Internship Report

Internet of Things and It's Applications

DLithe Consultancy Services Pvt. Ltd.

Internship Report

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Period:30 days

Job Assignment:

Organization: DLithe Consultancy Services Pvt. Ltd.

Supervisor's Name: Vijay G.H

Letter of Transmittal

To,

Program Co-ordinator

DLithe Consultancy services

Bengaluru

Dear Sir,

I am writing to submit my report on the IoT Internship that I recently completed on the Internet Of Things (IoT). The training program was an invaluable learning experience, and I am grateful for the opportunity to participate.

The training program covered various aspects of IOT, including the collective network of connected devices and technology that facilitates communication between devices and the cloud, as well as between the devices themselves. I gained a comprehensive understanding of the role of IOT in modern technology and industry and also gained hands-on experience with IOT tools and platforms. The training highlighted the potential of IOT to revolutionize various fields, including healthcare, finance, and manufacturing.

The report includes a detailed overview of the training program, including the topics covered, the learning objectives, and the outcomes achieved. It also provides observations and insights into the potential benefits and challenges of implementing IOT solutions in different fields.

I believe that the knowledge and skills that I acquired during the training program will be valuable to our organization. IOT is rapidly becoming more ubiquitous in various industries, and the ability to work with IOT tools and platforms will be increasingly important for our organization's success.

I hope that the report provides useful insights into the benefits of on-the-job training and the potential of IOT.

Sincerely,

Name RAKSHITA SANJAY DHALE

USN No: 2JR21CS068

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Introduction

The Internet Of Things is the most popular and fastest-growing field in computer science. The Internet of Things (IoT) describes the network of physical objects—"things"—that are embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the Internet. These devices range from ordinary household objects to sophisticated industrial tools. With more than 7 billion connected IoT devices today, experts are expecting this number to grow to 10 billion by 2020 and 22 billion by 2025. Oracle has a network of device partners.

They are changing the way we live, work, and interact with technology. The purpose of this report is to provide an overview of my IoT work experience and explain various ideas and concepts I learned during the course. After the impact of pollution on the human body, the gas detection process has become alarming and health problems have begun to occur. Liquefied petroleum gas is an asphyxiating gas and can cause coma and/or death if oxygen levels are insufficient. It can release oxygen and cause rapid death. Liquefied petroleum gas is also an extremely flammable and powerful gas; It will explode if heated. A gas detector is a device that detects the presence of gas in an area, usually as part of a security system. Gas detectors can alert workers in areas of leakage, giving them time to evacuate. This type of equipment is very important because many radioactive gases can harm organic life such as humans or animals. When there is gas leakage, the sensor will send a signal to work, MQ-2 is a gas meter used to detect LPG gas. The device is designed to check for gas leakage. More than 75 percent of methane from electric stoves is released when the stove is turned off. LPG-related cases decreased to 825 in 2021, again to 606 in 2021, and to 538 in 2022 (as of January 2023). Therefore, we can use smart electronic devices and gas equipment with flame retardant to prevent accidents caused by gas leakage. The burner and regulator buttons turn off automatically.

Background

The Internet of Things (IoT) is like a giant network of smart devices that talk to each other. These devices, like your phone, fridge, or even factory machines, have special sensors and software to collect and share information. This helps them make decisions on their own and work together in real time. Imagine your home, city, or workplace becoming super smart, with everything connected for better efficiency and convenience. IoT is making our world more connected and intelligent, promising a future where technology transforms the way we live and interact with our surroundings.

The idea of the Internet of Things (IoT) began in the early 1980s, suggesting the connection of devices to enable communication. However, it wasn't until the 21st century that IoT really took off. This growth was fueled by smaller sensors, better wireless tech, and widespread internet access. As sensor costs dropped and their abilities improved, people and industries started using IoT in various areas like smart homes, healthcare, agriculture, and industry. The number of IoT devices kept growing, creating a network where data could be collected, analyzed, and used to make things more efficient and productive in many fields. The continuous development of IoT has the potential to change how we live and work in our increasingly interconnected digital world

Evolution of IoT

The journey of the Internet of Things (IoT) has been like watching technology grow up quickly and become a crucial part of our daily lives. It started with connecting devices to the internet so they could share information. From simple communication between machines, it has evolved into a complex network of interconnected devices that can gather, analyze, and exchange a lot of data. We first saw smart devices like thermostats and wearables becoming popular, and then industries started using IoT too, creating what we call the Industrial Internet of Things (IoT). As technology got better, we started doing more of the data processing closer to where it's needed, making decisions faster. Security became a big deal, and we developed strong systems to keep everything safe. The combination of AI and IoT allowed devices to learn and improve, opening up new possibilities for automation and efficiency. Looking forward, IoT is going to keep evolving, especially with things like faster 5G internet, smarter edge computing, and more powerful AI, shaping a future where connected devices will be a big part of how we live and work.

Project Overview

The Internship Training program on the Internet of Things (IoT) that I participated in was conducted by a technology company. The program was designed to provide a comprehensive overview of the latest advancements in the field of IoT and to equip participants with the skills and knowledge required to build connected systems and applications.

The training program consisted of practical hands-on sessions. The lectures covered a wide range of topics, including the fundamentals of IoT, various communication protocols, and the integration of sensors. Additionally, the program delved into practical applications in smart cities and industrial IoT.

The practical sessions involved working on various projects and implementing IoT solutions in real-world scenarios, giving participants hands-on experience with hardware and software components. Overall, the program aimed to prepare participants for the dynamic and evolving landscape of the Internet of Things.

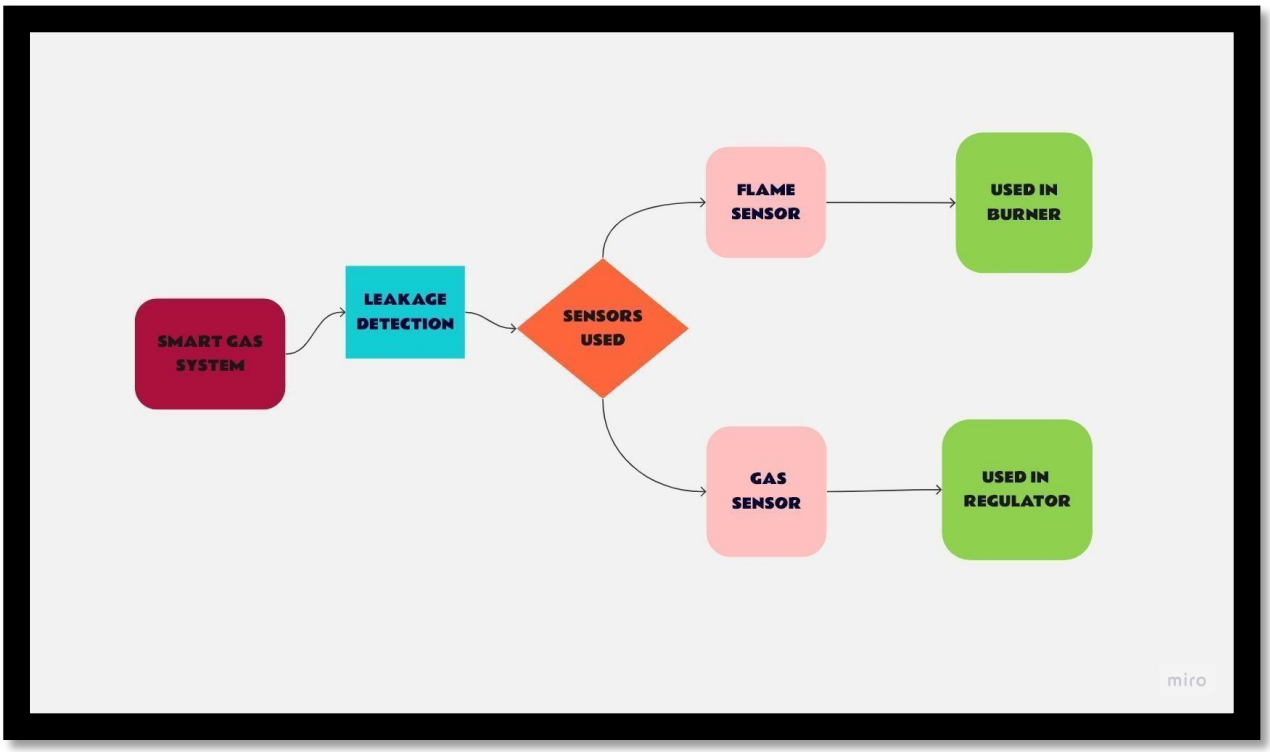
Problem Statement

The growing dependence on natural gas in diverse residential and industrial applications has heightened the potential for gas leak incidents. These leaks present significant dangers to life, property, and the environment due to the combustible and harmful properties of the gas. Although safety measures have been put in place, the timely identification of gas leaks remains a critical challenge. Current gas detection systems frequently lack the necessary sensitivity, real-time monitoring capabilities, and cost-effectiveness required for widespread implementation.

Solutions

- We proposed a Smart Gas Detection System to enhance the safety of lives of individuals who would die due to gas leakage which might lead to a massive explosion.
- The result of our project for gas leakage detection using an Arduino, gas sensor, servo motor, and buzzer with IoT integration would typically involve real-time monitoring and alerting.
- The gas sensor detects the gas leakage, triggering the Arduino to activate the servo motor and buzzer for immediate response.
- Additionally, IoT connectivity enables remote monitoring and notifications, allowing users to receive alerts or check the status of the system through the internet.
- It's important to ensure proper calibration and testing of the system to ensure reliable detection and response to gas leaks.

Methodology



This Mind map is divided into the following two features:

- **Leakage detection in regulators:** It is used to detect gas leakage in regulators and then automatically turns OFF the knob of the regulator.
- **Leakage detection in Burner:** It is used when the burner flame turns OFF due to various reasons and prevents the leakage by turning OFF the knob of the burner automatically.

System Requirement:

- Arduino Uno R3
- Arduino IDE 2.2.1

Hardware Requirements:

Fig 1: Arduino Uno R3

The Arduino Uno R3 is a popular microcontroller board based on the ATmega328P microcontroller. It is part of the Arduino family of boards and is widely used for prototyping and developing electronic projects. Here are some key features and information about the Arduino Uno R3:

- **Microcontroller:** The Arduino Uno R3 is based on the ATmega328P microcontroller, which is an 8-bit AVR microcontroller.

- **Clock Speed:** ATmega328P on the Uno R3 typically runs at a clock speed of 16 MHz. • Digital I/O Pins: The board has 14 digital input/output (I/O) pins that can be used for interfacing with external devices, such as sensors, LEDs, and other digital components.
- **Analog Inputs:** There are 6 analog input pins on the Arduino Uno R3, labeled A0 through A5, which can be used to read analog sensor values.
- **PWtM** Outputs: Some of the digital pins on the board can be configured as pulsewidth modulation (PWM) outputs, allowing for analog-like control of devices such as motors and LEDs.
- **USB Interface:** The Uno R3 can be connected to a computer via USB for programming and power. It uses a standard Type-B USB connector.
- **Power Supply:** The board can be powered through the USB connection or an external power source. The voltage range is typically 7-12V. Fig 2: Servo motor SG90

- A Towerpro SG90 servo motor is a small, lightweight, and inexpensive motor that is commonly used in robotics, remote-controlled vehicles, and other applications.
- It requires precise control over rotational motion.
- It is a micro servo motor that can rotate up to 180 degrees and has a torque of 1.2 kg-cm at 4.8V.
- One of the standout features of the SG90 Micro Servo Motor is its ease of use.

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- Microcontrollers and development boards easily control it due to its straightforward wiring and compatibility with popular interfaces like Arduino.
- By sending PWM signals to the motor, users can precisely adjust its position within its rotational range.

  This level of control allows for smooth and precise movements, which is essential for applications that demand accuracy and precision.
- It's a powerhouse when it comes to generating the force needed to make things move.
- The SG90 Servo Motor's user-friendly design allows for easy integration into projects, bringing ideas to life. Moreover, its compatibility with platforms like Arduino makes it accessible to all skill levels.

Fig 3: Flame sensor

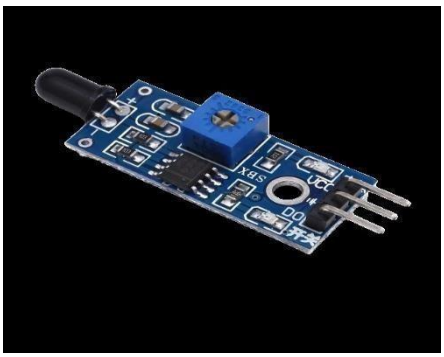
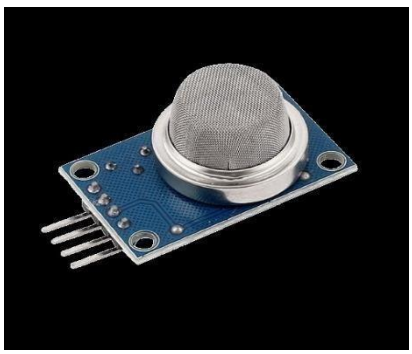


Fig 4: Gas sensor



Flame Sensor:

- A sensor that is most sensitive to normal light is known as a flame sensor. That's why this sensor module is used in flame alarms.
- This sensor detects flame otherwise wavelength within the range of 760 nm – 1100 nm from the light source.
- A flame-sensor is one kind of detector that is mainly designed for detecting as well as responding to the occurrence of a fire or flame. • The flame detection response can depend on its fitting.
- It includes an alarm system, a natural gas line, propane & a fire suppression system. This sensor is used in industrial boilers.

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Gas Sensor:

- MQ2 gas sensor is an electronic sensor used for sensing the concentration of gases in the air such as LPG, propane, methane, hydrogen, alcohol, smoke, and carbon monoxide.

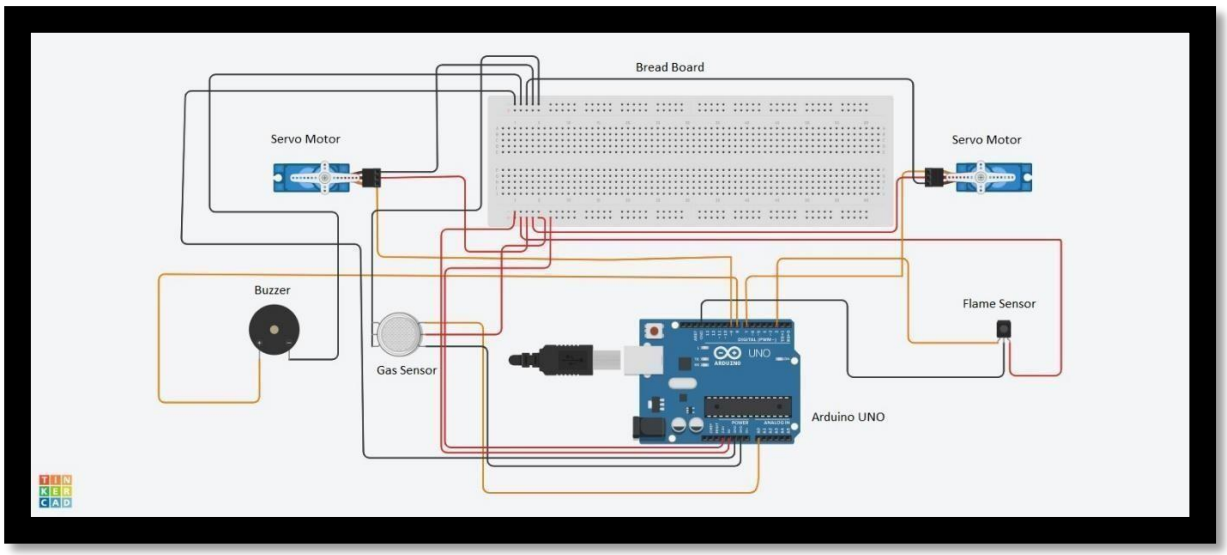
  MQ2 gas sensor is also known as chemiresistor. It contains a sensing material whose resistance changes when it comes in contact with the gas. This change in the value of resistance is used for the detection of gas.
- This sensor contains a sensing element, mainly aluminium-oxide based ceramic, coated with Tin dioxide, enclosed in a stainless steel mesh.
- Sensing element has six connecting legs attached to it.
- Two leads are responsible for heating the sensing element, the other four are used for output signals.
- These sensors are used to detect the presence of gases in the air such as methane, butane, LPG and smoke

Software requirements

- Arduino IDE 2.2.1 Arduino IDE 2.2.1 is an upgraded development environment for Arduino projects.
- It features a streamlined user interface, multi-file editing, a built-in serial monitor, and improved library management.
- The integration with Platform enhances versatility.
- This version aims to provide a more efficient and user-friendly experience for Arduino enthusiasts and developers.

Schematic and codes

Fig 5: Circuit Diagram



Code

```
#include <Servo.h>

#define gas_sensor      A0

#define buzzer          8

#define fireSensorPin   2   #define motorPin1       9

#define motorPin2       7


int sensorPin = A0; int sensorThreshold

= 400; int sensor_value;
```

```
Servo gasSensorServo;
Servo fireSensorServo;  void setup() {
  Serial.begin(9600);
  `
  pinMode(sensorPin, INPUT);   pinMode(buzzer,
OUTPUT);

  gasSensorServo.attach(9);  // Servo for gas sensor
gasSensorServo.write(2);

  fireSensorServo.attach(7); // Servo for fire sensor   fireSensorServo.write(0);
}

void loop() {   // Gas Sensor    if
(analogRead(sensorPin) > sensorThreshold) {
    Serial.println("Gas Leakage detected");
  }

  sensor_value = analogRead(gas_sensor);
  Serial.println(sensor_value);

  if (sensor_value > 400) {
    digitalWrite(buzzer, HIGH);     gasSensorServo.write(130);
  }
```

```
else
 {
 digitalWrite(buzzer, LOW);
    //gasSensorServo.write(5);
  }

  // Fire Sensor   int fireValue = digitalRead(fireSensorPin);
  Serial.println(fireValue);

  if (fireValue == 0) {  // Fire is detected
//digitalWrite(buzzer, HIGH);    digitalWrite(motorPin2,
LOW);    fireSensorServo.write(0);
  }
else {

    //digitalWrite(buzzer, LOW);     digitalWrite(motorPin2, HIGH);
//analogWrite(motorPin2, 0);
    fireSensorServo.write(130);  // You need to specify the angle for the fire
sensor servo
  }

  delay(500);
}
```

Results

We have designed gas leakage detection system using IoT involves integrating various components to ensure accurate and timely detection.

- **GAS SENSOR**: Deploy gas sensors capable of detecting specific gases (e.g., methane, propane). Place them strategically in areas prone to gas leaks, such as kitchens or industrial facilities.
- **FLAME SENSOR**: Choose a reliable flame sensor capable of detecting flames in the infrared spectrum.
- **BUZZER**: Incorporating a buzzer into a gas leakage detection system provides an audible alert for immediate local awareness.

Fig6:Flame sensor with flame

Fig7: Flame sensor without flame

Fig8:Regulator in ON condition

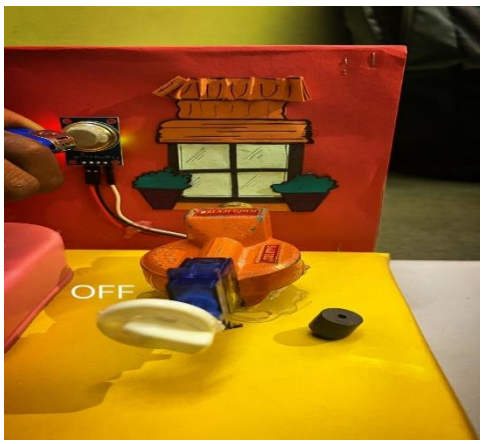


Fig9:Regulator in OFF condition

Applications Of IOT

A Smart gas system Project can have various applications across different sectors to enhance safety and prevent potential hazards. Here are some common applications:

- Residential Buildings: Gas leakage detection is vital in homes where natural gas or liquefied petroleum gas (LPG) is used for cooking or heating. The Smart gas System is designed to perform actions automatically based on the detection of gas leakage and the status of the flame, and it triggers the buzzer when the gas leakage is detected.

- Commercial Spaces: Restaurants, hotels, and other commercial establishments that use gas for cooking or heating can benefit from a Smart gas System. Timely detection can help prevent disruptions in business operations and ensure the safety of customers and employees.

- Industrial environments: Gas leakage detection systems are crucial in industrial settings where various gases are used. This includes manufacturing plants, chemical industries, and refineries. This system can monitor for leaks of combustible gases or toxic substances, triggering alarms and shutdown procedures to prevent accidents.

- Smart Cities: Gas leakage detection can be integrated into smart city infrastructure to enhance public safety. It can be part of a broader network of sensors for environmental monitoring and emergency response.

Literature Survey

We did a research over the possible sources that we could access. In our exploration, we did find the authors:

[1] "A Wireless Home Safety Gas Leakage Detection System", Luay Friwan, Khaldon Lweesy, Aya Bani-Salma and Nour Mani, November 2011.

They proposed to detect gas with the use of a sensor. This gassensor senses the changes in gas. Upon detection of a change, it activates the alarm and sends a signal to the receiver.

[2] "Development of multipurpose gas leakage and fire alarm system", Nivedita S and Padmavathy A, October 2013.

The ideology of this paper was to give indications of gas or smoke leakage with the help of LED, gas sensors and relay.

[3] "Gas leakage detection system", Gopinath .K , Chandru Thirunavukkarasu, May 2021.

They proposed a system that uses MQ6 gas sensor to detect inflammable gas leakage and an LM35 temperature sensor which will sense the sudden rise in temperature than above the room temperature. When gas leakage is detected, their device could inform the user, alert them, provide a solution from suffocation in that area, and ultimately prevent the leak from further effects. This makes easy for both the commercial as well as domestic sector to keep track on the problem.

Training Experience

Hands-on Learning: My training program was designed to provide hands-on experience with IOT tools and technologies. I was allowed to work on real-world projects and problems, which helped me develop practical skills and apply theoretical concepts.

Mentorship: I was fortunate to have a mentor who was an experienced AI and ML professional. My mentor provided guidance, feedback, and support throughout my training program, which was invaluable in my learning journey.

Collaboration: One of the most exciting aspects of my training program was the opportunity to work with a team of professionals from different backgrounds. We collaborated on projects and shared ideas, which helped me develop my communication and collaboration skills.

Exposure to Industry Trends: I was able to stay up-to-date with the latest industry trends and developments in AI and ML through various workshops, seminars, and conferences. This helped me gain a broader perspective on the field and prepare for future challenges.

Use of Industry-standard Tools and Technologies: During my training, I had the opportunity to work with industry-standard tools and technologies such as Python, TensorFlow, Keras, and Scikit-Learn. This allowed me to gain practical skills that are in demand in the industry.

Importance of Data Preparation: One of the most important lessons I learned during my training was the critical role of data preparation in the success of AI and ML projects. I learned how to collect, clean, and preprocess data to make it suitable for training models.

Iterative Process: I also learned that developing an AI or ML model is an iterative process that requires a lot of experimentation and tweaking. It is essential to have a feedback loop that allows for continuous improvement of the model.

Key Learnings

Engaging in an internship focused on the Internet of Things (IoT) can be beneficial, offering valuable skills and insights. Here are some things I learned during IoT internships:

- Understanding IoT Systems:

Learned about the different parts of IoT setups, like sensors, communication methods, and IoT platforms.

- Hands-on with Hardware and Sensors:

Get practical experience working with various sensors and devices used in IoT.

- Programming Skills:

Develop coding skills in languages like Python, C, or Java for creating IoT applications.

- Data Handling:

Learn how to collect, process, and analyze data generated by IoT devices. •

- Cloud and Edge Computing:

Get exposure to cloud platforms (like AWS, and Azure) and understand edge computing in IoT.

- Security and Privacy Awareness:

Understand the security challenges in IoT and how to keep data safe.

- Project Development:

Work on real IoT projects, from planning to execution, to gain practical experience.

- Troubleshooting Skills:

Develop the ability to solve issues related to hardware, software, and communication in IoT systems.

- Teamwork:

Learn to collaborate with teams, as IoT projects often involve different skills. Industry

These learnings provide a strong foundation for a career in IoT, combining technical skills, hands-on experience, and a broad understanding of the IoT field.

Challenges

Initially, we faced problems while debugging the errors in the Code, and merging different codes into a single Code, later we came up with a solution. Later on, we faced a lot of challenges with the servo motor like the sweep of the motor at right angle which played a key factor in our project.

Conclusion

The gas leakage system has a wide range of applications, including household safety and various industries. The development and implementation of this system are crucial for ensuring safety in different settings. Throughout the project, we have drawn important conclusions regarding the system's effectiveness, response time, efficiency, sensitivity, specificity, false positives, false negatives, environmental adaptability, costeffectiveness, and real-world applications. Our gas leakage detection project is a significant contribution to proactive safety measures, providing valuable insights into the system's performance and its potential impact on preventing gas-related incidents. The system's positive impact on safety, along with the recommended improvements, positions it as a valuable asset for diverse environments. We are committed to continuously evolving this technology to make substantial contributions to the prevention of gas-related incidents and the protection of lives and property.

My time in the IoT internship was a big learning and valuable experience. I gained a solid understanding of the fundamental concepts and techniques in the field and got a better understanding of how IoT works. I did practicals that helped me get better at programming and learn about different IoT technologies. Working with a team taught me how to communicate well and solve problems together. I also got to know more about what's happening in the industry and made some useful connections. But, the overall experience was positive, and everything I learned would be useful in my future career in this field.