GAS LEAKAGE MONITORING & ALERTING SYSTEM FOR INDUSTRIES

IBM-Project-24060-1659936453

NALAIYA THIRAN
PROJECTBASED LEARNING ON
PROFESSIONAL READLINESS
FOR INNOVATION,
EMPLOYNMENT AND
ENTERPRENEURSHIP

A PROJECT REPORT

Submitted by

SHRILEKHA [2127190701099]

ADITYA U TAWKER [2127190701002]

HARINEE V [2127190701033]

HARIHARA SUBRAMANIAN B [2127190701032]

TEAMID : PNT2022TMID05385

INDUSTRY MENTOR : Kumar Juluri

FACULTY MENTOR : Malathi S R

ELECTRONICS & COMMUNICATION

ENGINEERING SRI VENKATESWARA COLLEGE

OF ENGINEERING

Pennalur-602117

PROJECT REPORT

1. INTRODUCTION

1.1 Project overview:

The Internet of things (IoT) is the system of gadgets, vehicles, and home machines that contain hardware, programming, actuators, and network which enables these things to interface, collaborate and trade information. IoT includes broadening Internet network past standard device, for example, work areas, workstations, cell phones and tablets, to any scope of generally stupid or non-web empowered physical device and ordinary articles. Installed with innovation, these gadgets can convey and connect over the Internet, and they can be remotely observed and controlled [1]. The meaning of the Internet of things has advanced because of union of numerous innovations, ongoing examination, AI, ware sensors, and implanted frameworks. Conventional fields of installed frameworks, remote sensor systems, control frameworks computerization (counting home and building mechanization), and others all add to empowering the Internet of things. A gas spill alludes to a hole of petroleum gas or different vaporous item from a pipeline or other regulation into any territory where the gas ought not be available. Since a little hole may steadily develop a hazardous convergence of gas, spills are perilous. Notwithstanding causing flame and blast dangers, holes can slaughter vegetation, including huge trees, and may discharge amazing ozone harming substances to the environment.

1.2. Purpose

We design and develop and propose a system which includes some safety factors. Safety has been a major issue in today's day to day life. LPG and CNG i.e. petroleum gas and compressed natural gas are most commonly used in residential and commercial places for cooking purposes and in various vehicles as a replacement for costly fuels like diesel, petrol . These gases are filled in cylinders which are easily undamageable. But leakage can take place through pipes or regulators or knobs which may cause accidents like suffocation, uneasiness or sometimes.

2. LITERATURE SURVEY

2.1. Summary:

This paper detects the leakage of gas in households and sends a warning message to the appropriate user. It can also automatically book a new cylinder when the gas is about to empty. Here load cells are used to monitor the weight of the gas cylinder.

2.2. Merits:

. The working of the proposed system depends on detecting the change in concentration of any of the gases, which provides flexibility in the system to detect any leakage of these gases that avoids false alarms

- Gases that are widely used in the household are detected in case of leakage.
- The message has been successfully sent to the owner in case of emergency.

2.3. Demerits:

- The MQ5 sensor can only detect H2, LPG, CH4, CO, and Alcohol.

In case of emergency, respective safety authorities must also be

intimated.

2.4. References:

[1]. Mr. Sameer Jagtap, Prajkta Bhosale, Priyanka Zanzane, Jyoti Ghogare, "LPG Gas Weight and Leakage Detection System Using IoT", International Journal for Research in Applied Science & Engineering Technology", Volume 4, Issue 3, March 2016, Pg – 716 to 720.

[2]. Arun Raj, Athira Viswanathan, Athul T S, "LPG Gas Monitoring System", International Journal of Innovative Technology and Research, Volume 3, Issue 2, February 2015, Pg – 1957 to 1960.

[3]. S Shyamaladevi, V. G. Rajaramya, P. Rajasekar, P. Sebastin Ashok, "ARM7 based automated high-performance system for LPG refill booking & leakage detection", Journal of VLSI Design and Signal Processing", Volume 3, Issue 2, 2014.

[4]. S. Sharma, V. N. Mishra, R. Dwivedi, R. Das, "Classification of gases/odors using Dynamic Response of Thick Film Gas Sensor .

2.5. Problem Statement Definition

For industry owners-Ensuring the safety of workers is the main thing Sometimes it is hard to identify from which area the leakage is occurring. For homemakers-They are not able to identify whether the gas leakage is occurring due to external sources or something.

1.Proper maintenance should be taken at least once in a month and this prevents the customers from taking actions in gas Leakage problems.

2.The services can be done only by technicians, so it is difficult to set up gas leakage systems in home/industries.

Usage of sensors to sense gas leakage. The GSM module helps us to get notification when there is gas leakage.

Jobs-to-be-done: Automatic nob closing Switching off power supply.

Problems: If the cylinder is not maintained properly it causes problems. Preferring cylinders under room temperature not in a hot area or cold places.

1.Sometimes the sensor does not work properly which can cause major problems.

2.It is difficult to identify the difference between LPG gas and other gasses.

Behavior:-

1. Identifies the issues with the help of sensors.
2. Regular monitoring is done.
3. Automatic registration when the cylinder is about to empty.

Identification of gas leakage will be done immediately and necessary measurements are taken in case of emergency.

1.Customers feel safe by having this product in their environment.

2. Before, people worried about explosions and accidents due to gas leakage but after using this product they can have a better idea.

3. Switching on/off of any electric device should be avoided.

4. Creating shortcuts in industries to evacuate everyone in case of gas Leakage.

5. Easy way to build relationships and interaction with people is done in a proper manner.

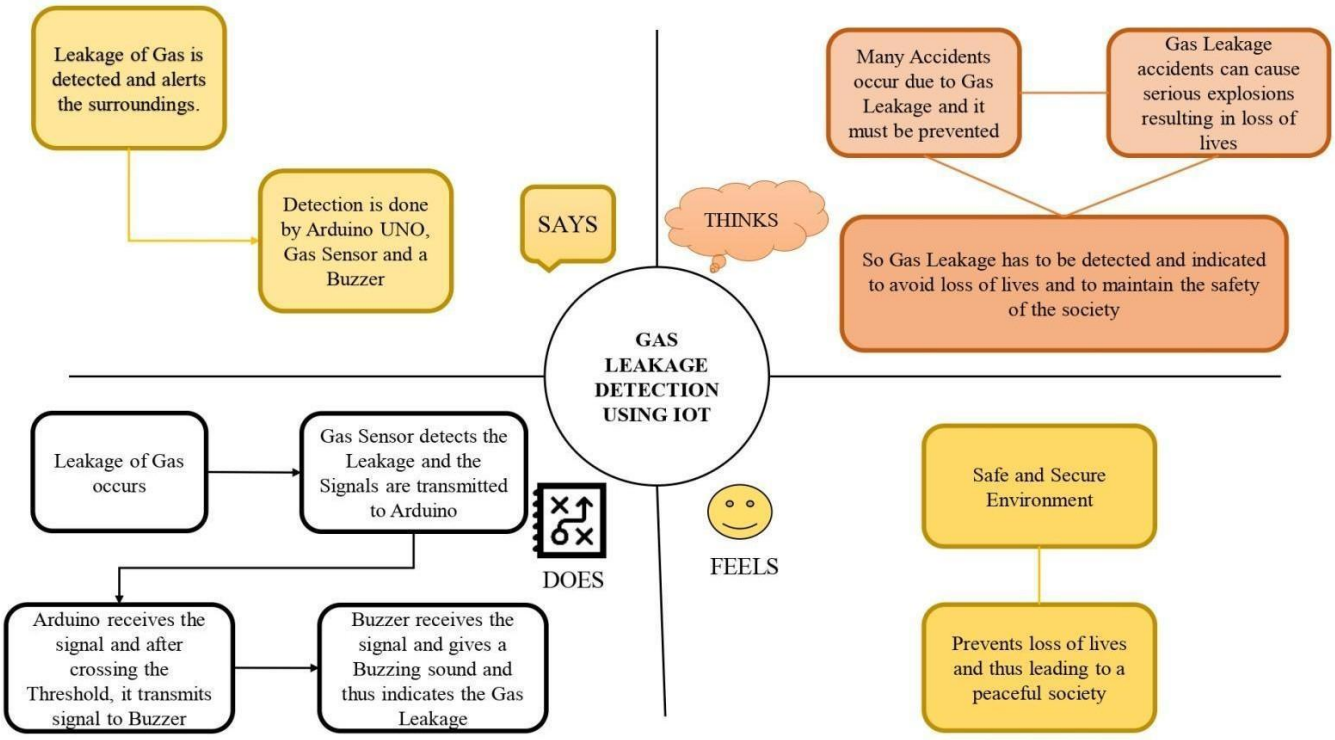
6. The customers prefer to visit professionals.

7. The products based on gas Leakage systems are less?

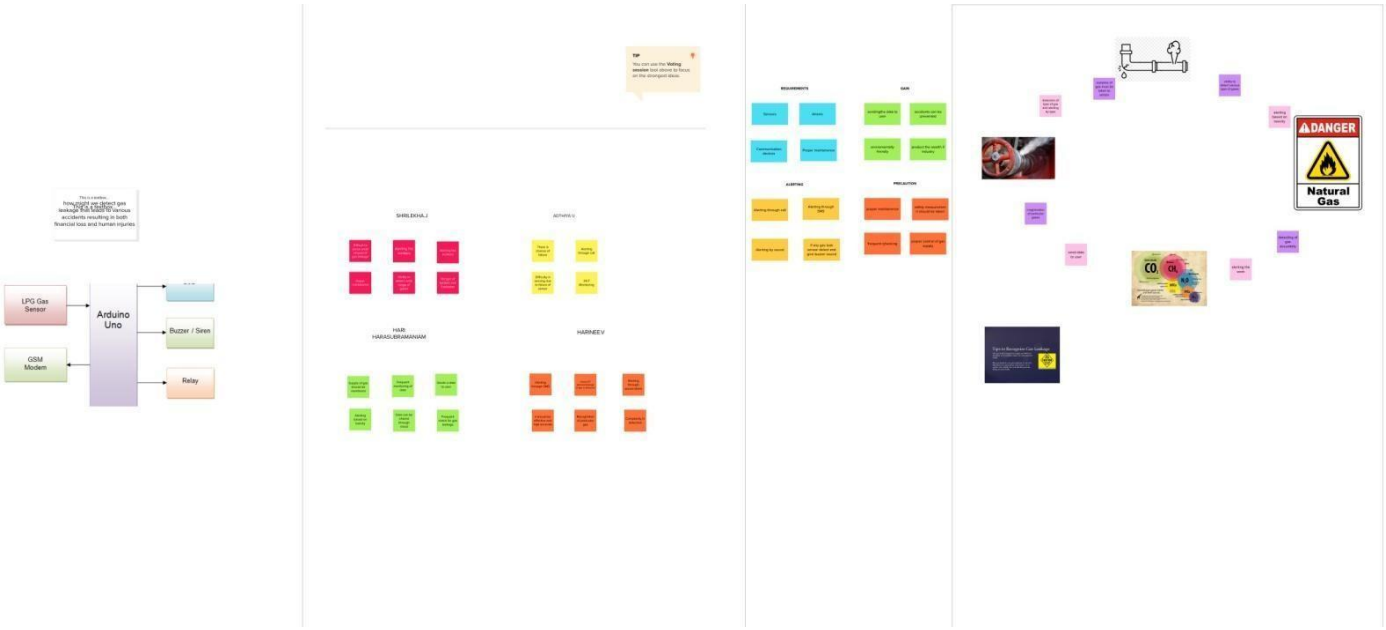
8. Returning the product is easy.

3. IDEATION & PROPOSED SOLUTION

3.1. Empathy Map Canvas



3.2. Ideation & Brainstorming:



3.4. ProposedSolution

Project team shall fill the following information in the proposed solution template.

	Parameter	Description

	Problem Statement (Problem to be solved)	To ensure the safety of workers in the industries,we develop an efficient system & an application to monitor the gas pipelines continuously and detect early if there is any gas leakage in the surroundings.Generally in gas industries there are some places that are too noisy. So ,in those areas workers can't hear the siren sound when the gas leakage alerting system alerts.
	Idea / Solution description	Our solution not only notify the industry person¬ but also notify the fire fighters Low latency¬ The use of stepper motor helps to close the¬ knob immediately if gas leakage is sensed¬ The position of the LED displays is placed on¬ the conspicuous part It has the ability to detect various type of gases,¬ not just of single type. Hence the system makes more efficient.
	Novelty / Uniqueness	Our solution not only notify the industry person¬ but also notify the fire fighters Low latency¬ The use of stepper motor helps to close the¬ knob immediately if gas leakage is sensed¬ The position of the LED displays is placed on¬ the conspicuous part It has the ability to detect various type of gases,¬ not just of single type. Hence the system is more efficient.
	Impact on society	Our solution will be very helpful for the workers and the society which is associated or located nearby the industries. Our solution will prevent great disasters like the Bhopal Gas Tragedy so that so many lives can be saved. Through this project the workers' mental pressure will be reduced so that they can concentrate on other works or by relaxing them.

	Business Model (Revenue Model)	The main target of our solution is Industries so we have planned to visit industries and explain to them about the benefits of our products. They can't just install and leave. they needed to get serviced.we can make

		profit by servicing ,upgrading, installing devices. No one wants to destroy their factory . so it's¬ assured that our product will be sold and installed in every gas industries
	Scalability of the Solution	Alerting system over this methods offers quick response time and sends alert to people in short period of time.So that people can evaculate as fast as they can and also the workers in the industries can fix before the explosion as fast as they can.Even when the gas leakage is more, the product sense the accurate values and alerts the workers effectively

3.5.Problem Solution fit:

PROBLEM-SOLUTION FIT

1. CUSTOMER SEGMENT(S)

For industry owner-Ensuring the safety of workers is the main thing Sometimes it is hard to identify from which area the leakage is occurring.
For homemakers-They are not able to identify whether the gas leakage is occurring due to external source or something.

6. CUSTOMER

1.Proper maintenance should be taken atleast once in a month and this prevents the customers from taking actions in gas Leakage problem.

2.The services can be done only by technicians, so it is difficult to set up gas leakage system in home/industries.

5. AVAILABLE SOLUTIONS

Usage of sensors to sense gas leakage.
GSM module helps us to get notification when there is gas leakage.

2. JOBS-TO-BE-DONE / PROBLEMS

Jobs-to-be-done:
Automatic nob closing
Switching off power supply
Problems:
If the cylinder is not maintained properly it cause problems.
Preferring cylinders under room temperature not in a hot area or cold places.

9. PROBLEM ROOT CAUSE

1.Sometimes sensor does not work properly which can cause the major problem.
2.It is difficult to identify difference between LPG gas and other gasses

7. BEHAVIOUR

1.Identifies the issues with the help of sensor.
2 Regular monitoring is done
3. Automatic registration when the cylinder is about to empty.

3. TRIGGERS

Identification of gas leakage will be done immediately and necessary measurements are taken incase of emergency.

4. EMOTIONS: BEFORE / AFTER

1.Customers feels safe by having this product in their environment.
2.Before, people worry about explosions and accidents occurs due to gas leakage but after using this product they can have a stressbest idea.

10. YOUR SOLUTION

1. Switching on/off of any electric device should be avoided.
2. Creating shortcuts in industries to evacuate everyone in case of gas Leakage.

8.CHANNELS of BEHAVIOUR

ONLINE:
Easy way to build relationship and interaction with people is done in a proper manner.

OFFLINE:
The customers prefer to visit professionals.
The products based on gas Leakage system is less.
Returning the product is easy.

4.PROJECT DESIGN

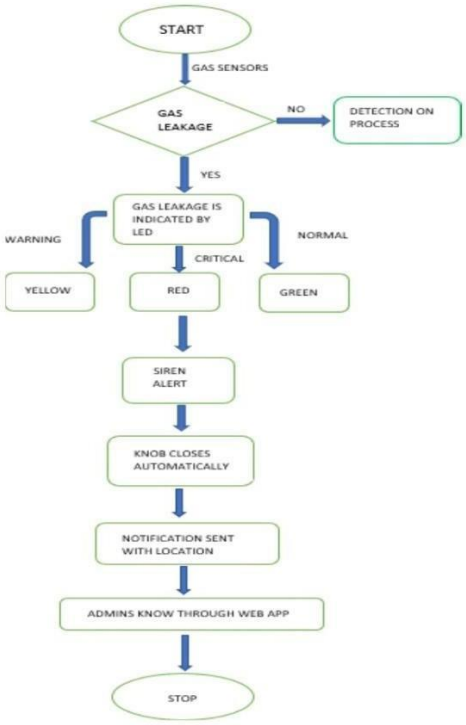
4.1Data FlowDiagrams

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

FLOW

Project Design Phase-II
Data Flow Diagram & User Stories

Date	15 October 2022
Team ID	PNT2022TMID53586
Project Name	Gas leakage monitoring and alerting system
Maximum Marks	4 Marks



User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirmingmy password.	I can access my account / dashboard	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
Customer (Web user)	Registration	USN-1	As a user, I can register for the application by google.	I can access confirmation email.	High	Sprint-1
		USN-2	As a user, I can register for the application by firebox.	I can access confirmation Login.	low	Sprint-2
	Login	USN-3	As a user, I can register for the application through Gmail		Medium	Sprint-1
Administrator	Registration	USN-1	As a user, I can register for the application through Mobile app.	I can access confirmation My account	High	Sprint-1
		USN-2	As a user, I can register for the application through Mobile app.	I can access confirmationemail	low	Sprint-2

Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	15 October 2022
Team ID	PNT2022TMID53586
Project Name	Gas leakage monitoring and alerting system
Maximum Marks	4 marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story/Sub-Task)
FR-1	Objective	The purpose of the system is to detect early gas leakage in the industries through the gas pipelines and alert the user with their location.
FR-2	Focus	To alert the user immediately if any gas leakage is sensed.
FR-3	Features	Gas leakage level will be indicated by the LED lights. It detects the different harmful gases like methane, LPG etc., by using the required sensors. It updates the sensor parameters in web applications.
FR-4	Essentiality	To prevent the industry workers from being exposed to toxic gases.
FR-5	Gas leakage location sent	Location sent to the web application through GPS module.

Non-Functional Requirements:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
FR-1	Usability	The web application is simple and easy to use. Efficiency is high.
FR-2	Reliability	The application runs accurately.
FR-3	Availability	The application can be accessed at any time and anywhere.
FR-4	Security	The web application is highly secure. Software is protected from unauthorized access.
FR-5	Scalability	Application is not limited to the users.

5. PROJECT PLANNING &

SCHEDULING 5.1.Sprint Planning &

Estimation

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Date	22 October 2022
Team ID	PNT2022TMID53586
Project Name	Project – Gas Leakage Monitoring and Alerting System
Maximum Marks	8 Marks

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Objective	USN-1	As a system, the gas sensor should detect the gas	8	High	Shrilekha
Sprint-1	Features	USN-2	As a system, the gas sensor values should be displayed in a LCD screen	2	Low	Aditya
Sprint-1	Features	USN-3	As a system, as soon as the detected gas reaches the threshold level, the red color LED should be turned ON.	5	High	Harinee
Sprint-1	Features	USN-4	As a system, as soon as the detected gas reaches the threshold level, the siren should be turned ON.	5	High	Hariharan
Sprint-2	Focus	USN-5	As a system, it should the send the location where the gas is detected	8	High	Shrilekha
Sprint-2	Focus	USN-6	As a system, it should also send the alerting SMS to the registered phone number	2	Low	Harinee

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-2	Features	USN-7	As a system, the gas leakage pipe should be closed automatically once there it attains the threshold value	5	Medium	Hariharan
Sprint-2	Features	USN-8	As a system, it will indicate that the gas leakage pipe is closed in the LCD screen and send SMS to the registered mobile number.	5	Medium	Aditya
Sprint-3	Data Transfer	USN-9	As a program, it should retrieve the API key of the IBM cloud to send the details of the system.	2	Low	Aditya
Sprint-3	Data Transfer	USN-10	As a system, it should send the data of sensor values along with latitudes and longitudes to the IBM cloud	5	Medium	Shrilekha
Sprint-3	Data Transfer	USN-11	As a cloud system, the IBM cloud should send the data to NodeRed	2	Medium	Harinee
Sprint-3	Data Transfer	USN-12	As a system, it should collect the data from the NodeRed and give it to the backend of the mit app.	3	Medium	Harinee
Sprint-3	Data Transfer	USN-13	As an application, it should display the details of the gas level and other details to the user through the frontend of the mit app.	8	High	Hariharan
Sprint-4	Registration	USN-14	As a user, I must first register my email and mobile number in the website	2	High	Shrilekha

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-4	Registration	USN-15	As a user, I must receive confirmation mail and SMS on registration	2	Medium	Harinee
Sprint-4	Login	USN-16	As a user, I can login into the web application through email and password.	3	High	Aditya
Sprint-4	Dashboard	USN-17	As a user, I can access the dashboard and make use of available resources.	2	Medium	Hariharan
Sprint-4	Focus	USN-18	As a user, I must receive an SMS once the leakage is detected.	5	High	Harinee
Sprint-4	Allocation	USN-19	As an admin, I must receive information about the leakage along with location and share exact location and route to the person.	3	High	Aditya
Sprint-4	Allocation	USN-20	As an admin, I must allot particular person to look after the leakage in a particular location.	3	High	Harinee

Project Tracker, Velocity & Burndown Chart: (4 Marks)

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		29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022		05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022		19 Nov 2022

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

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

Burndown Chart:

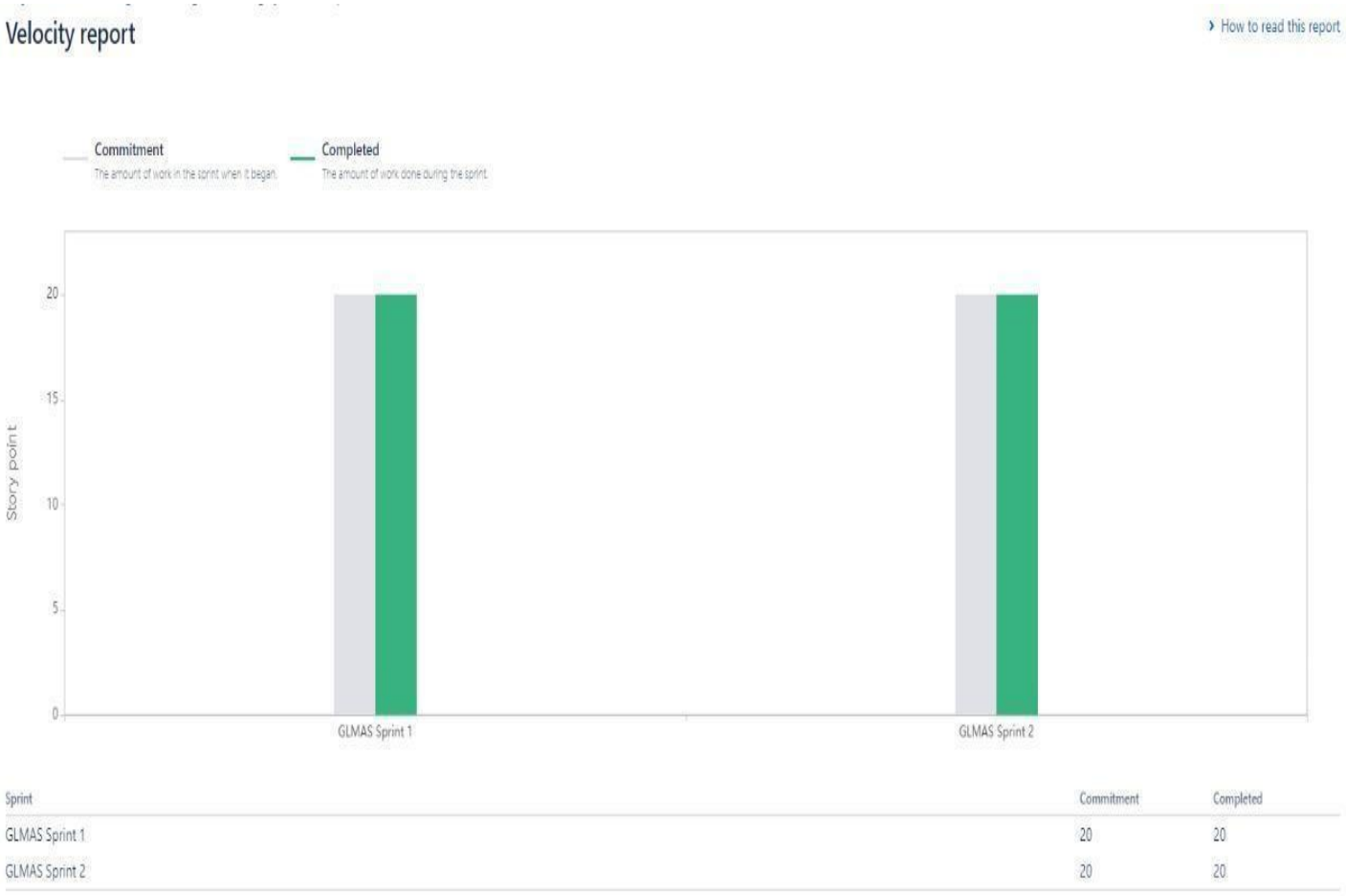
A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

https://www.visual-paradigm.com/scrum/scrum-burndown-chart/
https://www.atlassian.com/agile/tutorials/burndown-charts

Reference:

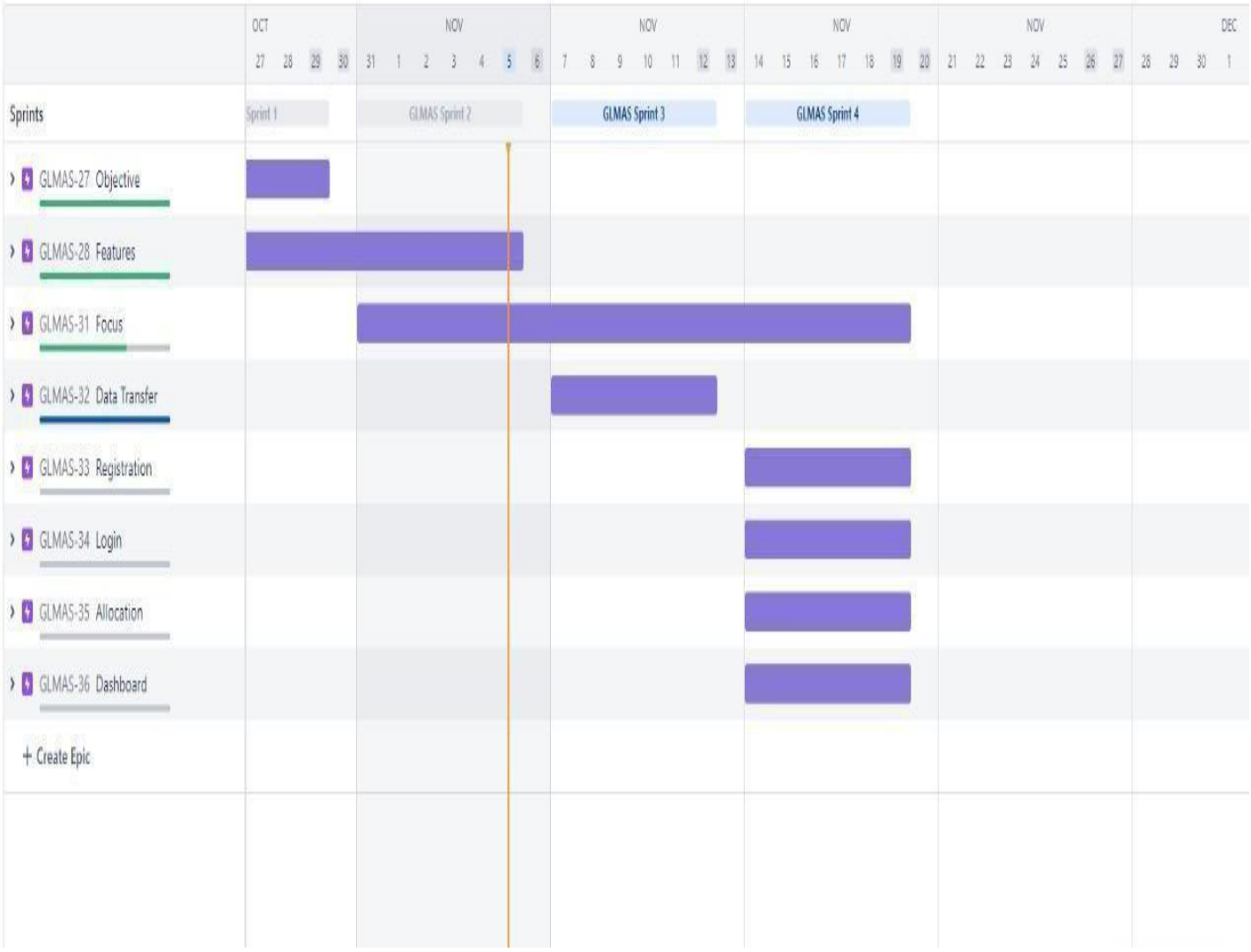
https://www.atlassian.com/agile/project-management
https://www.atlassian.com/agile/tutorials/how-to-do-scrum-with-jira-software
https://www.atlassian.com/agile/tutorials/epics
https://www.atlassian.com/agile/tutorials/sprints
https://www.atlassian.com/agile/project-management/estimation
https://www.atlassian.com/agile/tutorials/burndown-charts

6.3 Reports fromJIRA

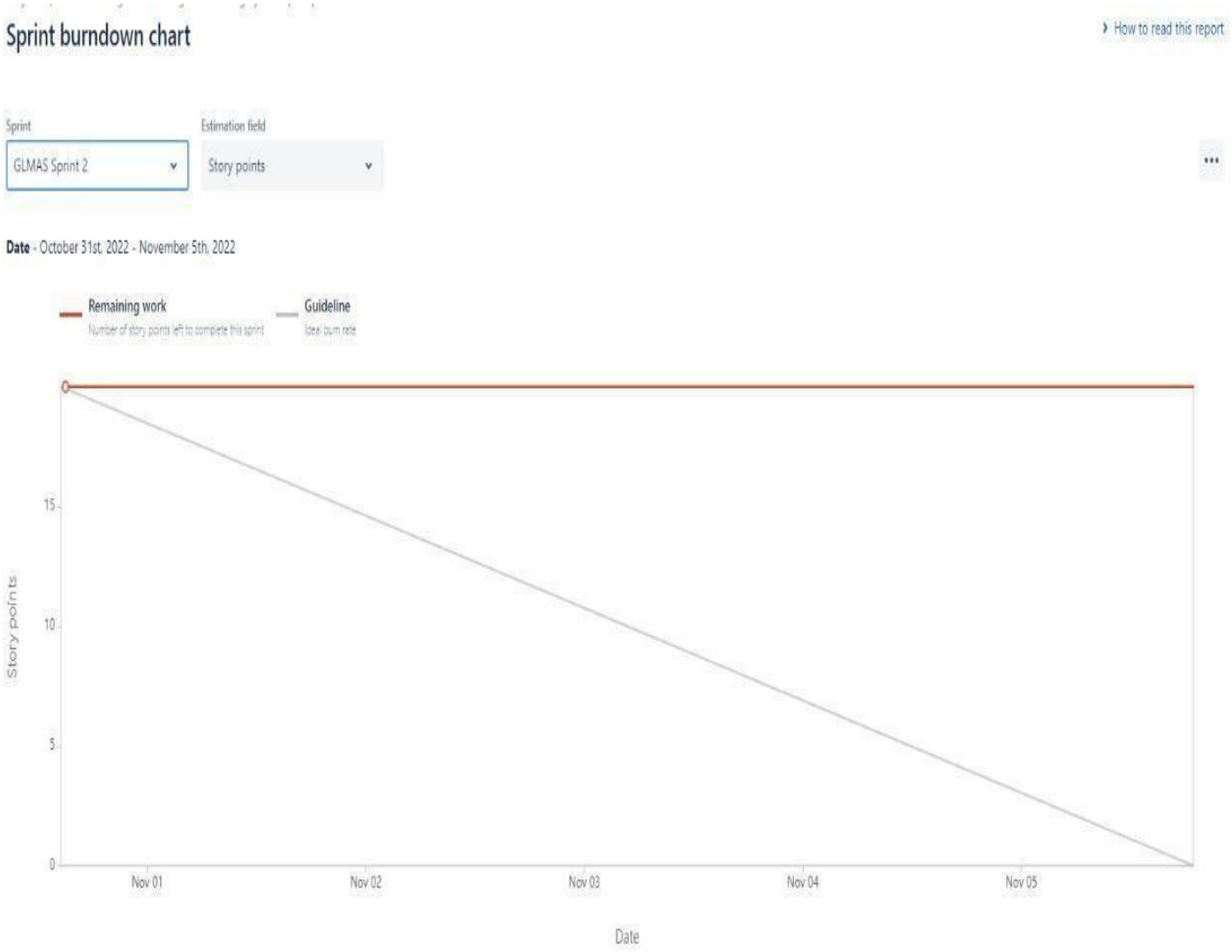


Sprint	Commitment	Completed
GLMAS Sprint 1	20	20
GLMAS Sprint 2	20	20

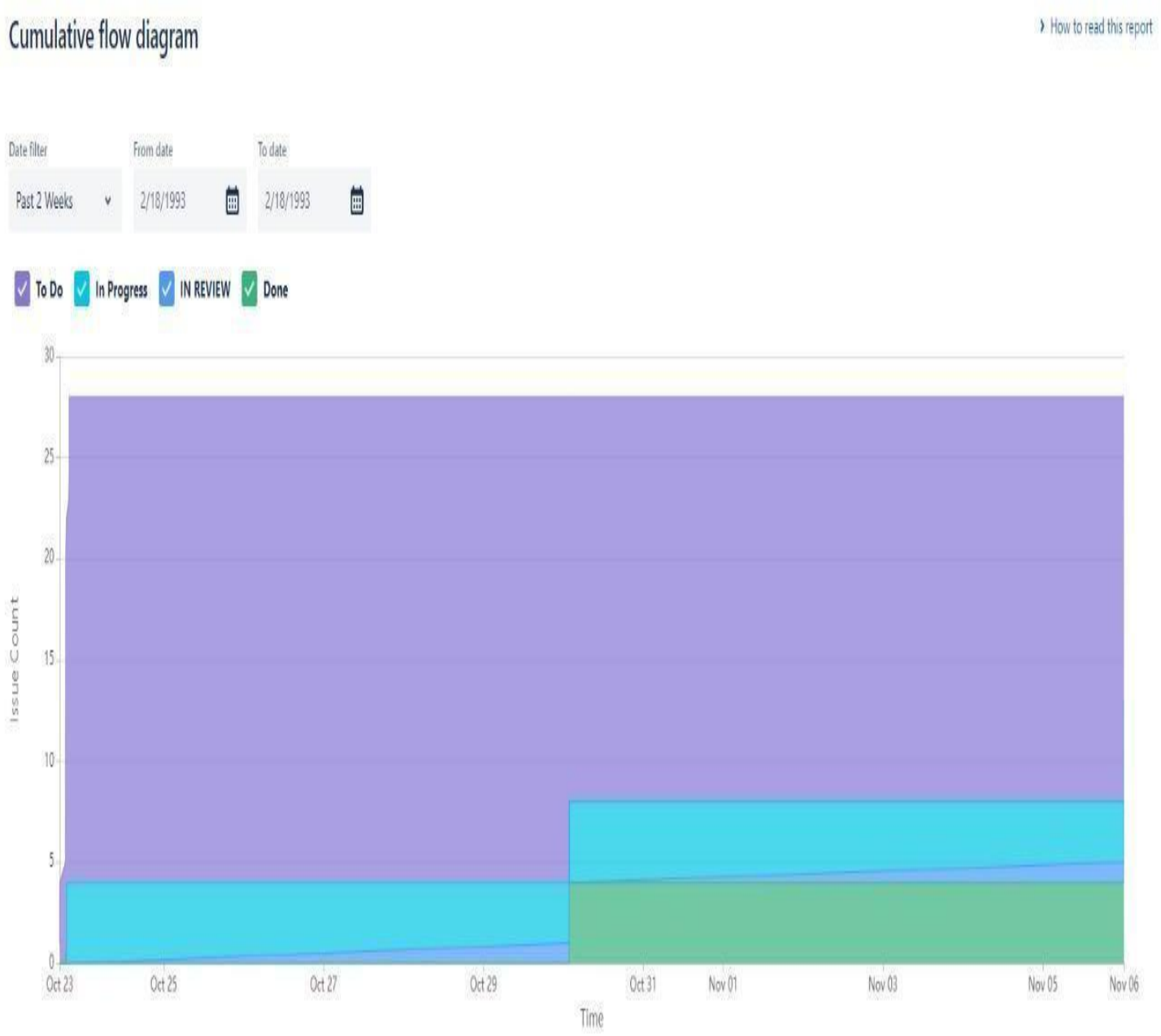
ROADMAP:


OCT
NOV
NOV
NOV
NOV
DEC
27 28 29 30 31 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 1
Sprints
Sprint 1
GLMAS Sprint 2
GLMAS Sprint 3
GLMAS Sprint 4
GLMAS-27 Objective
GLMAS-28 Features
GLMAS-31 Focus
GLMAS-32 Data Transfer
GLMAS-33 Registration
GLMAS-34 Login
GLMAS-35 Allocation
GLMAS-36 Dashboard
+ Create Epic

SPRINT BURNDOWN CHART:



CUMULATIVE FLOW DIAGRAM:



7. CODING & SOLUTIONING (Explain the features added in the project along with code)

1. Feature 1

```
#include<Servo.h>
const int pingPin = 7;
int servoPin = 8;
Servo servo1;
void setup() {
  // initialize serial communication:
  Serial.begin(9600);
  servo1.attach(servoPin);
  pinMode(2,INPUT);
  pinMode(4,OUTPUT);
  pinMode(11,OUTPUT);
  pinMode(12,OUTPUT);
  pinMode(13,OUTPUT);
  pinMode(A0,INPUT);
  digitalWrite(2,LOW);
  digitalWrite(11,HIGH);

}

void loop() {

  long duration, inches, cm;

  pinMode(pingPin, OUTPUT);
  digitalWrite(pingPin, LOW);
  delayMicroseconds(2);
  digitalWrite(pingPin, HIGH);
  delayMicroseconds(5);
  digitalWrite(pingPin, LOW);

  // The same pin is used to read the signal from the PING))): a HIGH pulse
  // whose duration is the time (in microseconds) from the sending of the ping
  // to the reception of its echo off of an object.
```

```
pinMode(pingPin, INPUT);
duration = pulseIn(pingPin, HIGH);

// convert the time into a distance
inches = microsecondsToInches(duration);
cm = microsecondsToCentimeters(duration);

//Serial.print(inches);
//Serial.print("in, ");
//Serial.print(cm);
//Serial.print("cm");
//Serial.println();
//delay(100);

servo1.write(0);

if(cm < 40)
{
  servo1.write(90);
  delay(2000);
}
else
{
  servo1.write(0);
}

// PIR with LED starts
int pir = digitalRead(2);

if(pir == HIGH)
{
  digitalWrite(4,HIGH)
  ; delay(1000);
}
else if(pir == LOW)
{
  digitalWrite(4,LOW);
}

//temp with fan
float value=analogRead(A0);
float temperature=value*0.48;
```

```
  Serial.println("temperature");
  Serial.println(temperature);

  if(temperature > 20)
  {
    digitalWrite(12,HIGH)
    ;
    digitalWrite(13,LOW);
  }
  else
  {
    digitalWrite(12,LOW)
    ;
    digitalWrite(13,LOW)
    ;
  }
}

long microsecondsToInches(long microseconds) {
  return microseconds / 74 / 2;
}

long microsecondsToCentimeters(long microseconds)
  { return microseconds / 29 / 2;
}
```

2. Feature 2

8. Build a python code,Assume u get temperature

9. and humidity values(generated with random function to a variable)

10. and write a condition to continuosly detect alarm in case of high teperature 11."""

```
12.
13.import numpy as np        #Header for number related function
14.import winsound as ws     #Header for sound raise
15.import time               #Header for time related function
16.
17.n=int(input("Enter the range of random inputs :"))   #Gets the number of inputs
18.a=np.random.randint(1,120,n)     #Random temperature generates from 1-120 degrees
19.
20.                          #Loop for checking all the temperature
21.for i in range (len(a)):
22.    print("current temperature is ",a[i])   #dislay the current temperature value
```

```
23.  if (a[i]>=60):          #checking temperture level
```

```
24.       ws.Beep(2850,150)     #if above 60 degree's alerm is ON to 150 ms
25.       time.sleep(0.1)       #delay for 100ms
26.       ws.Beep(2850,150)
27.       time.sleep(0.1)
28.       print("alert !!,current temerature is : ",a[i])
29.    else:
30.print("Normal temperature ")
```

FEATURE 3:

```
#!/usr/bin/env python
import RPi.GPIO as GPIO # RPi.GPIO can be referred as GPIO from now
import time
ledPin = 22    # pin22
def setup():
        GPIO.setmode(GPIO.BOARD)       # GPIO Numbering of Pins
        GPIO.setup(ledPin, GPIO.OUT)   # Set ledPin as output
        GPIO.output(ledPin, GPIO.LOW) # Set ledPin to LOW to turn Off the LED

def loop():
        while True:
                print 'LED on'
                GPIO.output(ledPin, GPIO.HIGH)   # LED On
                time.sleep(1.0)                  # wait 1 sec
                print 'LED off'
                GPIO.output(ledPin, GPIO.LOW)   # LED
                Off time.sleep(1.0)          # wait 1 sec
def endprogram():

        GPIO.output(ledPin, GPIO.LOW)     # LED
        Off GPIO.cleanup()             # Release resources

if _name_ == '_main_':         # Program starts from here
        setup()
        try:
                loop()
        except KeyboardInterrupt: # When 'Ctrl+C' is pressed, the destroy() will be executed.
                endprogram()
```

FEATURE 4:

```
import RPi.GPIO as GPIO
import time
import signal
import sys
GPIO.setmode(GPIO.BCM)
GPIO.setup(9, GPIO.OUT)
GPIO.setup(10, GPIO.OUT)
GPIO.setup(11, GPIO.OUT)
def allLightsOff(signal,
    frame): GPIO.output(9,
    False) GPIO.output(10,
    False) GPIO.output(11,
    False) GPIO.cleanup()
    sys.exit(0)
signal.signal(signal.SIGINT,
allLightsOff) while True:
    # Red
    GPIO.output(9,
    True) time.sleep(3)
    # Red and amber
    GPIO.output(10, True)
    time.sleep(1)
    # Green
    GPIO.output(9, False)
    GPIO.output(10, False)
    GPIO.output(11, True)
    time.sleep(5)
    # Amber
    GPIO.output(11, False)
    GPIO.output(10, True)
    time.sleep(2)
    # Amber off (red comes on at top of
    loop) GPIO.output(10, False)
```

8. RESULTS


GAS SENSOR
SW2
U1
7805
5V-9V
R1
150
Q1
BC557
10K
R2
47k
C1
100uF
R4
100
D1
D2
LPG Gas Leakage Detector
using Gas Sensor and 555 Timer IC

9. CONCLUSION

The advantage of this simple gas leak detector is its simplicity and its ability to warn about the leakage of the LPG gas [11]. This system uses GSM technique to send alert message to respective person if no one is there in the house and then gas leaks occurs, GSM module is there to send immediate messages to the respective person regarding the gas leak [13]. The main advantage of this system is that it off the regulator knob of the cylinder automatically when gas leakage detected.

FUTURESCOPE

Future Scope In future, we are planning to install this across several industry system in dense forest where reachability of resources and firefighters is difficult. In addition to that we will be updating the system with more features and reliability. We will also include a high pitch sound system that will keep away the animals from the site of fire.The proposed system can be developed to a more advanced system by integrating wireless sensors with CCTV for added protection and precision. The algorithm shows great promise in adapting to various environments.

10. Appendix

Github and Demo Link:

Github repository link :https://github.com/IBM-EPBL/IBM-Project-12986-1659504514
Demo Link : https://drive.google.com/file/d/1bU7GyTJJs0n50rkxUUXO-Tg5WLHjpMZk/view?usp=sharing