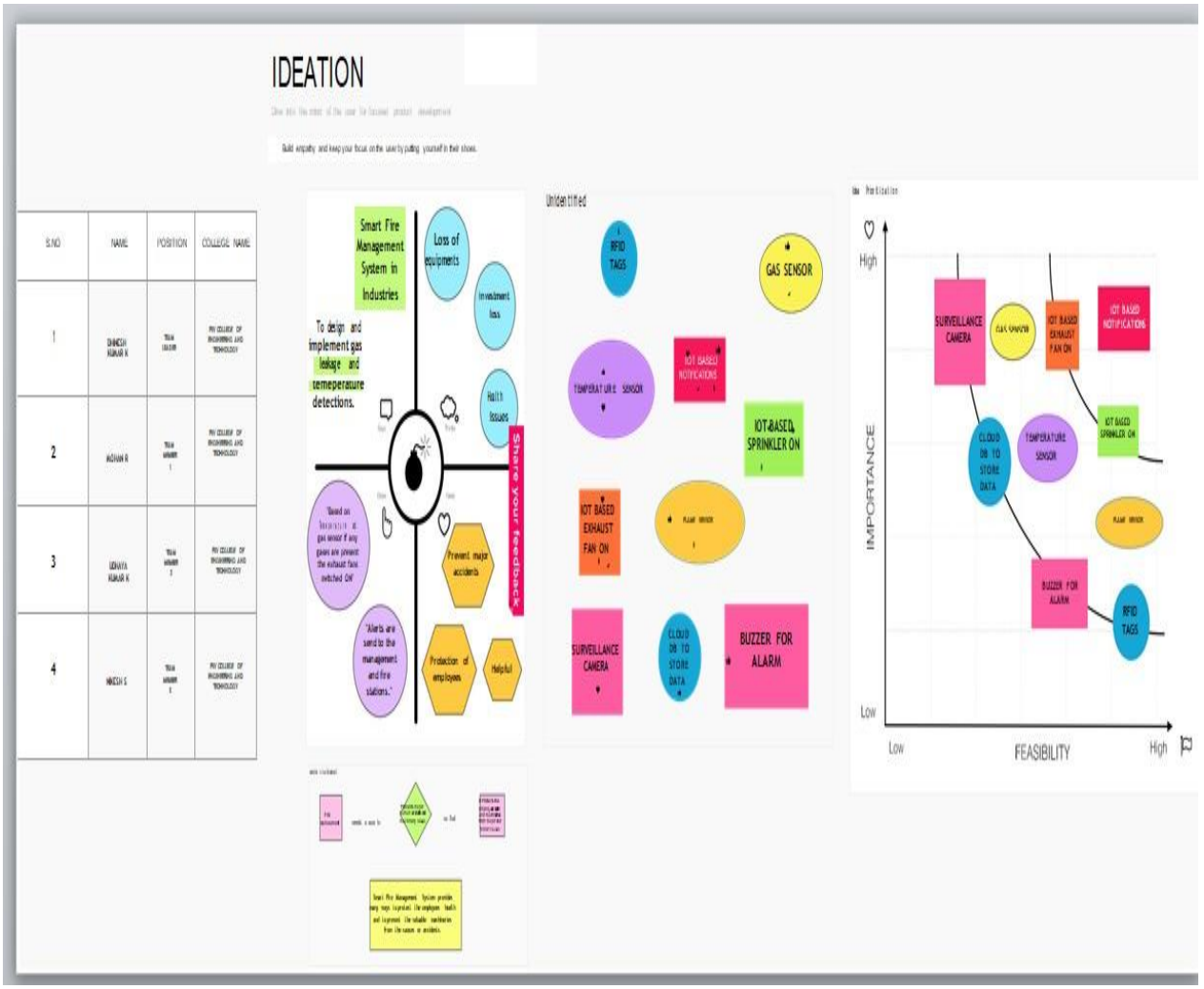
.CHAPTER 3

3.IDEATION&PROPOSEDSOLUTION :

3.1 EmpathyMap Canvas:



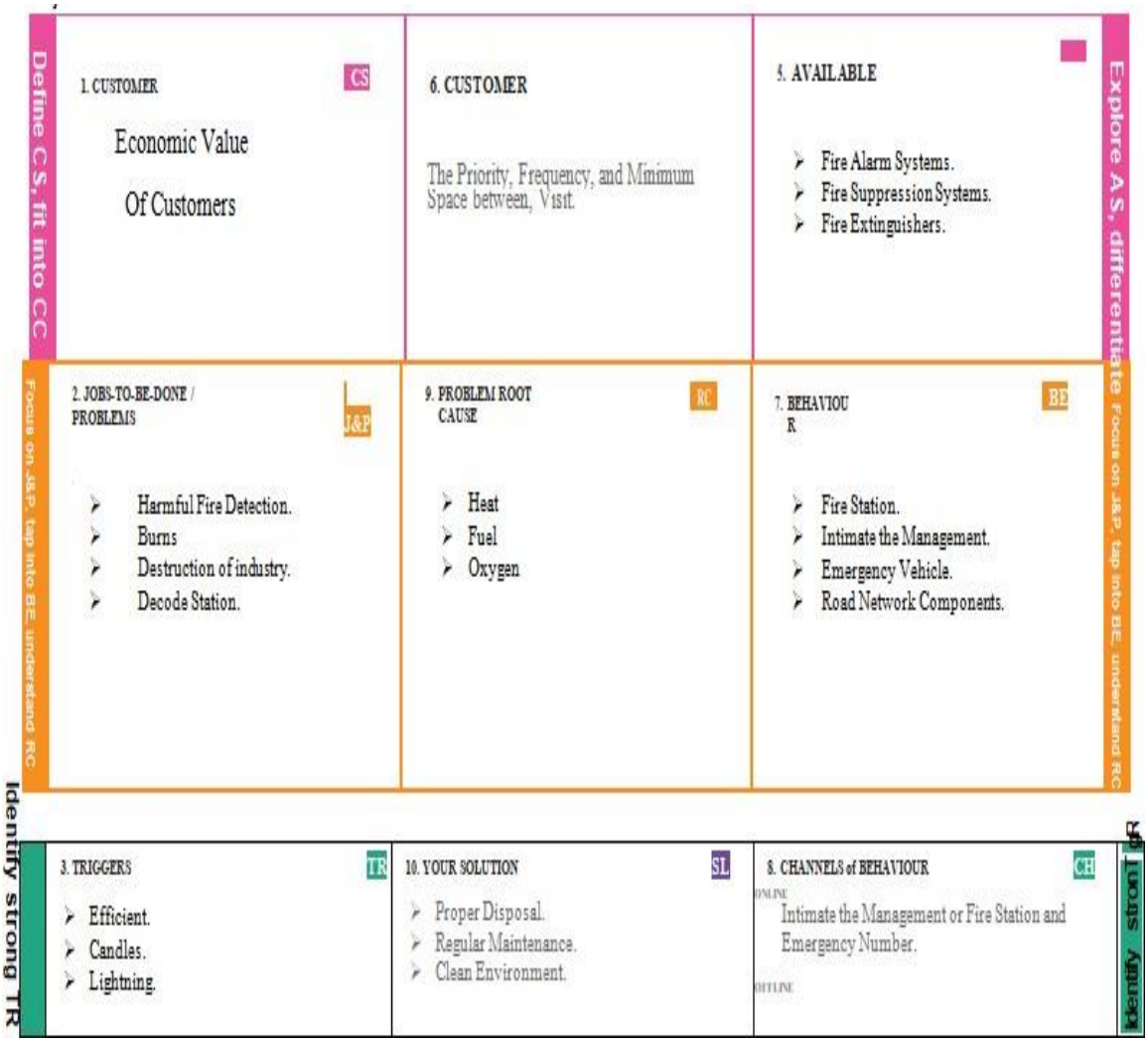
3.2 Ideation

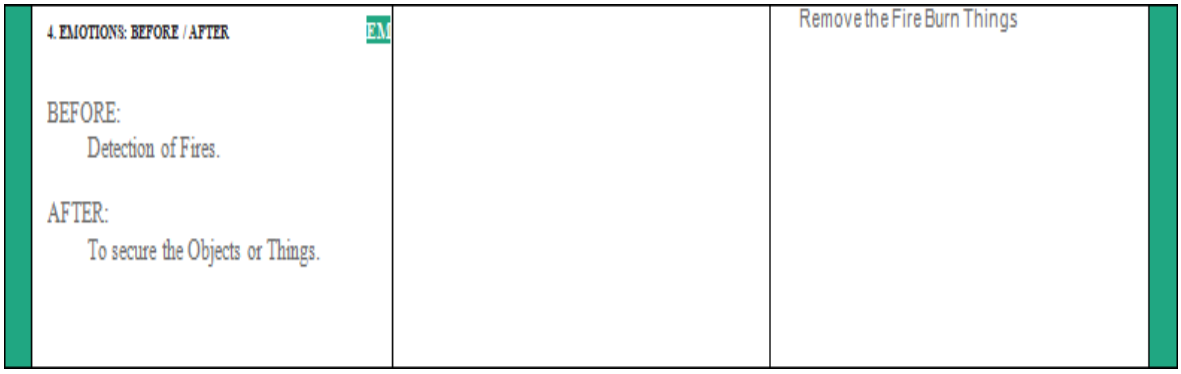

IDEATION
Build empathy and keep your focus on the user by putting yourself in their shoes.
S.NO
NAME
POSITION
COLLEGE NAME
Smart Fire Management System in Industries
To design and implement gas leakage and temeperature detections.
Loss of equipments
Investment loss
Health issues
Prevent major accidents
Helpful
Protection of employees
"Alerts are send to the management and fire stations."
Share your feedback
Unidentified
RFID TAGS
GAS SENSOR
TEMPERATURE SENSOR
IOT BASED NOTIFICATIONS
IOT BASED SPRINKLER ON
IOT BASED EXHAUST FAN ON
SURVEILLANCE CAMERA
CLOUD DB TO STORE DATA
BUZZER FOR ALARM
IMPORTANCE
FEASIBILITY
High
Low
Low
High

3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To create a smart industry-specific fire management system using IoT. It should have all the basic features for handling fire and report the incident to the fire department
2.	Idea / Solution description	Our solution is to provide a reliable smart fire management system that consists of exhaust fans, and sprinklers. We also ensure the proper working of sprinklers with flow sensors and check the water level for easy maintenance. It also sends periodic data to the safety sector in the company, in case of a negative situation it sends an alert to the fire department. The toxic gases and excess hydrogen and oxygen from water vapour are redirected towards outdoors by using an exhaust fan to avoid further combustion or spreading of flames by those gases.
3.	Novelty / Uniqueness	As a sprinkler gives an instant and efficient way to put down fire, we need to check the water source and the connection to it with the sprinkler this increase additional work and maintenance. This is solved by our smart system
4.	Social Impact / Customer Satisfaction	This gives a simple and powerful system making the focus and time more towards safety and not maintenance. This cuts the cost spend on maintenance, as it can be invested in other sectors.
5.	Business Model (Revenue Model)	It will cost an installation fee then the cloud and maintenance of the devices are handled in the subscription model. An additional scaling fee is also charged
6.	Scalability of the Solution	In medium or large-scale industries it is scalable. They can add any number of devices which are handled coherently in the cloud.

3.4 Problem Solution fit





CHAPTER 4

4.REQUIREMENTANALYSIS

4.1.Functional requirement

These are the requirements that the end user specifically demands as basic facilities that the system should offer. All these functionalities need to be necessarily incorporated into the system as a part of the contract. These are represented or stated in the form of input to be given to the system, the operation performed and the output expected. They are basically the requirements stated by the user which one can see directly in the final product, unlike the nonfunctional requirements.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email
FR-3	Interfacing with hardware	Interface the sensors with the software application so as to alert the farmers in case of any harm for crops
FR-4	Database Connection	Databases are retrieved from IBM Cloud ant
FR-5	Mobile Application	Alarm and motors can be accessed from the mobile app

4.2. Non Functional requirements

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The smart crop protection alerts the farmers in case of any obstacles and helps in protecting the crops
NFR-2	**Security**	Smart Agriculture can improve the farming practices and maintain sustainable production of crops especially by preventing the animals into the agricultural lands through IOT enabled devices.
NFR-3	**Reliability**	With a proper power supply, SD card and programming the processor should be able to run24/7 for years. The SD card and power supply will likely wear out faster than the Pi.
NFR-4	**Performance**	Usage of an SD card module that helps to store aspecified sound to scare the animals. Crop damage due to animal attack can be sensed. Network and Design Evaluation
NFR-5	**Availability**	Agriculture for different variety of crops is based on the monsoon changes, indoor and outdoor climatic temperatures, availability of rainfall and irrigation methods.
NFR-6	**Scalability**	The product shall be made available to everyone especially in remote areas for better efficiency of crop yield with the better safety of crops as well asthe farmers.

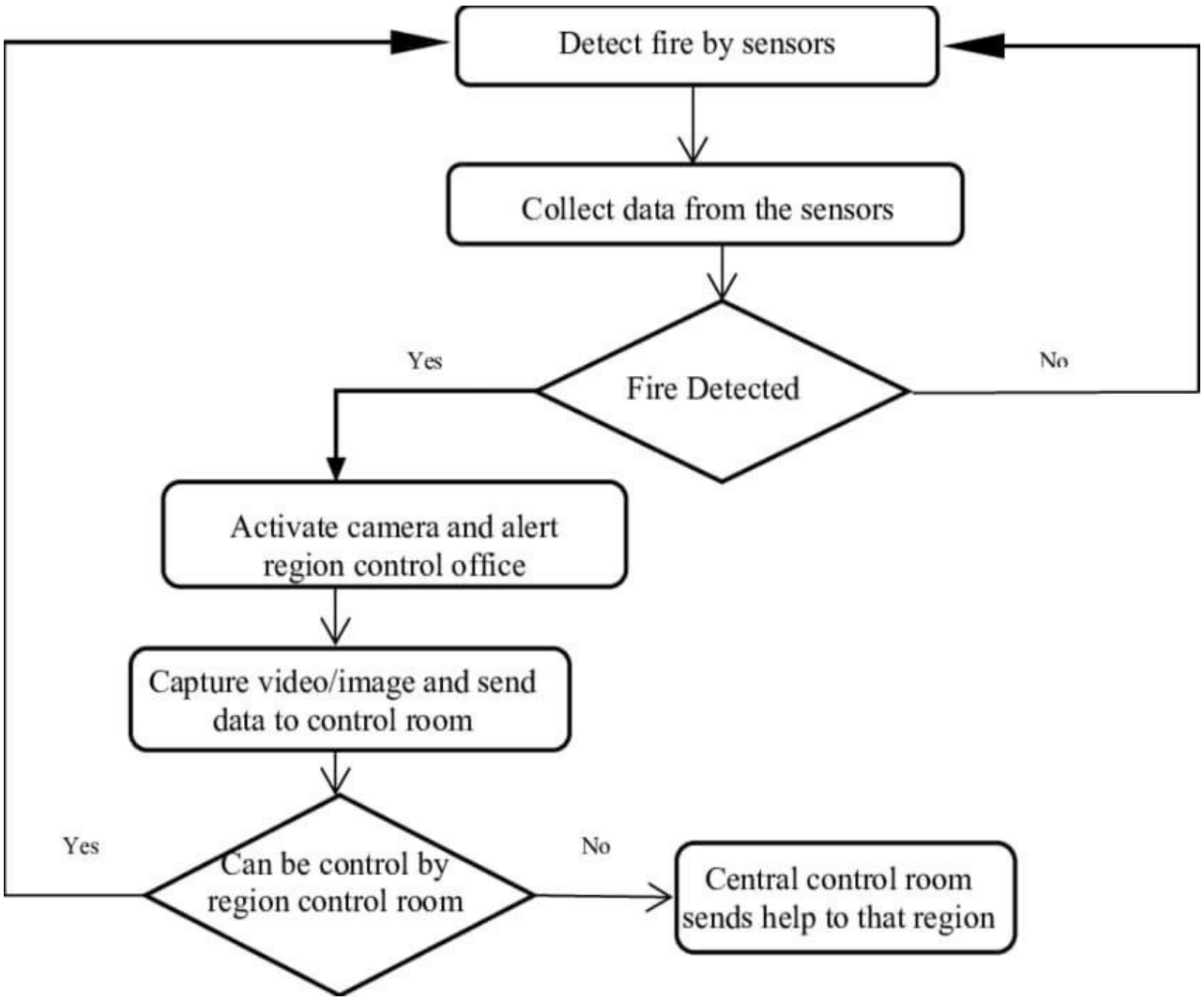
CHAPTER 5

5.PROJECT DESIGN

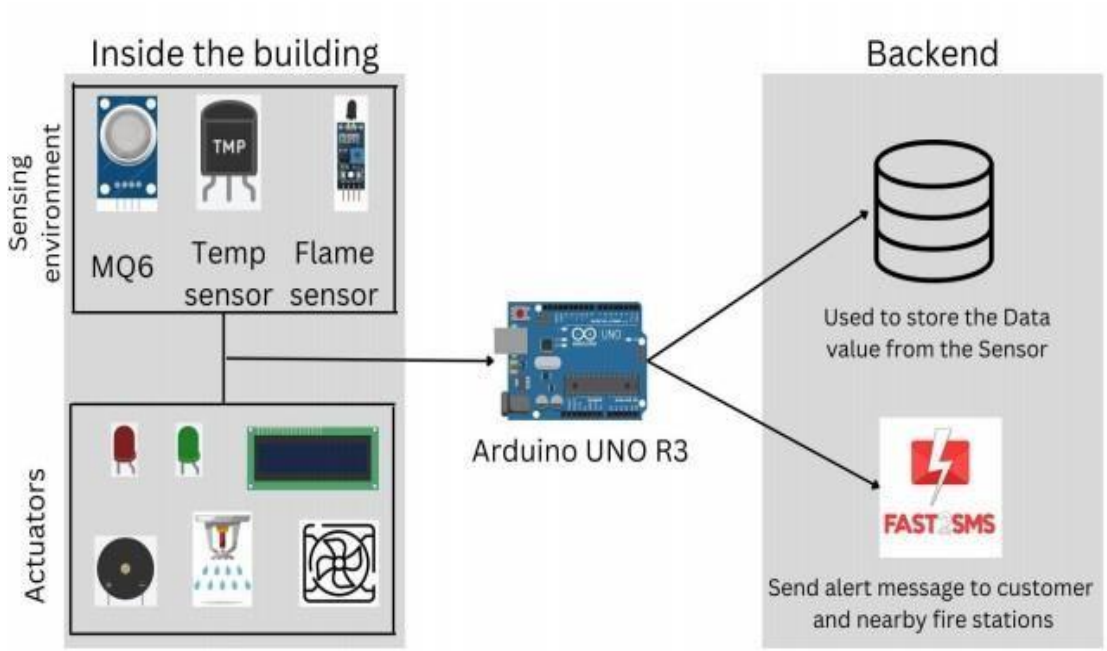
Project design is the process of planning out the ideas, procedure and deliverablesof the project.

5.1 DATA FLOW DIAGRAMS

This process maps out the flow of information and describes the systes operation.



5.2. Solution &Technical Architecture



5.3.User Stories

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	The dashboard can be used via a web browser It gives an abstract view in an easy-to-use form.
NFR-2	**Security**	As the data is sent through HTTPS the data is encrypted, so it is safe.
NFR-3	**Reliability**	The system is completely reliable as long as the internet and power is reliable
NFR-4	**Performance**	Only the data input and basic checking is done in smart device other heavy tasks are done in cloud.
NFR-5	**Availability**	The entire system is available for your service and for configuration .
NFR-6	**Scalability**	The smart system is scalable,we can add any number of devices as long as the IBM IoT platform supports it.

CHAPTER 6

6. PROJECT PLANNING & SCHEDULING

The process of planning deals with selecting the appropriate procedures for the project. Project scheduling consists of assigning start and end dates to individual tasks and allocating the resources within an estimated budget.

6.1. SPRINT PLANNING & ESTIMATION

This plan involve planning project and estimating the duration within which theproject can be completed.

6.2. SPRINT DELIVERY SCHEDULE

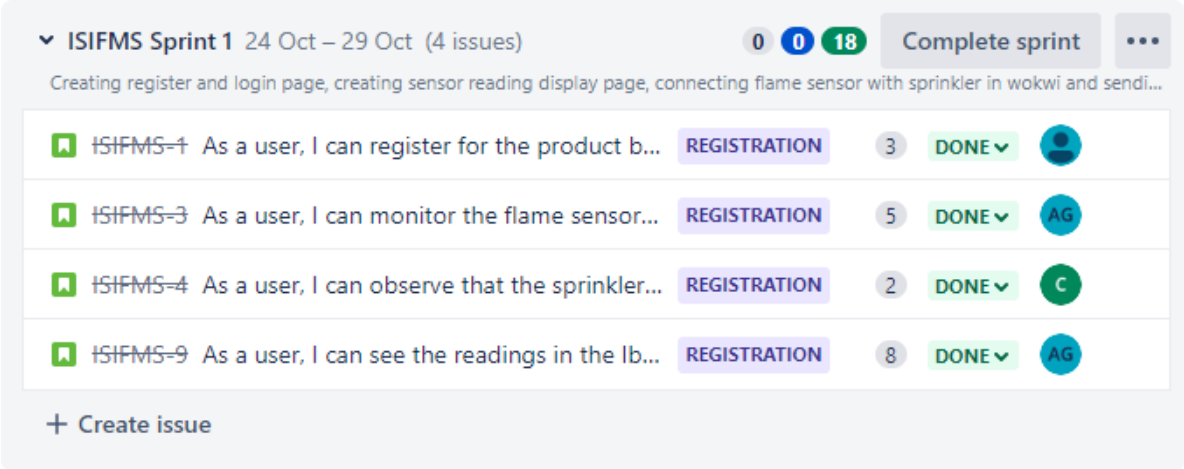
Sprint delivery schedule estimates the start date and release date of the sprints.

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

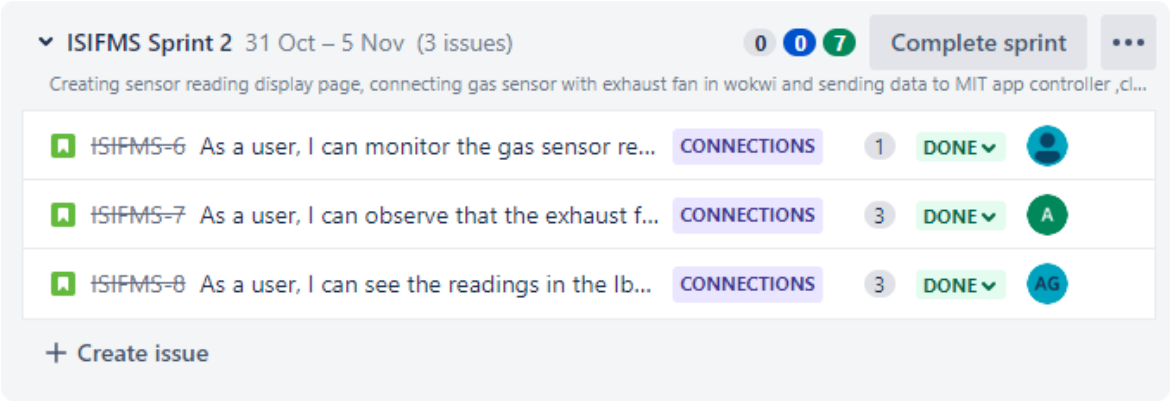
6.3. REPORTS FROM JIRA

BACKLOG

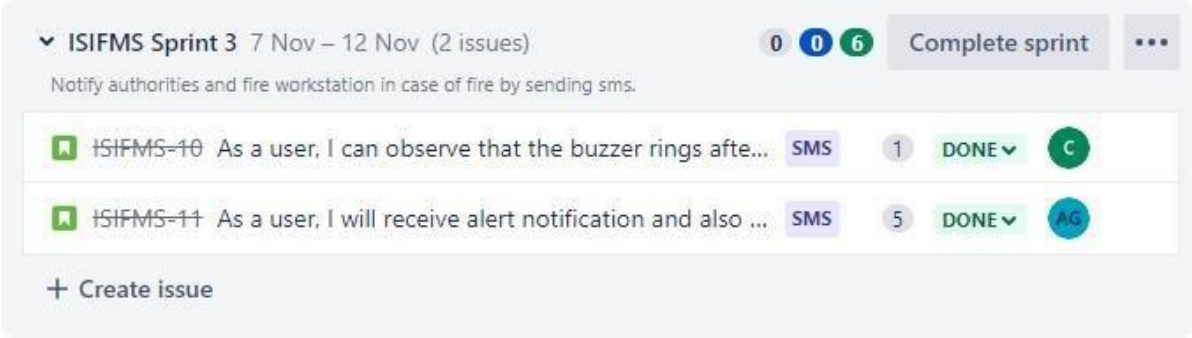
SPRINT 1



SPRINT 2



SPRINT 3



SPRINT 4

CHAPTER 7

7.CODING & SOLUTIONING

FEATURE 1

```
Void loop() {
Cons float BETA = 3950;
Int analog value= anlog read
(A4);
Float temp = 1/(log1/
(1023/analogvalue_1)).BETA
+1.0/298.15_273.15;
Serial.print("temperat");
Serial.print(temp);
Serial.println("c");
Int
Int=12879221;
If(temp.>+40){
Publishdata2(temp);


Digitalwrite(14,HIGH);
Publishdata(temp);
}
Delay(1000);
If(!client.loop()
){
Mqttconnect();
}
```

FEATURE 2

```
Void
Publish data1(float tem)
{
Mqtconnect();
String
Payload=”{|”temp|”:”;
Payload+=tem;
Payload+=”}”;
Serial.print(“sendingpaya);
serial.println(payload);
If(client.publish(publishtopi
c,(char*)payload.c_str())
{
serial.println(“publish ok”);
}
Else{
Serial.println(“publish
failed”);
}
}
Void
Publish data(floattern)
{

serial.println(payload);
```

```
Payload+=tem;
Payload+=”,”;
\”lon”:79.122258”payload+
=”}”;
Serial.print(“sending
payload:);
Serial.println(payload);
If(client.publish(publishtopi
c,(char*)payload.c_str))){
Serial.print(“publish ok”);
}
Else
{
Serial.println(“publish
failed”);
}
```

CHAPTER 8

8. TESTING

8.1. Test case

1.Purpose of document

The purpose of this document is to briefly explain the test coverage and open issues of the industry specific intelligent fire management system project at the time of release to user acceptance testing.

2.defect analysis

This report shows the number of resolved or cosed bugs at each severity level,and how they were resolved by our model (INDUSTRY SPECIFICINTELLIGENT FIRE MANAGEMENT SYSTEM)

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	8	3	2	3	16
Duplicate	0	1	0	3	4
External	4	1	0	5	10
Fixed	10	4	3	13	30
Not Reproduced	1	1	0	1	3
Skipped	1	0	1	1	3
Won't Fix	0	0	2	3	5
Totals	24	10	8	29	63

3.Test case analysis

This report shows the number of test cases that have passed, failed and untestedby our industry specific intelligent fire management system project.

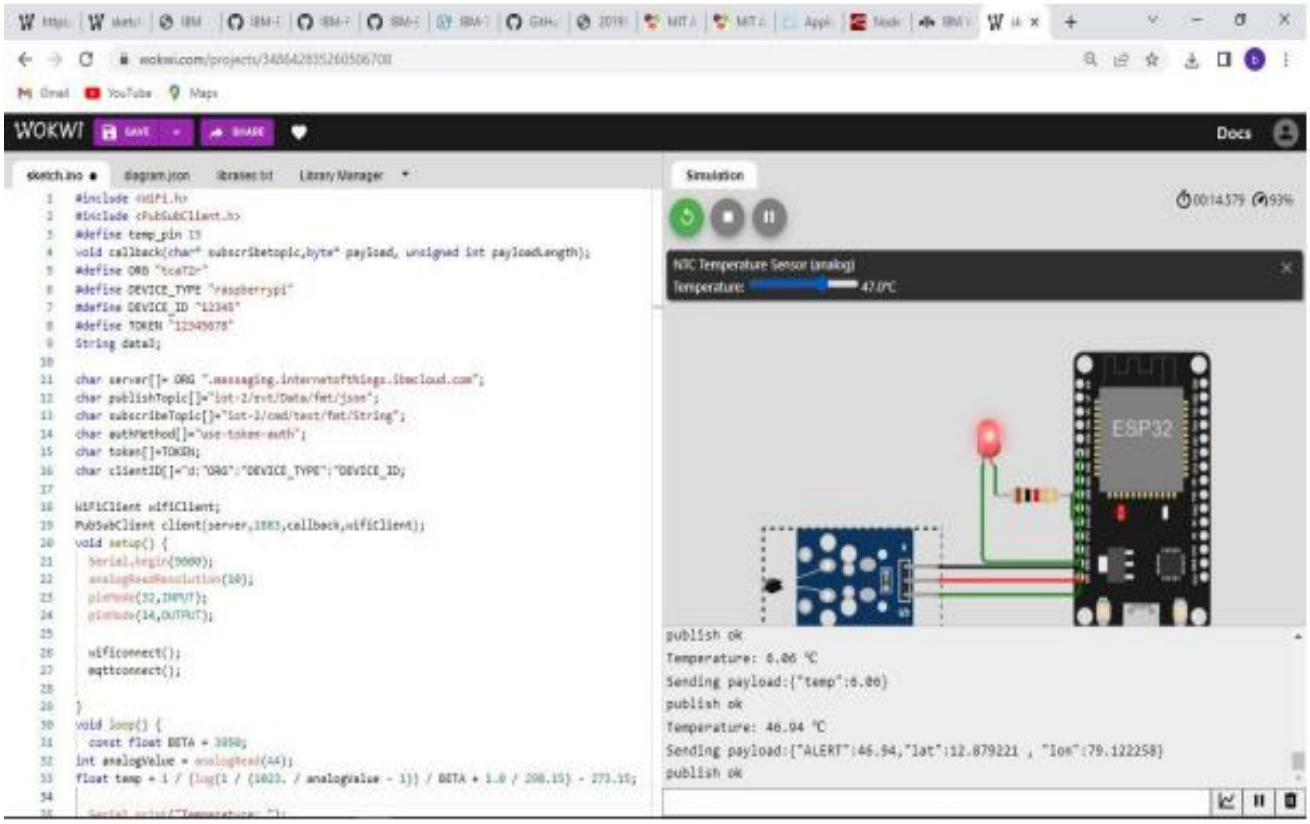
Section	Total Cases	Not Tested	Fail	Pass
Login	20	0	5	15
Redirecting to Detection Page	20	0	7	13
User input	48	0	10	38
Security Popup	19	0	0	19
URL Validation	35	0	10	25
Detection Rate	70	0	49	21
Redirecting to the Given URL	70	0	54	16
Final Model Output	52	0	29	23

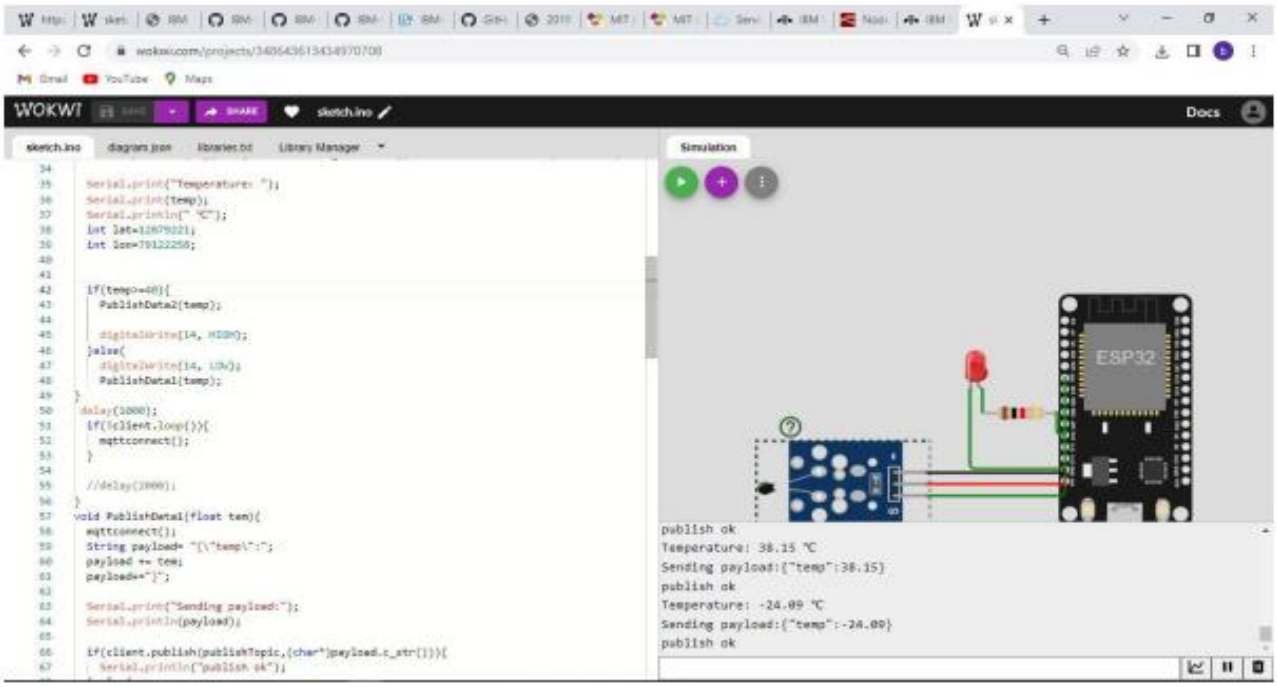
CHAPTER 9

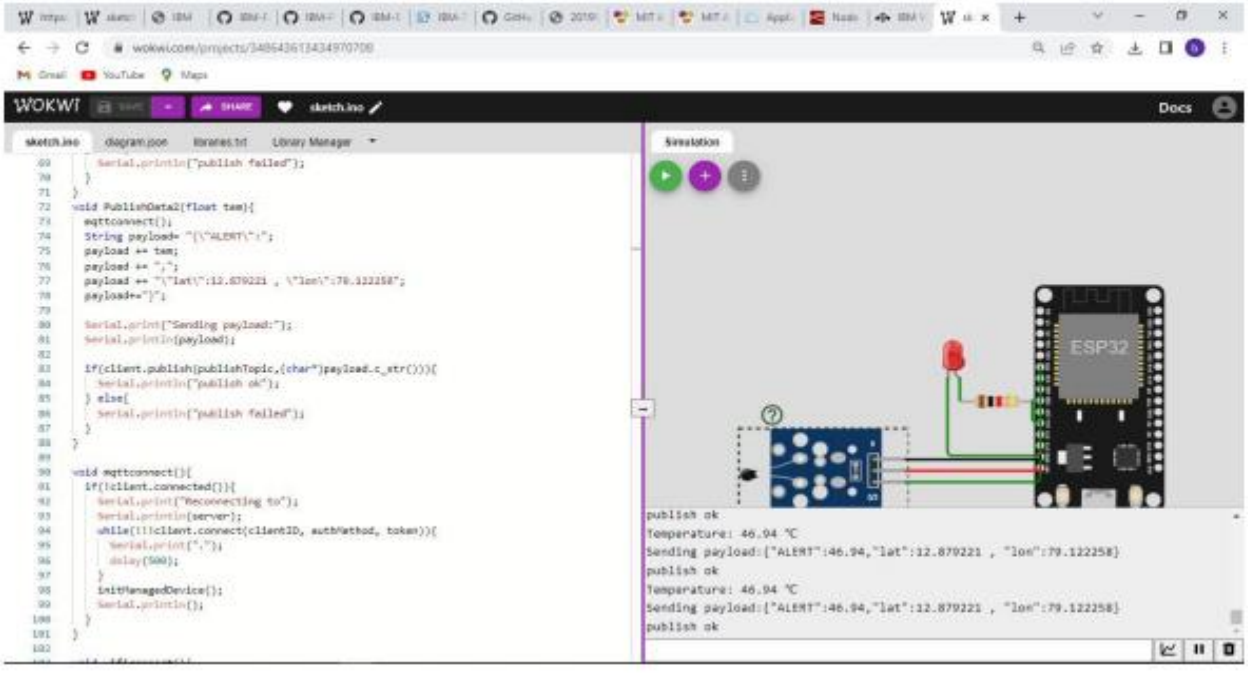
9. RESULTS

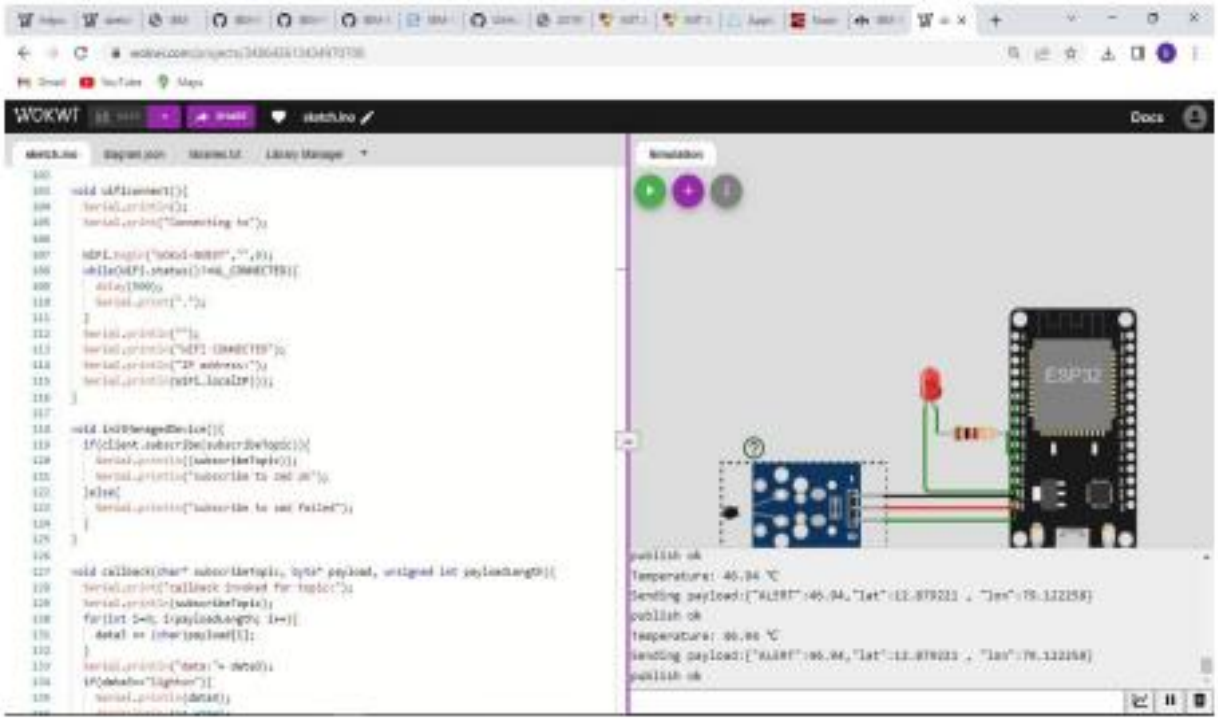
9.1 PERFORMANCE MATRICS

Fire alarms are prime necessity in modern buildings and architecture, especially in banks data centers and gas Stations. They detects the fire in ambience at very early stage By sensing smoke or slash and heat and raise an alarm which warns people About the fire and furnish sufficient time to take preventive measures it not only prevents a big losses caused by deadly fire but sometime proves to be live savers. Fire alarm is a device that detects the presence of fire and atmospheric changes relating to smoke.

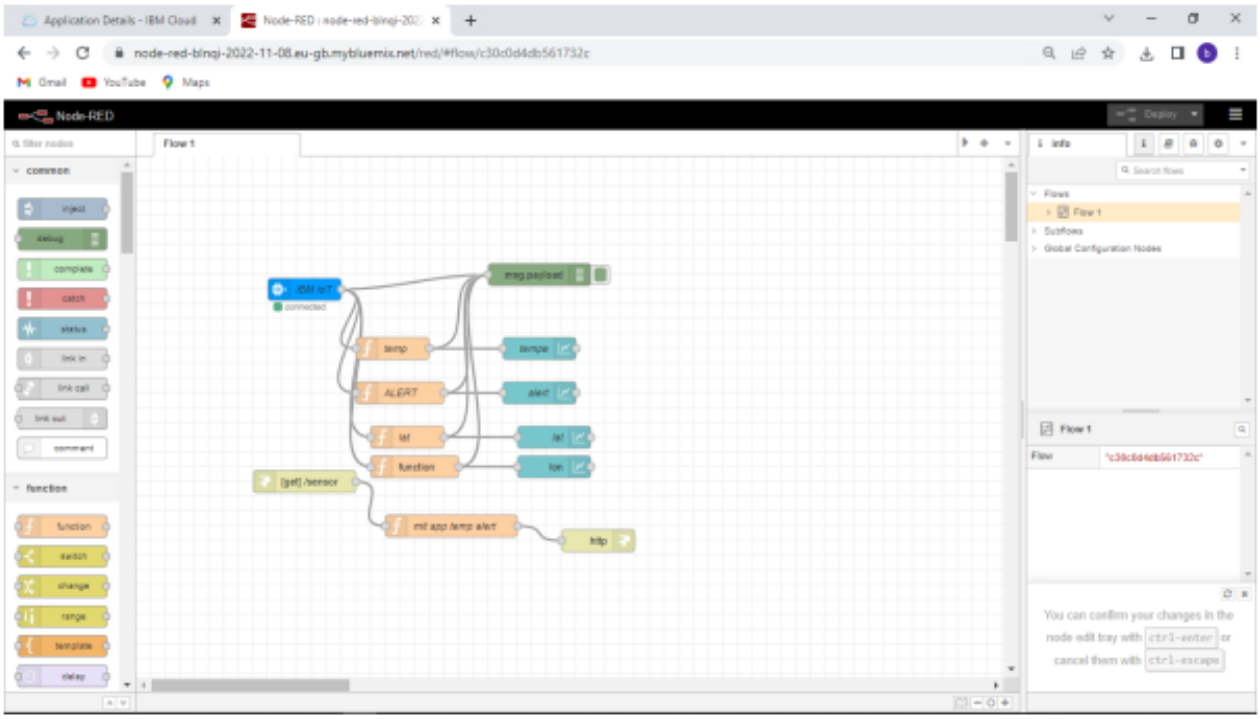



WOKWI
SHARE
sketch.ino
Docs
sketch.ino
diagram.json
libraries.txt
Library Manager
Simulation
ESP32
publish ok
Temperature: 38.15 °C
Sending payload:{"temp":38.15}
publish ok
Temperature: -24.09 °C
Sending payload:{"temp":-24.09}
publish ok

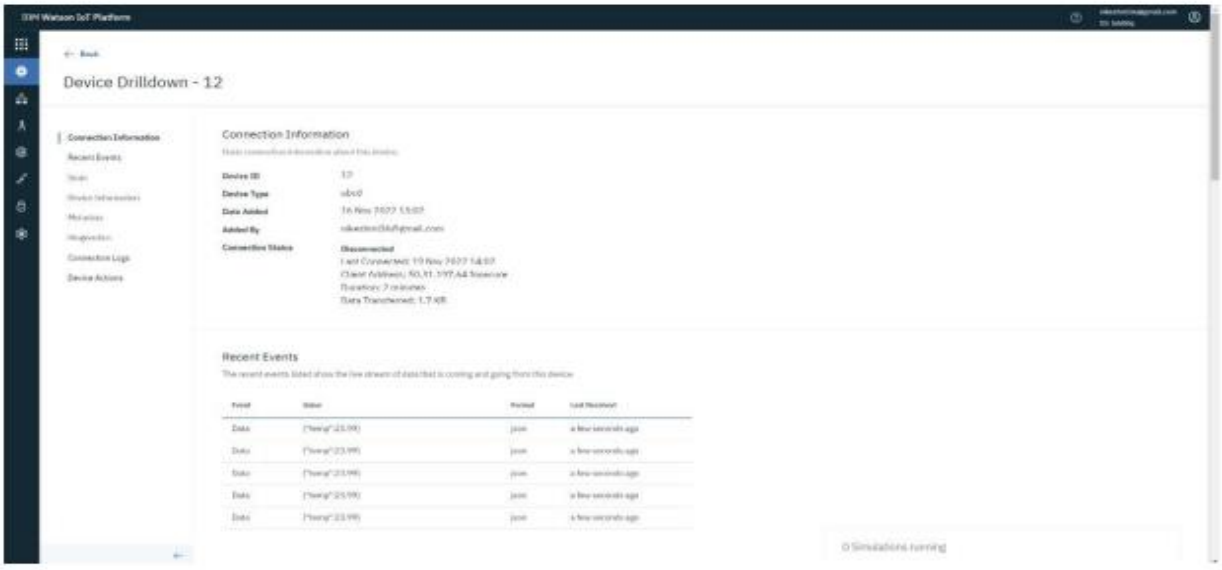

WOKWI
SHARE
sketch.ino
Docs
sketch.ino
diagram.json
libraries.txt
Library Manager
Simulation
ESP32
publish ok
Temperature: 46.94 °C
Sending payload:{"ALERT":46.94,"lat":12.879221 , "lon":79.122258}
publish ok
Temperature: 46.94 °C
Sending payload:{"ALERT":46.94,"lat":12.879221 , "lon":79.122258}
publish ok



IMAGES OF IBM CLOUD:


Application Details - IBM Cloud
Node-RED
node-red-blnqi-2022-11-08.eu-gb.mybluemix.net/red/#flow/c30c0d4db561732c
Gmail
YouTube
Maps
Node-RED
Flow 1
common
function
msg.payload
temp
ALERT
lat
function
[get] /sensor
msl app /temp alert
http
info
Flow 1
You can confirm your changes in the node edit tray with ctrl-enter or cancel them with ctrl-escape


Fee_detection_copy
Blocks
Viewer


Device Drilldown - 12
Connection Information
Recent Events

CHAPTER 10

10.ADVANTAGES & DISADVANTAGES

Advantages of using fire management system:

- Certainty of avoiding the outbreak and spread of fire Retaining access to protected areas at any time
- Fire protection without any interruption - no refilling or replacement needed
- Absolute safety for human beings through using breathable air - no nitrogen injection
- Very small footprint and little building space needed
- Scalable to any size of protected areas and number of protected compartments No design limitations
- No damages by fire, released water, foam or other extinguishing agents
- No excessive piping, no nozzles, no pressurized cylinders, no leaking.

Disadvantage of using fire management system:

- Cost, not competitively priced for larger systems.
- Detection of smoke or a fire is done by zone, which could be multiple areas rather than specifying a specific location. This could delay emergency responders from locating the fire.
- Conventional panels are often called “dumb” panels because of the inability to provide detail information, such as…
- No details on event history.
- No internet connection for notification of alarm/trouble/supervisory events.

CHAPTER 11

11. CONCLUSION

Fire wireless sensor platform of hardware and software design for the entire system development and application is essential, as the bottom of the whole system support to the miniaturization of its inevitable, highly integrated, network-based, energy-saving and intelligent direction, nearly few years, with the declining cost of computer and microprocessor to reduce the size, development and construction of intelligent wireless fire alarm system will have broad application prospects. Engineering test results fully demonstrated the technical feasibility and the effectiveness of the realization.

Fire alarm systems that provide remote monitoring services can also be used to provide medical alert services. Here a person with health problems who lives alone carries a radio transmitter that can trigger the system in case they need assistance. Signals received at the monitoring station are identified by type (fire, burglary, medical alert) so that the proper response can be made. Finally, we can say by applying the suggested technique in Fire Alarm wireless Intelligent system that this system has advantages of; Low cost System, Addressable system, Integrated networkability, Conventional detector used" lower wiring costs". Also it has little disadvantages of; System will be failed if the slaves' unit network has a failure.

CHAPTER-12

12.FUTURE SCOPE

Fire detection technologies have been slow to evolve compared to rapidly advancing smart devices. Understandably, global companies focus their efforts on developing high-return products, especially ones that connect consumers with popular trends. While fire alarms aren’t exactly at the forefront of social advancement, innovative companies are developing new methods of approahing fire and gas- related threats.Some of the few methods that would play a fantastic role in fueture fire alarm system are sensor assisted fire fighting,High pressure water mist,drones,fireballs wireless devices and sound triggered devices.

As new technologies emerge,dealers should be sure to leverage both timeless and emerging technologies to target more customers. Devices are becoming more and more capable, and regardless their application, they are all evolving to connect to the internet and cooperate with other devices. Consumers look for smart home technology along with commercial products that work in a cohesive environment. Along with investigating which products to sell, we encourage dealers to take a serious look at reliable partners to provide wholesale alarm monitoring services for devices so that consumers never go without protection.

CHAPTER-13

13.SOURCE CODE

GITHUB LINK:

https://github.com/IBM-EPBL/IBM-Project-48790-1660812978