GAS LEAKAGE MONITORING & ALERTING SYSTEM FOR INDUSTRIES

A PROJECT REPORT

Submitted by

KARTHIKEYAN S (19F221)
KISHORE AHMET K H (19F222)
SARAN S (19F244)
PRAVA V (19F235)

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COIMBATORE

ANNA UNIVERSITY:: CHENNAI 600 025

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CHAPTER 1

INTRODUCTION

Gas leakage leads to various accidents resulting in both material loss and human injuries. The risk of explosion, firing, suffocation are based on their physical properties such toxicity, flammability, etc. The number of deaths due to explosion of gas cylinders has been increasing in recent years. The reason for such explosion is due to substandard cylinders, old valves, worn out regulators and lack of awareness in handling gas cylinders. The LPG or propane is a flammable mixture of hydrocarbon gases used as fuel in many applications like homes, hostels, industries, automobiles, vehicles because of its desirable properties which include high calorific value, less smoke, less soot, and meager harm to the environment. Natural gas is another widely used fuel in homes. Both gases burns to produce clean energy, however there is a serious problem of their leakage. Being heavier than air, these gases do not disperse easily. It may lead to suffocation when inhaled and may lead to explosion .

Due to the explosion of LPG, the number of deaths has been increased in recent years. To avoid this problem there is a need for a system to detect the leakage of LPG. Gas leak detection is the process of identifying potentially hazardous gas leaks by means of various sensors . Several designs of LPG detection and alert system have been proposed in the literature. Apehetal. designed kitchen gas leakage detection and automatic gas shut off system . T.Soundaryaetal. presented the cylinder LPG gas leakage detection system . Wireless and GSM technology based gas detectors have also been proposed. This paper presents a LPG leakage detection and alert system to avoid fire accidents and to provide house safety. The rest of the paper is organized as follows.

This system provides the information such as when a gas leakage is noticed, sensors of in the project are used to notice the gas leakage and immediately turns ON the buzzer for the danger indication.

Buzzer is a clear indication of gas leakage. By the detection of the hazardous gas the alerting message reached to the person who has control over it from the GSM. Detection of the gas leakage is importantand halting leakage is important equally. The main objective of this project is that it is extremely accurate with a least cost, this project system is best to detect gas leakage and also warn people aroundby buzzer beep sound and an SMS is been send to the responsible person for preparatory safety calculations.

1.1 PROJECT OVERVIEW

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

1.2 PURPOSE

The gas detectors can be used for the detection of combustible, flammable and poisonous gases and for loss of oxygen, and also to detected a gas leak or other pollutants. It makes the area where the leak occurs an warning sound and instructs operators to leave the area. The system proposed is planned, built and sent an SMS warning system for detection of gas leakages. Infrared imaging sensors have recently been used for a number of applications in industrial plants and refineries.

Fixed Flammable Gas Detection System is to be installed to detect flammable gases (cargoes) leaked to cargo equipment spaces, pump rooms, double hull spaces, cofferdams, void spaces and other spaces in or adjacent to cargo area.A human nose has around 400 different types of scent receptors that enable us to smell approx. 1 trillion different odors. But still, most of us cannot identify the type of gas present in the atmosphere. Hence, there are different sensors to measure accurate gas concentration in the atmosphere.

CHAPTER 2
LITERATURE SURVEY

A number of reviews on the subject of gas leakage detection techniques were done in the past either as part of research papers/technical reports on a certain leak detection method and other gas related subjects.Kumar Keshamoni and Sabbani Hemanth. [3] they introduce design and implementation of an economic gas leakage detector. They gave the formulation of many problems in previous gas leakage detectors. They told that several standards have been formulated for the design of a gas leakage detection system such as IEEE, BS 5730, and IEC.For this work, the recommended UK safety standards have been adopted. The proposed alarm system is mainly meant to detect LPG leakage, which is most commonly used in residential and commercial premises. The system detects not only the presence of gas (gas leak), but also the amount of leakage in the air, and accordingly raises an appropriate audio visual alarm. The objective of the system is to detect LPG gases such as propane andbutane. The allowed UK level for butane is 600 ppm above which it is considered to be of high level and poses a danger. The proposed system ensures a continuous monitoring of the gas levels. If the gas level increases above the normal threshold level of 400 ppm butane (LPG), the system starts to issue early warning alarms at 100ms interval, which implies low level gas leakage. If the leakage level increases to 575 ppm of butane (LPG), the system activates high severity audio alarms at 50 ms intervals warning the occupants to run to safety.

Prof. M.Amsaveni, A.Anurupa, R.S.Anu Preetha, C.Malarvizhi, M.Gunasekaran;[6] they told in their research paper on “GSM based LPG leakage detection and controlling system” the leakage of LPG gasis detected by the MQ-6 gas sensor. Its analog output is given to the microcontroller. It consists of predefined instruction set. Based on this, the exhaust fan is switched on. So, the concentration of gas inside the room gets decreased. Then, the stepper motor is rotated thus closing the knob of the cylinder.Because of this process, the leakage of gas is stopped. The relay is switched to off the power supply of the house. The buzzer produces an alarm to indicate the gas leakage. Then, the user is alerted by SMS through the GSM module. They proposed their methodology that the system takes an automatic control action after the detection of 0.001% of LPG leakage. This automatic control action provides a mechanical handle for closing the valve. We are increasing the security for human by means of a relay which will shut down the electric power to the house. Also by using GSM, we are sending an alert message to the users and a buzzer is provided for alerting the neighbors about the leakage.

B. B. Did paye, Prof. S. K. Nanda; in this paper they told about their research on leakage detection and review of"Automated unified system for LPG using microcontroller and GSM module". Their paper proposed an advance and innovative approach for LPG leakage detection,prevention and automatic booking for refill. In advance, the system provides the automatic controlling of LPG regulator also if leakage is detected the system will automatically turn off the main switch of power supply. Hence ithelps to avoid the explosion and blast.

Srinivasan, Leela, Jeya bharathi, Kirthik,Rajasree; in this research paper they told about gas leakage detection and control. In this paper, the gas leakage resulting into fatal inferno has become a serious problem in household and other areas where household gas is handled and used. It alerts the subscriberthrough the alarm and the status display besides turning off the gas supply valve as a primary safety measure.

Ch. Manohar Raju and N. Sushma Rani, 2008, they introduce an android based automatic gas detection and indication robot. They proposed prototype depicts a mini mobile robot which is capableto detect gas leakage in hazardous places. Whenever there is an occurrence of gas leakage in a particular place the robot immediately read and sends the data to android mobile through wireless communication like Bluetooth. We develop an android application for android based smartphones
which can receive data from robot directly through Bluetooth. The application warns with an indication whenever there is an occurrence of gas leakage and we can also control the robot movements via Bluetooth by using text commands as well as voice commands. The previous mobile robots are based on heterogeneous technologies like GSM, GPS, internet based etc., but the main disadvantage of those prototypes were the absence of communication in particular areas. So, with the rapid developments andtremendous changes in technology we have lots of techniques to eradicate previous problems. Wireless communication protocols play a vital role in present trends. Bluetooth, WI-Fi, Zigbee etc., we use one of the best feature of smartphone, i.e., the Bluetooth technology to control and monitor parameters driven by a robot.

Hitendra Rawat, Ashish Kushwah, Khyati Asthana, Akanksha Shivhare,in the year 2014 planned a framework, They gave security issues against hoodlums, spillage and fire mishaps. In those cases theirframework sends SMS to the crisis number gave to it.

1.3 EXISTING PROBLEM

The presence of hazardous LPG gas leakage in a domestic, work place, also, stored gases container gas which exhibits ideal characteristic is use. For that sake, an alarm unit is used to vibrate an alarm which is buzzer. Buzzer gives an audible sign of the presence of LPG volume. The sensors are widely used to detect essence of propane, iso-butane, LPG and even smoke. The sensor has an advantage to combine asensitivity response time. If the LPG sensor senses gas leak from work place or home, sensor output goes to active low (logic-0) condition. Arduino UNO is used in the project; low signals are overlooked by the Arduino and gas leakage is been noticed by the Arduino. The Arduino UNO turns on the LCD and buzzer.

1.4 REFERENCES

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[5]“Design and Implementation of an Economic Gas Leakage Detector”National Institute of Health (2004). What you need to know about natural gas detectors.

[6]Prof.M.Amsaveni, A.Anurupa, R.S.Anu Preetha, C.Malarvizhi,M.Gunasekaran “Gsm based LPG leakage detection and controlling system” the International Journal of Engineering and Science (IJES) ISSN (e): 2319 – 1813 ISSN (p):2319 – 1805 Pages 112-116 March- 2015

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[8] Pal-Stefan Murvaya, IoanSileaa “A survey on gas leak detection and localization techniques”

[9] Ashish Shrivastava,Ratnesh Prabhaker, Rajeev Kumar and Rahul Verma “GSM BASED GAS LEAKAGE DETECTION SYSTEM” in International Journal of Technical Research and Applications e-ISSN: 2320- 8163,www.ijtra.com Volume 1, Issue 2 (may-june 2013).

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1.5 PROBLEM STATEMENT DEFINITION

Internet of Things (IoT) is the networking of ‘things’ by which physical things can communicate with the help of sensors, electronics, software, and connectivity. These systems do not require any human interaction. Internet of Things aim towards making life simpler by automating every small task around us. As much is IoT helping in automating tasks, the benefits of IoT can also be extended for enhancing the existing safety standards.Safety plays a major role in today’s world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existingsafety model installed in industries and this system can also be used in homes and offices. The traditional Gas Leakage Detector Systems though have great precision, fail to acknowledge a few factors in the field of alerting the people about the leakage. Therefore we have used the IoT technologyto make a Gas Leakage Detector for society which having Smart Alerting techniques involving sendingtext message to the concerned authority and an ability performing data analytics on sensor readings.

CHAPTER 3

IDEATION AND PROPOSED SOLUTION

3.1 EMPATHY MAP CANVAS

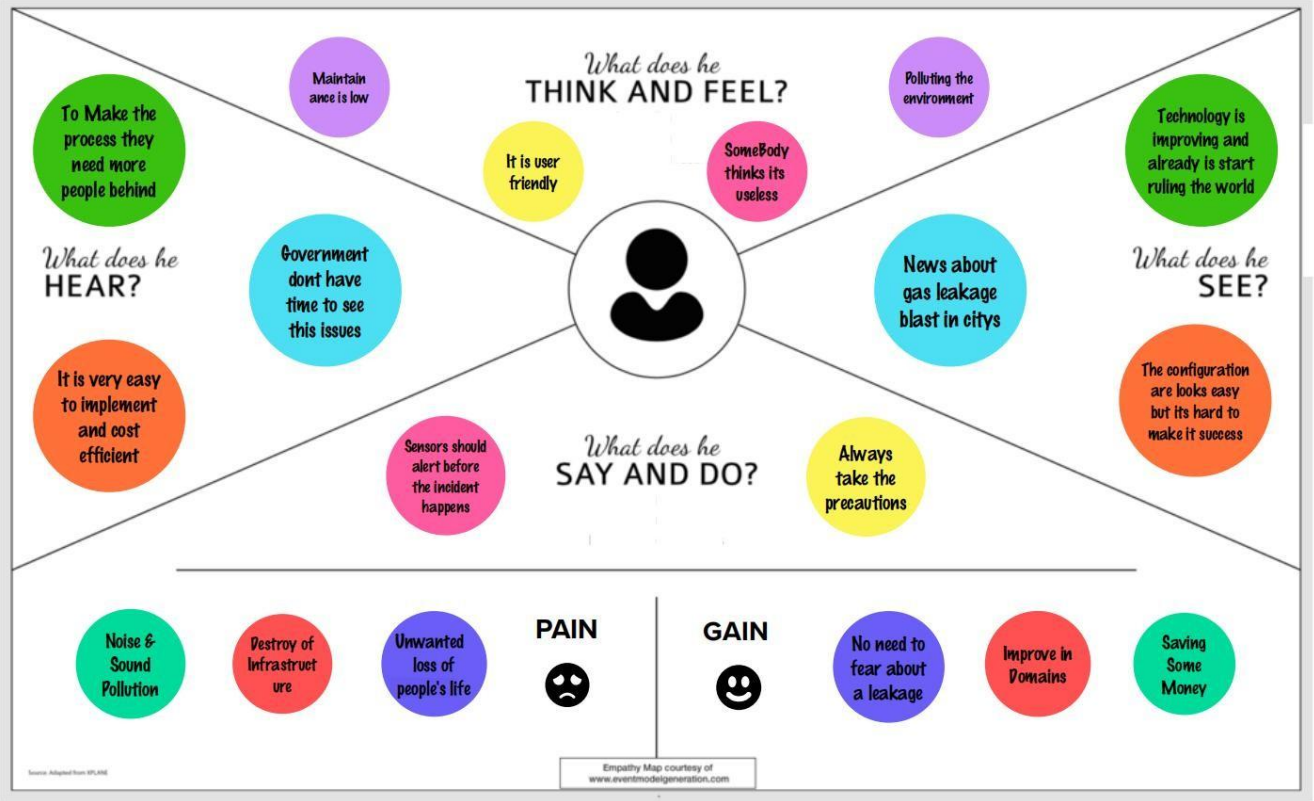


Fig 3.1 EMPATHY MAP CANVAS

3.2 IDEATION AND BRAINSTROMING

Fig 3.2 BRAINSTORMING

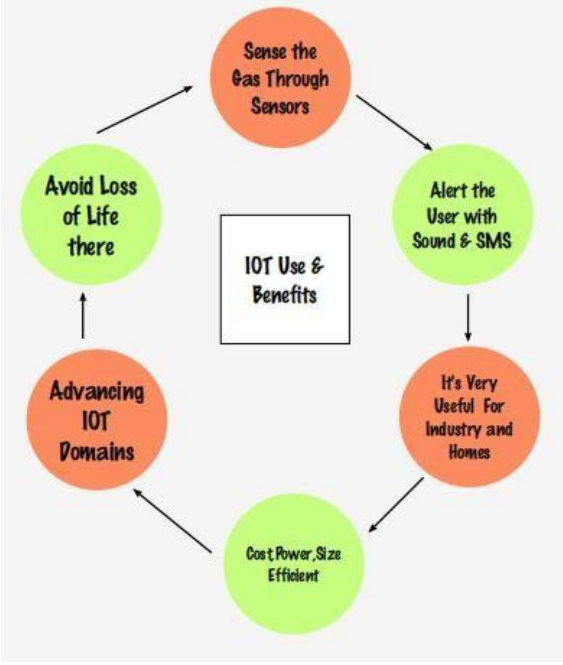


Fig 3.2 BRAINSTORMING

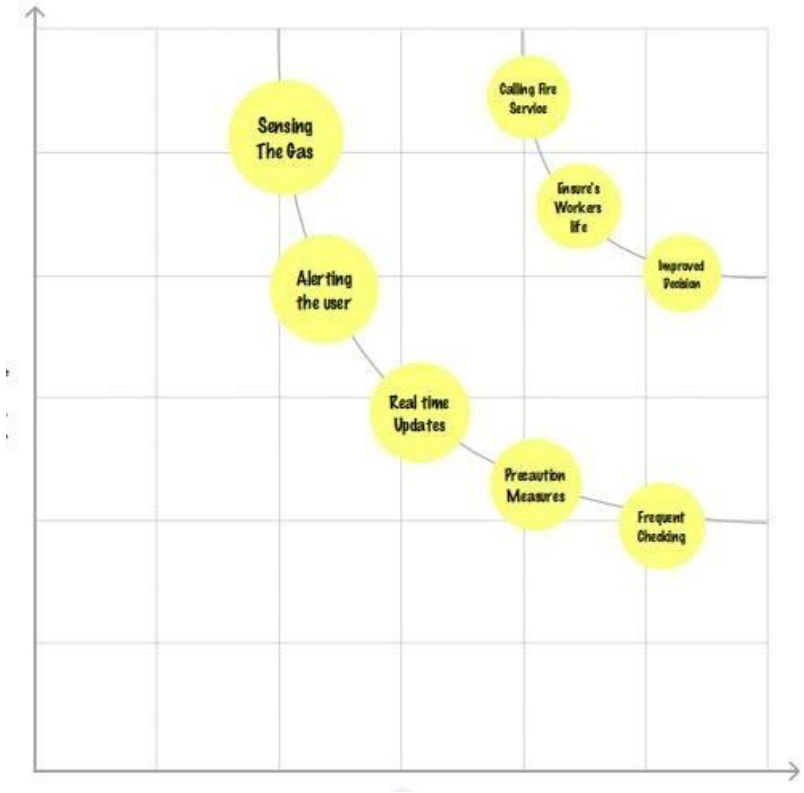


Fig 3.2 BRAINSTORMING

3.3 PROPOSED SOLUTION

If the gases can be leaked in industries or home, then it will detect by using gas sensor after that it gives alert sound to the people by using buzzer. In this way we avoid the huge explosion. And also by alerting the user or near fire station the location with the message.Ability to predict the hazardous gases like LPG and propane. User Friendly and Live alert to the workers.Includes many Hazardous gas detection in industries. The system can be extended in future based on industry requirements and features.

3.4 PROBLEM SOLUTION FIT

1. CUSTOMER SEGMENT

The levels of gases are detected, can help to prevent an explosion or can help to prevent worker injury or exposure to toxic gases. Sometimes its hard to find the leakage area.

2. PROBLEM ROOT CAUSE

The root cause / problem for the gas leakage is due to atomic reactions between gas molecules, material quality and etc.Some of the faults in the machines, leakage by the machines, people

carelessness in workplace and life security.

3. TRIGGERS

Usage of the device in portrayed in the news. The trigger varies from the incorrect installation to theuse of defective gas cylinders. In real life situation, the device has helped in saving number of individuals.

4. AVAILABLE SOLUTIONS

GSM module helps us to Get notification when there is a gas leakage. Availing network connection from a reliable Service provider. Buzzer to indicate the leakage. Quick Connectors, Test Benches, Leak Testers. Low cost IOT based device that can be easily accessed and fixed by people. Device can be manufactured in multiple standards based on the environment.

CHAPTER 4

REQUIREMENT ANALYSIS

4.1 FUNCTIONAL REQUIREMENT

To ensure the system works well, it has to support the following business requirements:

- The user shall be able to receive warning message as quickly as possible.
- The user shall be able to turn off the electricity.
- The user shall be able to turn on the air- refreshing device.
- The user shall be able to view information of fire station.
- The user shall be able to view nearest fire station.
- The user shall be able to navigate to nearest fire station.
- The user shall be able to make call to 998.
- The user shall be able to share/ location.

4.2 NON-FUNCTIONAL REQUIREMENTS

Non-functional requirements "refer to behavioural properties that the system must have, such as performance and usability". To determine the gas characteristics and solve the issue, they will locate the leak and identify the warning. Harsh environment is prevailing only on certain industry; thus, the frequency of the said problem is low.

CHAPTER 5

PROJECT DESIGN

5.1 DATA FLOW DIAGRAM

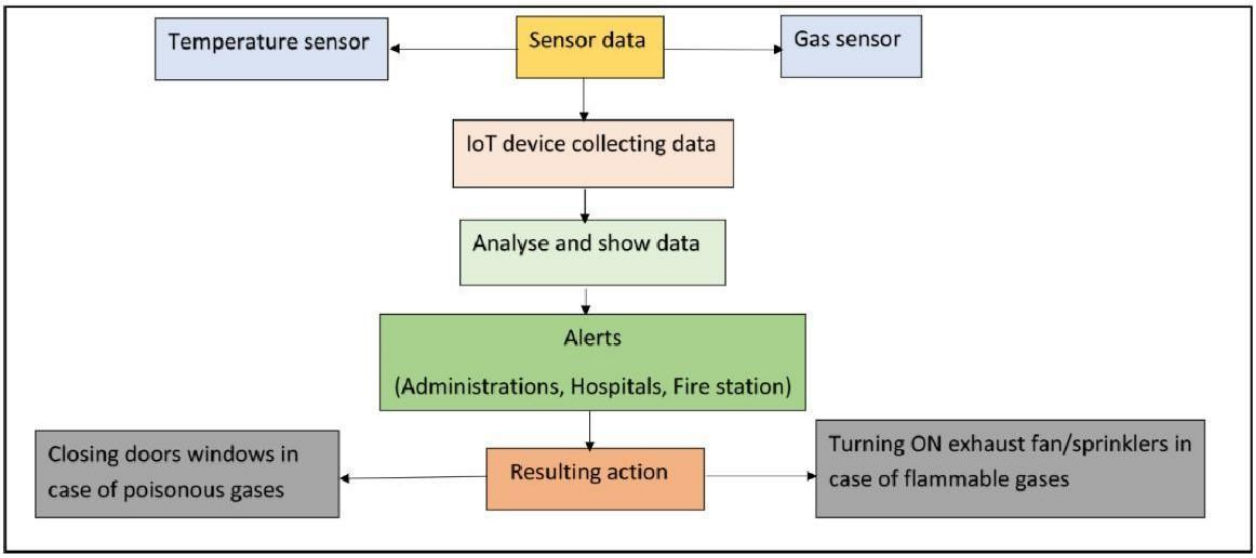


Fig 5.1 DATA FLOW DIAGRAM

5.2 SOLUTIONAL AND TECHNICAL ARCHITECTURE

Solution architecture is a complex process – with many sub-processes – that bridges theGap between business problems and technology solutions. Its goals are to:

➢ There are numerous available projects and solution for this problem. Among them using gas sensor near the map and alerting the industry workers is the working and best solutions in the market.

➢ In our solution we will place a sensor near the gas plants which will always monitor the gas plants which will constantly send data to the micro controller.

➢ In case if gas leak occurs the value measured by the gas sensor will exceed the threshold value and the controller will be coded to send a message to admin department, workers of that industry and Disaster Management Department of that particular area.

➢ This message alert will be done through the cloud services.

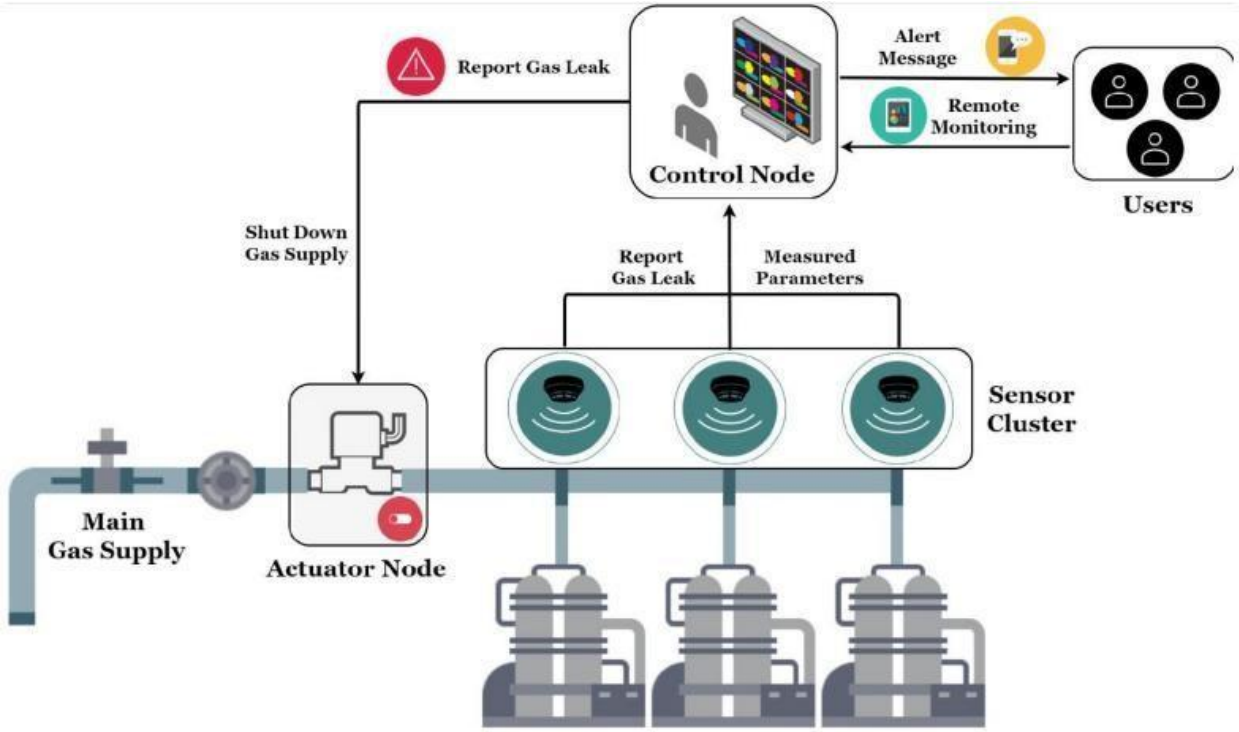


Fig 5.2 SOLUTIONAL ARCHITECTURE

CHAPTER 6

PROJECT PLANNING AND SCHEDULING

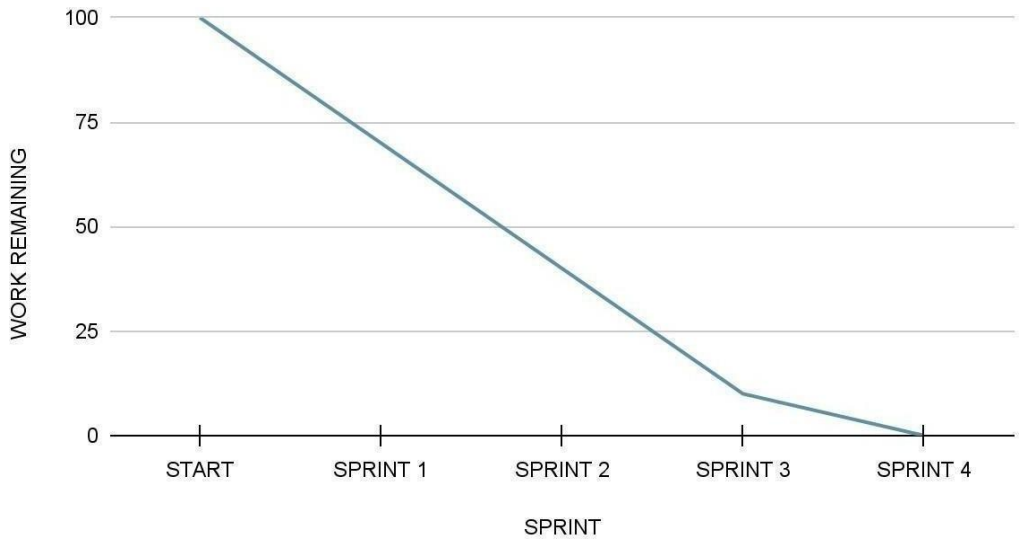
6.1 SPRINT PLANNING & ESTIMATION

Sprint	Functional Requirement (Epic)	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Resources Initialization	Create and initialize accounts in various public APIs like OpenWeatherMap API.	1	LOW	Saran Kishore Ahmet Karthikeyan Prava
Sprint-1	Local Server/Software Run	Write a Python program that outputs results given the inputs like weather and location.	1	MEDIUM	Saran Kishore Ahmet Karthikeyan Prava
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	Saran Kishore Ahmet Karthikeyan Prava
Sprint-3	Hardware initialization	Integrate the hardware to be able to access the cloud functions and provide inputs to the same.	2	HIGH	Saran Kishore Ahmet Karthikeyan Prava
Sprint-4	UI/UX Optimization & Debugging	Optimize all the shortcomings and provide better user experience.	2	LOW	Saran Kishore Ahmet Karthikeyan Prava

6.2 SPRINT DELIVERY SCHEDULE

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	31 Oct 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	07 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	14 Nov 2022

6.3 REPORTS FROM JIIRA



CHAPTER 7

ADVANTAGES

- Low power consumption and reliable.
- The advantage this has over others is that it provides quick response rate and has faster diffusion ofthe critical situation than the manual methods.
- All the reviewed works aimed at developing systems capable of detecting gas leakages and sendingan SMS alert to the user.
- The system enables monitoring of gas leakages in remote locations and thereby leads to a faster response time in the events of a leakage condition.
- In the long run the maintenance cost is very less when Compared to the present systems.
- The system is highly reliable, tamper-proof and secure.
- It is possible to get instantaneous results and with high accuracy.

DISADVANTAGES

- Will not sense the small leakage.
- Its sensitivity to smoke then it is not perfectly reponse for LPG gas detection.
- High sensitivity to humidity and temperature; sensor response drift with time; short-life time.
- Relatively poor signal to noise performance; complex circuitry; unsatisfactory reproducibility.
- Sensitive to humidity; complex supporting software and instrument; short life time; only sensitive to oxygen and VOCS.
- High-power-consumption; limited application on portable systems; blind with sulfur gas; limited coating materials; sensitive to humidity

CHAPTER 8

CONCLUSION

Internet of Things is a new revolution of the Internet & it is a key research topic for researcher in embedded, computer science & information technology area due to its very diverse area of application& heterogeneous mixture of various communications and embedded technology in its architecture. Inour modern scenario the usage of LPG has increased in a greater manner. As a result of this,the damages caused by the leakage of gas is increasing day by day. So as to eradicate this problems we are introducing highly advanced system known as Internet Of Things(IOT) . It is used in wide range ofapplications in present day society and introducing a vast scope to the future. Our proposed system ismore effective and eco friendly due to the reason of detecting the leakage of gas and controlling the gasvalve. So it is mainly designed for the safety of people and property. Using IOT ,it also allows us tobook the gas from the gas agency ,when the weight of the gas cylinder reduces below a threshold value .Thus people could easily use their time effectively. It also uses to alert the consumers about thewastage of gas while removing the utensils from the burner by using an object detection sensor.

CHAPTER 9

FUTURE SCOPE

1. A Mobile Application can be created for this system which can give information about the concentration of gas present in the area, setting reminders to check gas level, also to predict the gasleak by giving values.

2. The use of Pressure sensor along with the system can provide an extra feature of Automatic Gas Booking. Like other sensors, the pressure sensor can constantly monitor the amount of gas present incylinder and send a booking SMS if it reaches certain level.

3. Relay motors can be added into the system to provide more safety. These motors can switch off theMain Gas Supply and Main Power supply in case the gas concentration exceeds certain limit.

4. As no system is perfect, neither is this one. So it leaves us with the further scope of improvement. In addition to gas leakage detection, the weight measurement system can also be incorporated, thus givingthe user intimation about the refill time of cylinder.

CHAPTER 11

APPENDIX

SOURCE CODE

SPRINT 1

```
#include<LiquidCrystal_I2C.h
> LiquidCrystal_I2C lcd(32,
16, 2);int green = 2;
int yellow
= 3;int red
= 4;
int siren =
5;int gas =
A0;
int sensorValue
= 0;void setup()
{
Serial.begin(960
0);lcd.init();
lcd.clear();
lcd.backlight();
lcd.setCursor(3,
0);
lcd.print("GAS
LEAKAGE");
lcd.setCursor(4,1);
lcd.print("DETECTION");
delay(3000);
lcd.clear();
lcd.setCursor(0,0);
lcd.print("Gas Value: ");
pinMode(green,
```

```
OUTPUT);
pinMode(yellow,
OUTPUT);pinMode(red,
OUTPUT);
pinMode(siren,
OUTPUT);
digitalWrite(red, LOW);
digitalWrite(yellow,
LOW); digitalWrite(green,
LOW);
}
void loop()
{
sensorValue =
analogRead(gas);
Serial.println(sensorValue);
lcd.setCursor(11,0);
lcd.print(sensorValue);
if(sensorValue > 500)
{
lcd.setCursor(0,1);
lcd.print("GAS
DETECTED");
digitalWrite(red, HIGH);
digitalWrite(yellow, LOW);
digitalWrite(green, LOW);
tone(siren, 200);
}
else if(sensorValue > 281 && sensorValue < 500)
{
lcd.setCursor(0,
1);lcd.print("
");
digitalWrite(yellow,
HIGH);digitalWrite(red,
```

```
LOW);
digitalWrite(green,
LOW); noTone(siren);
}
else
{
lcd.setCursor(0,1);lcd.print
("");
digitalWrite(green,
HIGH); digitalWrite(red,
LOW);
digitalWrite(yellow,
LOW);noTone(siren);
}
delay(1000);
}
```

SPRINT 2

```
#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
buttongasLevel = analogRead(gasPin);
buttonState = digitalRead(buttonPin);
// call the function for gas detection and button
workgasDetected(gasLevel);
buzzer(gasLevel);
exhaustFanOn(buttonState);
}
// Gas Leakage Detection & Automatic Alarm and Fan ON
void gasDetected(float
gasLevel){if(gasLevel >=
300){ digitalWrite(buzzPin,HI
GH);
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(100
0);
lcd.clear()
;
}
}
//BUZZER
void buzzer(float
gasLevel){if(gasLevel>=
300)
{
for(int i=0; i<=30; i=i+10)
{
tone(4,i);
delay(40
0);
noTone(
4);
delay(40
0);
}}

}
```

```
// 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();
}
}
```

SPRINT 3

```
#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(50
0);
lcd.clear
();
}
void loop(){
// Read the value from gas sensor and
buttongasLevel = analogRead(gasPin);
buttonState = digitalRead(buttonPin);
// call the function for gas detection and button
workgasDetected(gasLevel);
buzzer(gasLevel);
exhaustFanOn(buttonState);
}
// Gas Leakage Detection & Automatic Alarm and Fan
ONvoid 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(100
0);
lcd.clear()
;


}
//BUZZER
void buzzer(float
gasLevel){if(gasLevel>=
300)
{
for(int i=0; i<=30; i=i+10)
{
tone(4,i);
delay(40
0);
noTone(
4);
delay(40
0);
}
}
}
// 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();
}
}
```

SPRINT 4

```
#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 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
buttongasLevel = analogRead(gasPin);
buttonState = digitalRead(buttonPin);
// call the function for gas detection and button
workgasDetected(gasLevel);
buzzer(gasLevel);
exhaustFanOn(buttonState);
}
```

```
// Gas Leakage Detection & Automatic Alarm and Fan
ONvoid 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(100
0);
lcd.clear()
;
}
}
//BUZZER
void buzzer(float
gasLevel){if(gasLevel>=
300)
{
for(int i=0; i<=30; i=i+10)
{
tone(4,i);
delay(40
0);
noTone(
4);
delay(40
0);
}
```

```
}
}
// 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 LINK

https://github.com/IBM-EPBL/SI-GuidedProject-14823-166.