Industry-specific intelligent fire management system

TEAM ID	PNT2022TMID12811
TEAM LEAD	PRAVISHAW C M
TEAM MEMBER-1	BRINDHA B
TEAM MEMBER-2	PRIYADHARSHINI R
TEAM MEMBER-3	SWETHA M

TABLE OF CONTENTS

CHAPTER	DESCRIPTION	PAGE NO
1	**INTRODUCTION**	
	1.1 Project Overview	
	1.2 Purpose	
2	**LITERATURE SURVEY**	
	2.1 Existing problem	
	2.2 References	
	2.3 Problem Statement Definition	
3	**IDEATION AND PROPOSED SOLUTION**	
	3.1 Empathy Map Canvas	
	3.2 Ideation & Brainstorming	
	3.3 Proposed Solution	
	3.4 Problem Solution fit	

4 **REQUIREMENT ANALYSIS**

4.1 Functional Requirement

4.2 Non Functional Requirements

5 **PROJECT DESIGN**

5.1 Data Flow Diagrams

5.2 Solution and Technical Architecture

5.3 User Stories

6 **PROJECT PLANNING AND SCHEDULING**

6.1 Sprint Planning and Estimation

6.2 Sprint Delivery Schedule

6.3 Reports from JIRA

7 **CODING AND SOLUTIONING**

7.1 Feature 1

7.2 Feature 2

7.3 Database Schema

8 **TESTING**

8.1 Test cases

8.2 User Acceptance Testing

9 **RESULTS**

9.1 Performance Matrics

10 **ADVANTAGES AND DISADVANTAGES**

11 **CONCLUSION**

12 **FUTURE SCOPE**

13 **APPENDIX**

Source Code

GitHub & Project Demo Link

CHAPTER-1

1.INTRODUCTION

1.1 Project Overview:

The fire alarm system is integrated with AC supply, access control, firefighting systems, Building Management System (BMS).....etc. To indicate the area where fire exist fire indicating/fire alarm panels are used. So far, cables were used to integrate all the device of fire alarm systems, these cables carried the power & communication. When we have unique address; therefore all these devices can be easily identifiable, controllable & networkable as required by the end users. Subsequent detector installation saves not only the cost of cabling, but also the time-consuming work associated with mounting & wiring even under difficult environmental conditions. The detector most suitable for the corresponding usage area is simply placed on the wireless base and/or wireless interface. Fire detection is a key point in security systems. As thesystem performs, it must detect the fire as early as possible. Early detection of fire in a large area is a difficult task. To identify the properties of fire is also one of the important steps. The fire and fire coloured objects are to be distinguished properly. Thus, the identification may face some difficulties like; it is sensitive to the changes in brightness, presence of shadows or to different tonalities of the red.

1.2 Purpose:

- Most victims of fire succumb to the smoke and toxic gases and not to burns. Fire produces poisonous gases that can spread rapidly and far from the fire itself to claim victims who are asleep and not even aware of the fire.This is why it is so crucial for you and your family to have sufficient warning so that you can all escape before your ability to think and move is impaired.
- Sensors values can be viewed in the Web Application.
- Notifies the admin the random values cross the threshold value.

CHAPTER-2

2. LITERATURE SURVEY

This survey consists of various other papers related to this particular field and their individual nature of approaching to the problem and deriving the effective results are compared.

Ahmed Imteaj et.al : They looked at the difficulties faced by production workers when fires are more likely to occur. They suggested a Raspberry Pi 3 system that can detect fire and provide information about the fire's location. To record the fire occurrence, various Arduino boards are connected to several motors and cameras by the Raspberry Pi. They talked on how to employ contemporary technologies to lessen the terribly tragic accidents brought on by fire in this. We have pooled our ideas and come up with the best solution using the findings from such investigations.

Ondrej Krejcar : He proposed a model for location enhancement and personnel tracking using Wi-Fi networks. In this, he has represented the control system over concept that is used in handling information of location and control unit operations. The location of the user present in the building, is obtained through Wi-Fi access points. We have understood the feasibility of Wi-Fi networks a radio range for live tracking and to notify about the location of fire caught in an area.

Karwan Muheden : They have studied the safety features in home and industrial areas. They have designed new model using WSN. Not only have they incorporated temperature and humidity sensors but also included fire and smoke sensors while developing the model. They present a preceding study of WSN is able to detect fire alarm. It is for setting up a wireless sensor network with three sensors. This study helped us in bringing ideas for home automation setup.

Kusprasapta Mutijarsa : They have proposed a prototype for a centralized management system for homes or offices whichhelps better in managing the safety features. In this, home management system is required. This system controls the room lights by turning on and off automatically, it keeps the record of use of electronic device status, turning on and off the ac regulator automatically, it displays the room temperature in home. If fire is detected in the house, it turn on sprinkler at home, it supervises at home via surveillance cameras, take photos and store them including recordings of surveillance at home, it detects the movements of people at home, and provide notification when someone enters the house. Hence, one of the basic application for setting up, monitoring and controlling various sensors connected to a centralized unit for the controlling mechanism is evoked.

2.1 EXISTING PROBLEM

After analyzing the past studies, here are some perks to adore before setting up an automated fire management system. The salient features are as follows:

Determine the status periodically- The derived system should analyze the status of the fire accident at periodic intervals of time. This should work fine in real time as many industries are prone to fire accidents.

Transfer of information – Manually transferring information over automatic mechanism is not feasible down the line.

Analyzing the physical parameters – Unable to obtain the physical parameters such as the temperature, pressure at areas which are more likely for fire accidents.

Cumbersome repair -Tedious to determine structural damage.

Usage of technicalskills for 3D plot - MEMS are used to get axis of the building block.

2.2 REFERENCES

[1] 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

[2] Ahmed Imteaj, Tanveer Rahman, Muhammad Kamrul Hossain, Mohammed Shamsul Alam, Saad Ahmad Rahat, "An IoT based fire alarming and authentication system for workhouse using Raspberry Pi 3" , International Conference on Electrical, Computer and Communication Engineering (ECCE), IEEE, 2017

[3] Ondrej Krejcar, "Using of mobile device localization for several types of applications in intelligent crisis management",5th IEEE GCC Conference & Exhibition, IEEE, 2009

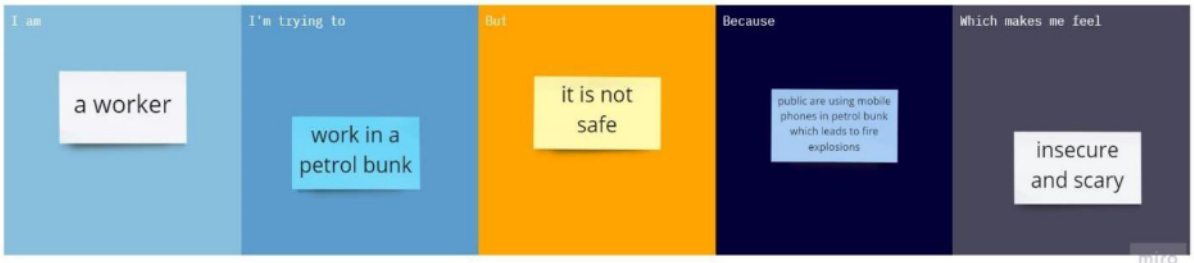
[4] Karwan Muheden, Ebubekir Erdem, Sercan Vançin, "Design and implementation of the mobile fire alarm system using wireless sensor networks", 17th International Symposium on Computational Intelligence and Informatics (CINTI), IEEE, 2016

[5] Azka Ihsan Nurrahman, Kusprasapta Mutijarsa, "Intelligent home management system prototype design and development", International Conference on Information Technology Systems and Innovation (ICITSI), IEEE, 2015

2.3 PROBLEM STATEMENT DEFINITION

Recently, it has sometimes been impossible for fire-fighting personnel toaccess the site of a fire, even as the fire causes tremendous property damage and lossof human life, due to high temperatures or the presence of explosive materials. Insuch environments, fire-fighting robots can be useful for extinguishing a fire. Thus,Fire-fighting robots are operated in places where fire fighters are unable to work.Besides that, fire fighting robot can be use for protecting fire fighters from extremedangerinpetrochemical,chemicaldangerousproduct,toxicityorexploder fire accidents. Therefore, it also can reduce the human injury from a fireburning.

PROBLEM STATEMENT-1



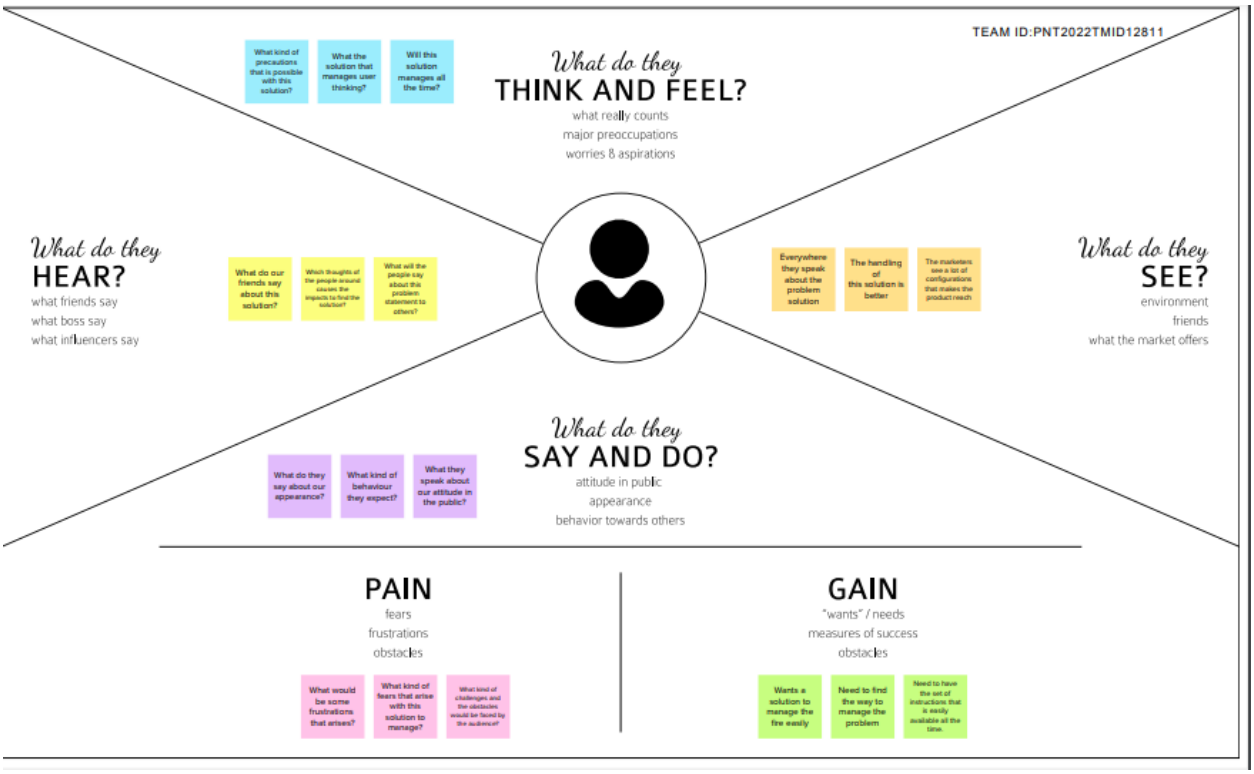
PROBLEM STATEMENT-2

Problem Statement (PS)	I am	I'm trying to	But	Because	Which makes me feel
PS-1	A worker	Work in a petrol bunk	It is not safe	Public are using mobile phones in petrol bunk which leads to fire explosion	Insecure and scary
PS-2	An employee	Work in a cracker company	It is not safe	There are no safety measures to avoid fire accidents	Unsafe and secury

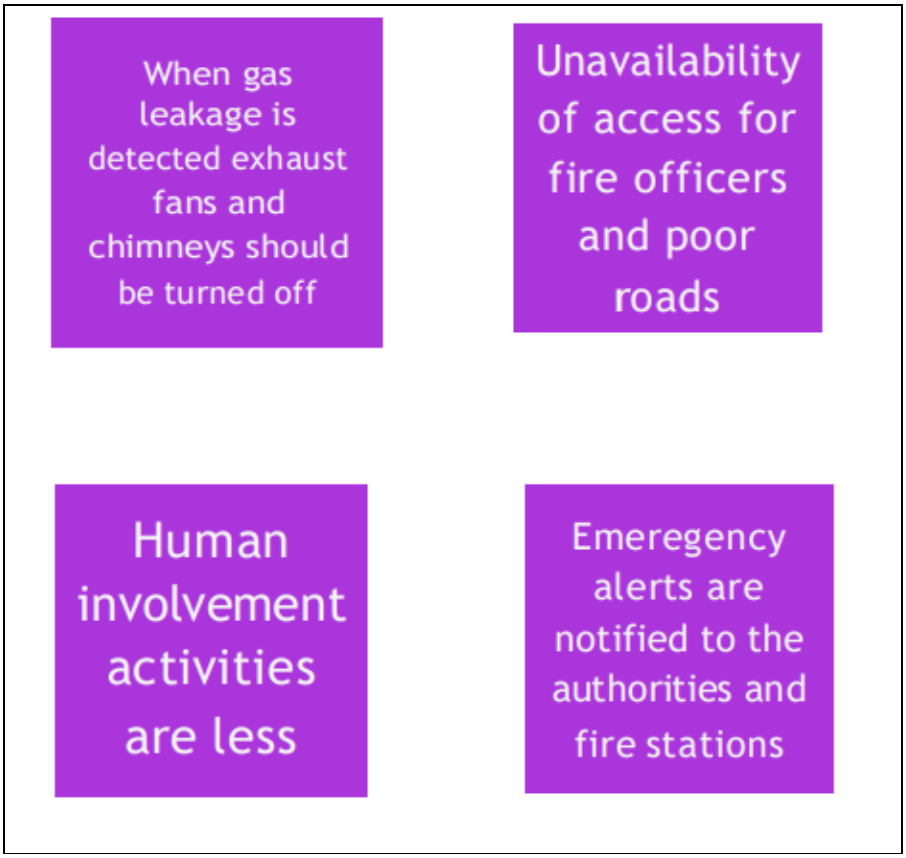
CHAPTER-3

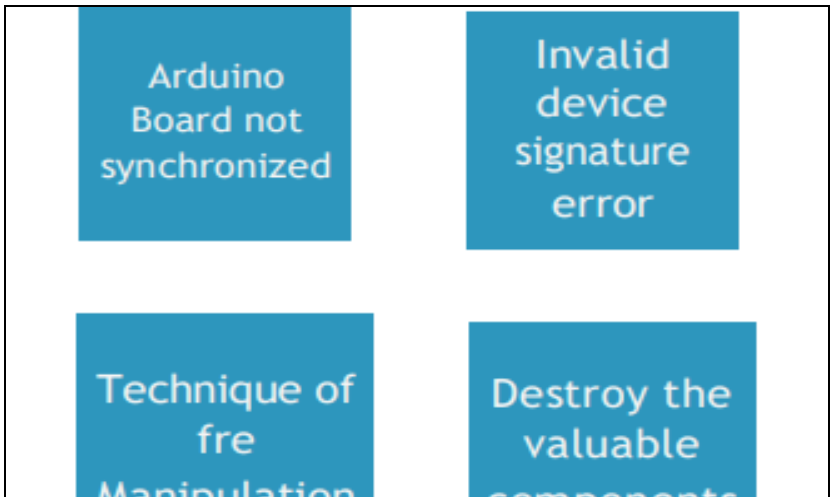
3. IDEATION AND PROPOSED SOLUTION

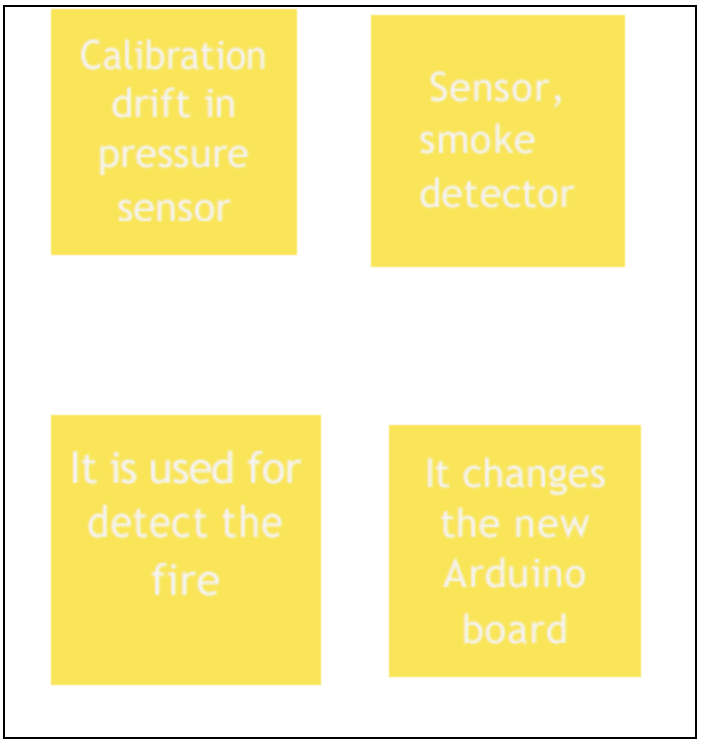
3.1 EMPATHY MAP CANVAS

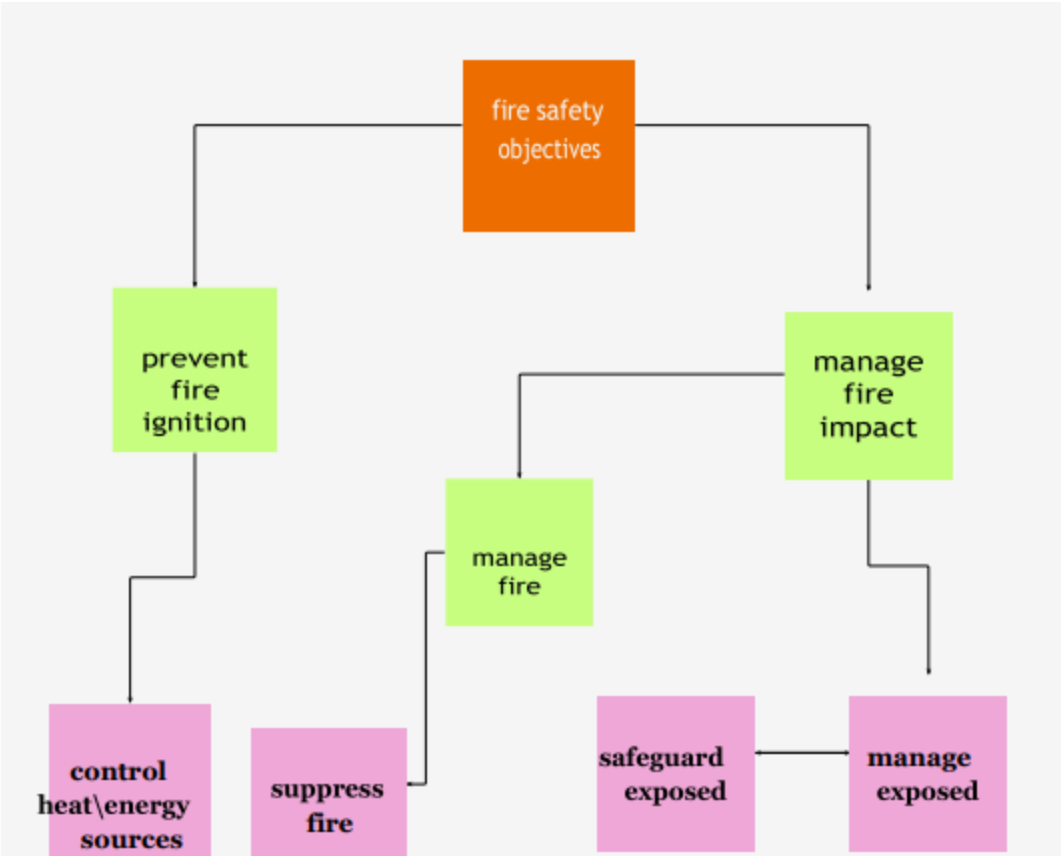


3.2 IDEATION & BRAINSTORMING



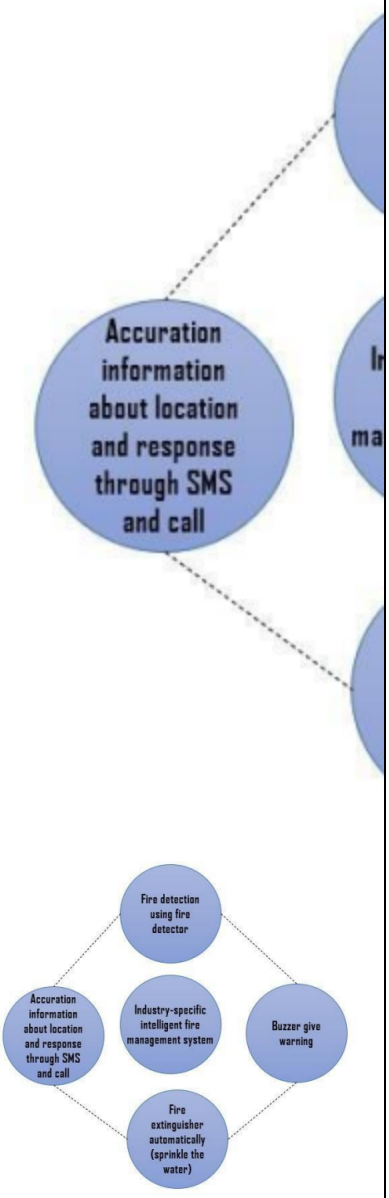



Calibration drift in pressure sensor
Sensor, smoke detector
It is used for detect the fire
It changes the new Arduino board


fire safety objectives
prevent fire ignition
manage fire impact
manage fire
control heat\energy sources
suppress fire
safeguard exposed
manage exposed

3.3 PROPOSED SOLUTION

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	To improve the safety management system in industries. Improving the safety management system against the fire incidents in industries.
2.	Idea / Solution description	To implement the fire safety management in industry based on IOT using Arduino uno board with fire detection and fire extinguisher system. And using some sensors (Humidity sensor, Flame sensor, smoke sensor) with GPS tracking system.
3.	Novelty / Uniqueness	An integrated system of temperature monitoring, gas monitoring, fire detection automatically fire extinguisher with accusation of information about locations and response through SMS notification and call.
4.	Social Impact/ Customer Satisfaction	i) It early prevents the accident cost by fire in industries. ii)Nearby locations so maximum extend more accurate reliability. iii)Compatibility design integrated system.

5.	Business Model (Revenue Model)	
6.	Scalability of the Solution	i)This project can be used more efficiently with accurate information requiring. ii)Easy operability and maintenance. Required low time for maintain Cost is reasonable value

3.4 PROBLEM SOLUTION FIT

Oftentimes, there is an existing solution for whatever problem you are trying to solve. Customers often need to choose between this existing choice and whatever the startup's invention is. Sometimes this requires convincing and a whole lot of marketing. For example, Henry Ford had to convince his customers that his car was faster than a horse. That was not an easy thing to do!

Knowing your competition is an important part about knowing how customers currently solve a problem. Usually competition for a startup falls into 3 categories:

- Existing product
- Combination of 2-3 products
- Jury-rigging a solution.

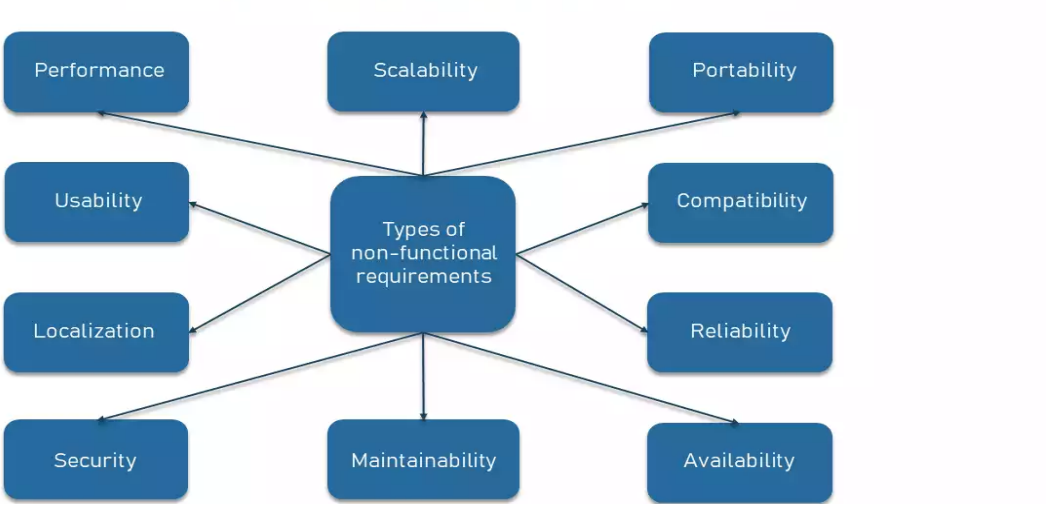
CHAPTER - 4

4.REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

Functional requirements are product features or functions that developers must implement to enable users to accomplish their tasks.so,it's important to make them clear both for the development team and stakeholdrs.generally,functional reqirements describe system behaviour under specific conditions.

4.2 NON FUNCTIONAL REQUIREMENTS

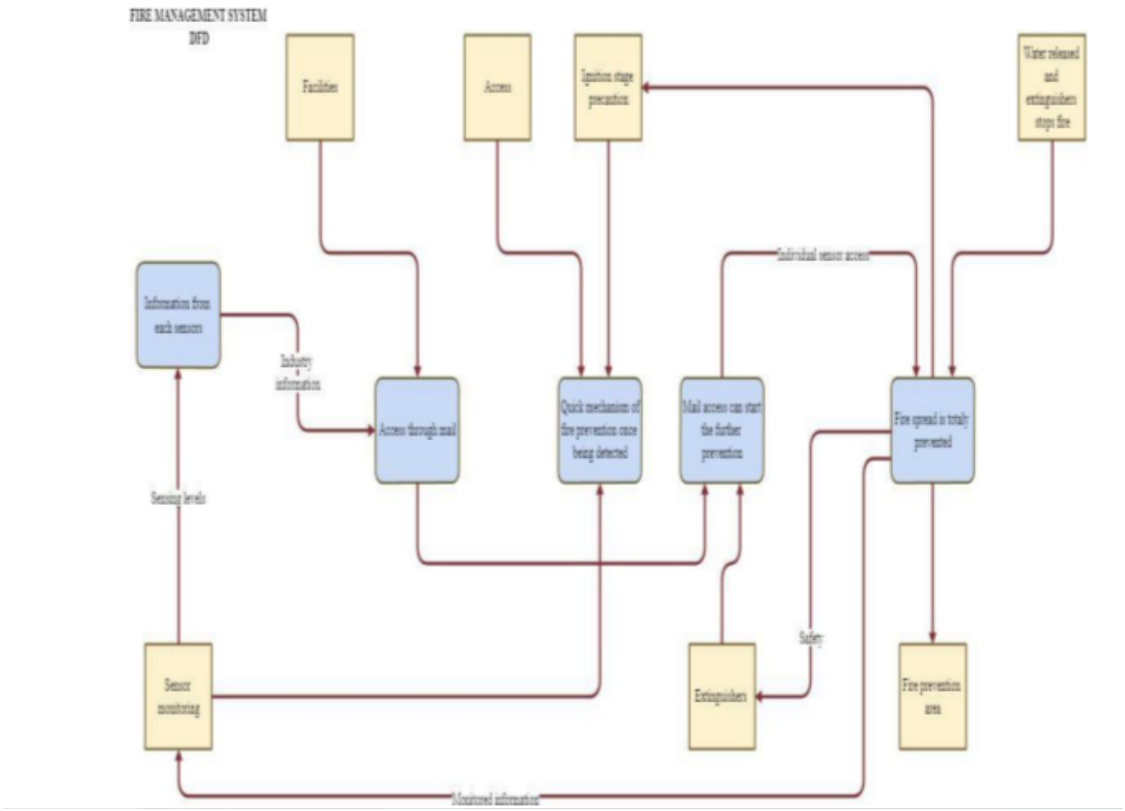


Non-functional requirements specify the quality attributes of the system, hence their second name — *quality attributes*. Continuing our messaging platform example, a non-functional requirement can be the speed with which a system must perform editing to satisfy user expectations.

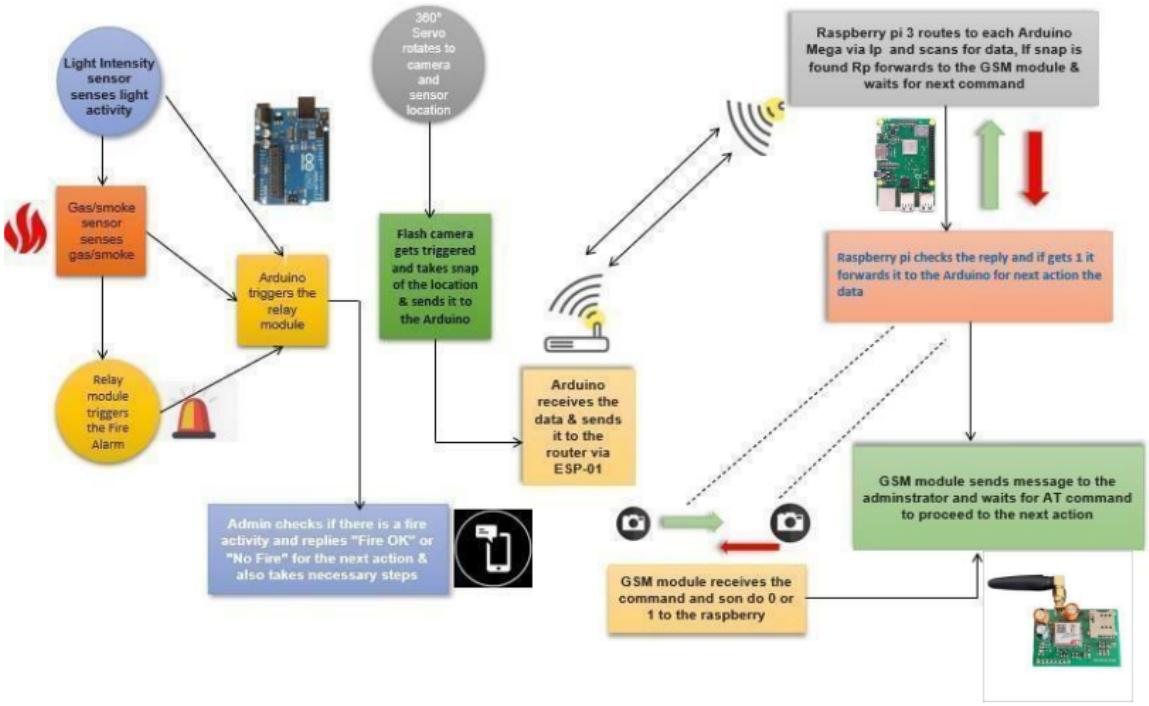
CHAPTER - 5

5.PROJECT DESIGN

5.1 DATA FLOW DIAGRAM



5.2 SOLUTION AND TECHNICAL ARCHITECTURE



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	I can receive confirmation	high	Sprint-1

			confirmation email once I have registered for the application	email and click confirm		
	Dashboard	USN-3	as a user,i can register for the application through internet	I can register and 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 gmail	medium	Sprint-1
	Login	USN-5	as a user,i can log into the application by entering email and password	I can login with my id and password	high	Sprint-1

CHAPTER-6

6.PROJECT PLANNING AND SCHEDULING

6.1 SPRINT PLANNING AND ESTIMATION

Sprint planning is an event in scrum that kicks off the sprint. The purpose of sprint planning is to define what can be delivered in the sprint and how that work will be achieved. Sprint planning is done in collaboration with the whole scrum team.However, before you can leap into action you have to set up the sprint. You need to decide on how long the time box is going to be, the sprint goal, and where you're going to start. The sprint planning session kicks off the sprint by setting the agenda and focus. If done

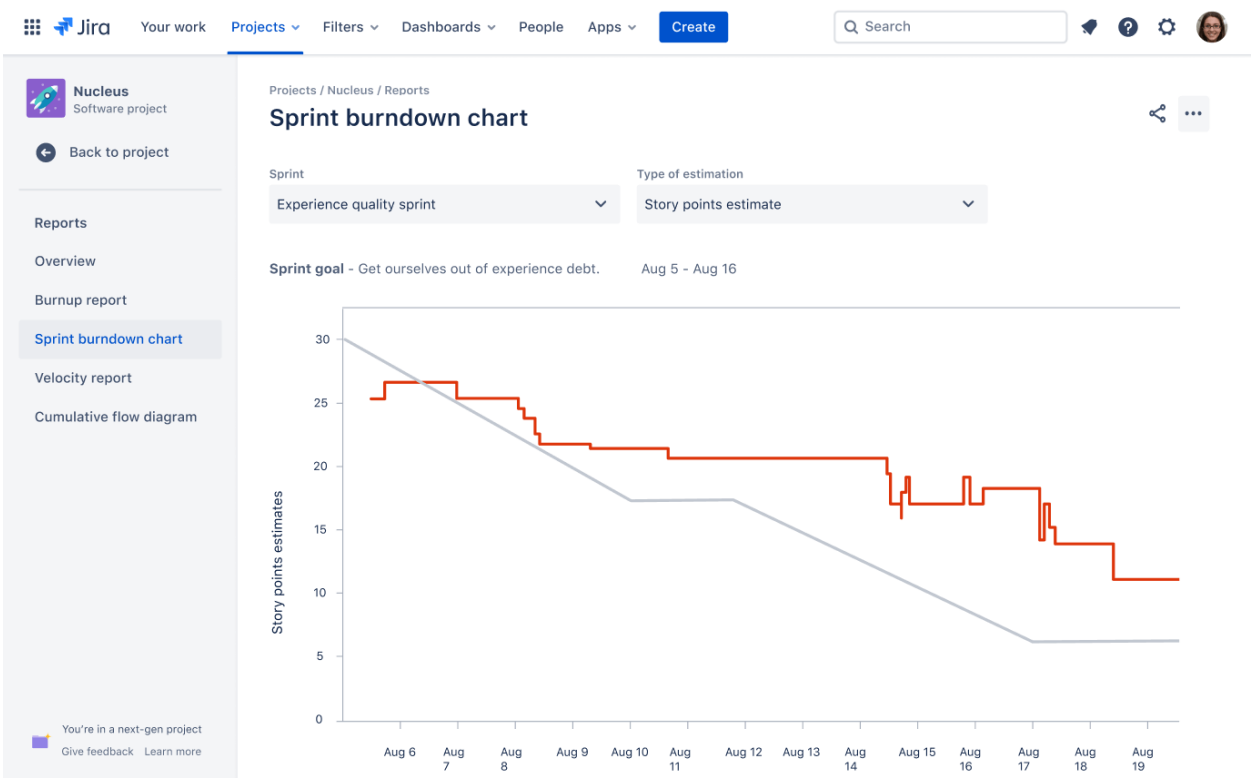
correctly, it also creates an environment where the team is motivated, challenged, and can be successful. Bad sprint plans can derail the team by setting unrealistic expectations.

6.2 SPRINT DELIVERY SCHEDULE

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority
Sprint-1	Simulation software	USN-1	Using WOKWI, connect temperature, flame, gas sensors to ARDUINO with python script	2	High

Sprint-2	Cloud software	USN-2	Create device in the IBM Watson IoT platform, and link it to Node-Red	2	High
Sprint-3	MIT app invertor	USN-3	Develop a mobile application using MIT App invertor	2	High
Sprint-4	Linking	USN-4	Link WOKWI, IBM Cloud and the developed App Application	2	High
Sprint-4	Dashboard	USN-5	Design the modules and Test the Mobile Application	2	High

6.3 REPORTS FROM JIRA



CHAPTER-7

7.CODING AND SOLUTIONING

7.1 FEATURE 1

```
#include<Wifi.h>

#include<Wire.h>

 #include<SPI.h>

 #include "ThingSpeak.h"

 #include<WifiClient.h>
```

```
 unsigned long myChannelNumber = 2;

 const char * myWriteAPIKey = "25V40ZAPI6KIZFGY";

 int LED_PIN = 32; // the current reading from the input pin int BUZZER_PIN= 12;

const int mq2 = 4;

 int value = 0;

//Flame int flame_sensor_pin = 10 ;// initializing pin 10 as the sensor digital output pin

 int flame_pin = HIGH ; // current state of sensor

 char ssid[] = "Amirtha";

char pass[] = "Amirtharavi";

 WiFiClient client;

 #define PIN_LM35 39

 #define ADC_VREF_mV 3300.0

#define ADC_RESOLUTION 4096.0

void setup()

 {

Serial.begin(115200);

Serial.print("Connecting to ");
```

```
Serial.println(ssid);

 WiFi.begin(ssid, pass);

 int wifi_ctr = 0;

while (WiFi.status() != WL_CONNECTED) { delay(1000); Serial.print(".");

 }

 Serial.println("WiFi connected");

 ThingSpeak.begin(client);

 pinMode(LED_PIN, OUTPUT);

 pinMode(mq2, INPUT);

pinMode ( flame_sensor_pin , INPUT ); // declaring sensor pin as input pin for Arduino
pinMode(BUZZER_PIN, OUTPUT);

 }

 void temperature()

 {

 int adcVal = analogRead(PIN_LM35);

 float milliVolt = adcVal * (ADC_VREF_mV / ADC_RESOLUTION);

 float tempC = milliVolt / 10;

 Serial.print("Temperature: ");
```

```
 Serial.print(tempC);
Serial.print("°C");
if(tempC > 60)
 {
 Serial.println("Alert");
 digitalWrite(BUZZER_PIN, HIGH); // turn on
 }
else
{
 digitalWrite(BUZZER_PIN, LOW); // turn on
 }
 int x = ThingSpeak.writeField(myChannelNumber,1, tempC, myWriteAPIKey);
 }
void GasSensors()
 {
//mq2
 int gassensorAnalogmq2 = analogRead(mq2);
```

```
 Serial.print("mq2 Gas Sensor: ");
 Serial.print(gassensorAnalogmq2);
Serial.print("\t");
 Serial.print("\t");
 Serial.print("\t");
 if (gassensorAnalogmq2 > 1500) { Serial.println("mq2Gas");
 Serial.println("Alert");
}
 else { Serial.println("No mq2Gas");
 }
 int a = ThingSpeak.writeField(myChannelNumber,4, gassensorAnalogmq2, myWriteAPIKey);
}
void flamesensor()
 {
 flame_pin = digitalRead ( flame_sensor_pin ) ; // reading from the sensor
 if (flame_pin == LOW ) // applying condition
 {
```

```
 Serial.println ( " ALERT: FLAME DETECTED" ) ;

 digitalWrite ( buz_pin , HIGH ) ;// if state is high, then turn high the BUZZER

 }

 else

{

Serial.println ( " NO FLAME DETECTED " ) ;

digitalWrite ( buz_pin , LOW ) ; // otherwise turn it low

}

 }

 void loop()

 {

 temperature();

 GasSensors();

 flamesensor();

 }
```

7.2 FEATURE 2

```
#include
```

```
#include

 #include

 #include "ThingSpeak.h"

 #include unsigned long myChannelNumber = 2;

const char * myWriteAPIKey = "25V40ZAPI6KIZFGY";

 int LED_PIN = 32; // the current reading from the input pin int BUZZER_PIN= 12;

const int mq2 = 4;

 int value = 0; //Flame int flame_sensor_pin = 10 ;// initializing pin 10 as the sensor digital output pin int flame_pin = HIGH ; // current state of sensor

 char ssid[] = "Amirtha";

char pass[] = "Amirtharavi";

WiFiClient client;

 #define PIN_LM35 39

 #define ADC_VREF_mV 3300.0

 #define ADC_RESOLUTION 4096.0

 #define RELAY_PIN 17

#define RELAY_PIN1 27

 void setup()
```

```
 {
Serial.begin(115200);
 pinMode(RELAY_PIN, OUTPUT);
pinMode(RELAY_PIN1, OUTPUT);
 Serial.print("Connecting to ");
 Serial.println(ssid);
WiFi.begin(ssid, pass);
 int wifi_ctr = 0;
 while (WiFi.status() != WL_CONNECTED)
 {
 delay(1000); Serial.print(".");
 }
Serial.println("WiFi connected");
 ThingSpeak.begin(client);
 pinMode(LED_PIN, OUTPUT);
 pinMode(mq2, INPUT);
  pinMode ( flame_sensor_pin , INPUT ); // declaring sensor pin as input pin for Arduino
pinMode(BUZZER_PIN, OUTPUT);
```

```
 }
void temperature()
{
int adcVal = analogRead(PIN_LM35);
float milliVolt = adcVal * (ADC_VREF_mV / ADC_RESOLUTION);
 float tempC = milliVolt / 10;
 Serial.print("Temperature: ");
 Serial.print(tempC);
 Serial.print("°C");
 if(tempC > 60)
 {
Serial.println("Alert");
 digitalWrite(BUZZER_PIN, HIGH); // turn on
 }
else
 {
 digitalWrite(BUZZER_PIN, LOW); // turn on
```

```
}
int x = ThingSpeak.writeField(myChannelNumber,1, tempC, myWriteAPIKey);
 }
 void GasSensors()
 {
//mq2
 int gassensorAnalogmq2 = analogRead(mq2);
Serial.print("mq2 Gas Sensor: ");
 Serial.print(gassensorAnalogmq2);
 Serial.print("\t");
 Serial.print("\t");
Serial.print("\t");
 if (gassensorAnalogmq2 > 1500)
{
Serial.println("mq2Gas");
 Serial.println("Alert");
digitalWrite(RELAY_PIN1, HIGH); // turn on fan 10 seconds delay(100
```

```
}
 else
 {
 Serial.println("No mq2Gas");
 digitalWrite(RELAY_PIN1, LOW); // turn off fan 10 seconds
 delay(100);
 }
 int a = ThingSpeak.writeField(myChannelNumber,4, gassensorAnalogmq2, myWriteAPIKey);
 }
 void flamesensor()
{
 flame_pin = digitalRead ( flame_sensor_pin ) ; // reading from the sensor if (flame_pin == LOW )
// applying condition
 {
 Serial.println ( " ALERT: FLAME DETECTED" ) ;
 digitalWrite (BUZZER_PIN, HIGH ) ;// if state is high, then turn high the BUZZER
 }
 else
```

```
{
 Serial.println ( " NO FLAME DETECTED " ) ;
digitalWrite (BUZZER_PIN , LOW ) ; // otherwise turn it low
 }
 int value = digitalRead(flame_sensor_pin); // read the analog value from sensor
 if (value ==LOW)
 {
Serial.print("FLAME");
digitalWrite(RELAY_PIN, HIGH);
 }
 else
 {
Serial.print("NO FLAME");
 digitalWrite(RELAY_PIN, LOW);
 }
 }
 void loop()
```

```
{

temperature();

 GasSensors();

flamesensor();

}
```

7.3 DATABASE SCHEMA

A database schema defines how data is organized within a relational database; this is inclusive of logical constraints such as, table names, fields, data types, and the relationships between these entities. Schemas commonly use visual representations to communicate the architecture of the database, becoming the foundation for an organization’s data management discipline. This process of database schema design is also known as a data modelling.

- **Access and security:** Database schema design helps organize data into separate entities, making it easier to share a single schema within another database. Administrators can also control access through database permissions, adding another layer of security for more proprietary data. For example, a single schema may contain personally identifiable information (PII), which you would want to encrypt for privacy and security purposes.

- **Organization and communication:** Documentation of database schemas allow for more organization and better communication among internal stakeholders. Since it provides a common source of truth, it enables users to understand the logical constraints and methods of aggregation across tables.

- **Integrity:** This organization and communication also helps to ensure data validity. For example, it can help administrators manage normalization processes to avoid data duplication. It can also assist in monitoring compliance of the constraints in the schema's database design,

enabling adherence to ACID properties (atomicity, consistency, isolation, durability).

CHAPTER-8

8.TESTING

8.1 TEST CASES

```
#include<Wifi.h>
 #include<Wire.h>
 #include<SPI.h>
 #include "ThingSpeak.h"
 #include unsigned long myChannelNumber = 2;
 const char * myWriteAPIKey = "25V40ZAPI6KIZFGY
int LED_PIN = 32; // the current reading from the input
 pin int BUZZER_PIN= 12;
 const int mq2 = 4;
int value = 0;
//Flame int flame_sensor_pin = 10 ;
// initializing pin 10 as the sensor digital output pin int flame_pin = HIGH ; // current state of
sensor
 char ssid[] = "Rathi";
 char pass[] = "Rathidevi";
WiFiClient client;
 #define PIN_LM35 39
 #define ADC_VREF_mV 3300.0
 #define ADC_RESOLUTION 4096.0
 #define RELAY_PIN 17
 #define RELAY_PIN1 27
 void setup()
 {
 Serial.begin(115200);
pinMode(RELAY_PIN, OUTPUT);
 pinMode(RELAY_PIN1, OUTPUT);
Serial.print("Connecting to ");
 Serial.println(ssid);
 WiFi.begin(ssid, pass);
```

```
 int wifi_ctr = 0;
while (WiFi.status() != WL_CONNECTED)
 {
 delay(1000); Serial.print(".");
 }
Serial.println("WiFi connected");
 ThingSpeak.begin(client);
pinMode(LED_PIN, OUTPUT);
pinMode(mq2, INPUT);
 pinMode ( flame_sensor_pin , INPUT ); // declaring sensor pin as input pin for Arduino
pinMode(BUZZER_PIN, OUTPUT);
void temperature()
 {
 int adcVal = analogRead(PIN_LM35);
 float milliVolt = adcVal * (ADC_VREF_mV / ADC_RESOLUTION);
 float tempC = milliVolt / 10;
 Serial.print("Temperature: ");
 Serial.print(tempC);
Serial.print("°C");
if(tempC > 60)
 {
 Serial.println("Alert");
digitalWrite(BUZZER_PIN, HIGH); // turn on
 }
 else
 {
 digitalWrite(BUZZER_PIN, LOW); // turn on
 }
int x = ThingSpeak.writeField(myChannelNumber,1, tempC, myWriteAPIKey);
}
 void GasSensors()
 {
 //mq2 int gassensorAnalogmq2 = analogRead(mq2);
 Serial.print("mq2 Gas Sensor: ");
 Serial.print(gassensorAnalogmq2);
Serial.print("\t");
 Serial.print("\t");
 Serial.print("\t");
 if (gassensorAnalogmq2 > 1500)
 {
 Serial.println("mq2Gas");
```

```
Serial.println("Alert");
 digitalWrite(RELAY_PIN1, HIGH); // turn on fan 10 seconds delay(100);
 }
 else
 {
 Serial.println("No mq2Gas");
 digitalWrite(RELAY_PIN1, LOW); // turn off fan 10 seconds
delay(100);
 }
 int a = ThingSpeak.writeField(myChannelNumber,4, gassensorAnalogmq2, myWriteAPIKey);
 }
 void flamesensor()
 {
flame_pin = digitalRead ( flame_sensor_pin ) ; // reading from the sensor
 if (flame_pin == LOW ) // applying condition
 {
 Serial.println ( " ALERT: FLAME IS DETECTED" ) ;
 digitalWrite (BUZZER_PIN, HIGH ) ;// if state is high, then turn high the BUZZER
 }
 else
 {
 Serial.println ( " NO FLAME DETECTED " ) ;
 digitalWrite (BUZZER_PIN , LOW ) ; // otherwise turn it low
 }
 int value = digitalRead(flame_sensor_pin); // read the analog value from sensor
 if (value ==LOW)
{
 Serial.print("FLAME");
 digitalWrite(RELAY_PIN, HIGH);
 }
 else
 {
 Serial.print("NO FLAME");
 digitalWrite(RELAY_PIN, LOW);
 }
 }
 void loop()
 {
 temperature();
GasSensors();
 flamesensor();
```

}

8.2 USER ACCEPTANCE TESTING

Testing fire protection systems following their installation is of utmost importance. This month Scott Futrell, president of Futrell Fire Consult & Design Inc., joins this column to take a closer look at acceptance testing and the numerous requirements that are part of the process. He shows examples of what can happen if the proper testing is not completed and some common modes of failure. There is a focus on dry pipe sprinkler systems, but many of the items draw attention to the detail of acceptance testing needed in fire protection systems in general.

Acceptance testing of fire and life safety systems, if not done properly and thoroughly, can have disastrous implications. Fire protection engineers, and the engineers in other disciplines who specify fire and life safety systems, should be at the forefront and actively involved in the acceptance testing of these systems.

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. The fire alarm operates to alert people to evacuate a location in which a fire or smoke accumulation is present. When functioning properly, if fire alarm will sound too naughty five people on and immediate fire emergency. The distinct sound exist to allow the notification to be hard the fire alarm constructed by this project Is reliable at low-cost. The primary advantage of a home fire alarm system is increased reliability and the ability to place alarms and bells exactly where needed. However, the reason most people have them is that they wanted a burglar alarm system and the cost of adding fire alarm features to a residential burglary system is relatively small. These are an effective alternative to traditional wired fire alarm systems for all applications. They utilize secure, license-free radio communications to interconnect the sensors and devices with the controllers. It is a simple concept, which provides many unique benefits and is a full intelligent fire detection system without the need for cabling. In this article, we have learned that Fire

Alarm systems are fitted in many buildings we encounter every day and that they are used to warn people within the building of an emergency fire-related situation.

CHAPTER-10

10.ADVANTAGES AND DISADVANTAGES

Advantages of using fire management system:

- Certainty of avoiding the outbreak and spread of fire Retaining access to protected areas at any time
- Proactive and permanent fire protection to secure business processes and valuable good Protecting multiple hazards with just one system
- 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 approaching fire and gas-related threats.

Perhaps most applicable to dealers looking to grow their RMR, wireless devices provide mobile capabilities to homeowners looking to install themselves, or even to take with them when relocating. According to firesystemsltd.co.uk, "Some of the systems on the market are using mesh network for the first time in wireless fire detection technology. The detectors are connected to each other and are using different frequencies on different bandwidths." For those who look for something truly reliable in any

situation, many devices can be connected in wired and non-wired formats. This dual connectivity provides unprecedented coverage and ultimate reliability. Yet, for buildings that are difficult to wire, or consumers who want something simple, wire-free systems will take the market by storm.

CHAPTER-13

13.APPENDIX

Source code:

```
#include LiquidCrystal lcd(2,3,4,5,6,7);

 int sensorPin=A0; int buzzer=13;

int G_led=8;

int R_led=9;

 int read_value;

 void setup()

{

 pinMode(sensorPin,INPUT);

 pinMode(buzzer,OUTPUT);

pinMode(R_led,OUTPUT);
```

```
 pinMode(G_led,OUTPUT);

 lcd.begin(16,2);

 lcd.clear();

lcd.setCursor(0,0);

 lcd.print(“ WELCOME TO “);

lcd.setCursor(0,1);

 lcd.print(“ Fire Detector “);

delay(2000); lcd.clear();

 }

void loop()

{

 24 read_value=digitalRead(sensorPin);

 if(read_value==1)

{

 lcd.setCursor(0,0);

 lcd.print(“ Not Flame “);

 lcd.setCursor(0,1);
```

```
 lcd.print(“....Normal….”);
 digitalWrite(buzzer,LOW);
 digitalWrite(R_led,LOW);
digitalWrite(G_led,HIGH);
 }
else
{
 lcd.setCursor(0, 0);
 lcd.print (“Fire is Detected”);
 lcd.setCursor(0,1);
 lcd.print(“Alert….!!! “);
digitalWrite(buzzer,HIGH);
digitalWrite(R_led,HIGH);
digitalWrite(G_led,LOW);
delay(1000);
 }
 dealy(1000);
```

```
}
```