VISVESVARAYA TECHNOLOGICAL UNIVERSITY

Jnana Sangama, Belagavi – 590014.

Internship Report

On

"AIoT"

Submitted in partial fulfillment of the requirement for the award of degree of

BACHELOR OF ENGINEERING

In

COMPUTER SCIENCE & ENGINEERING
INFORMATION SCIENCE & ENGINEERING
ELECTRONICS & COMMUNICATION ENGINEERING

By

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Under the guidance of:

Mr. Sai Charan

2023 - 2024

A P S COLLEGE OF ENGINEERING

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Project Completion Certificate

I, **Suhaan S** (Roll No: 1AP21IS035), hereby declare that the material presented in the Project Report titled **" Smart Home System Using AIOT"** represents original work carried out by me in the **Department of Information Science** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

With My signature, I certify that:

- I have not manipulated any of the data or results.
- I have not committed any plagiarism of intellectual property and have clearly indicated and referenced the contributions of others.
- I have explicitly acknowledged all collaborative research and discussions.
- I understand that any false claim will result in severe disciplinary action.
- I understand that the work may be screened for any form of academic misconduct.

Date: 12-12-2024 **Student Signature**:

In my capacity as the supervisor of the above-mentioned work, I certify that the work presented in this report was carried out under my supervision and is worthy of consideration for the requirements of the B.Tech. Internship Work.

Advisor's Name: **Guide Name:**

Dr Shivamurthaiah M Sai Charan Teja

Advisor's Signature **Guide Signature**

Project Completion Certificate

I, **Sohan M K** (Roll No: 1AP21IS032), hereby declare that the material presented in the Project Report titled **" Smart Home System Using AIOT"** represents original work carried out by me in the **Department of Information Science** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

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Advisor's Name: **Guide Name:**

Dr Shivamurthaiah M Sai Charan Teja

Advisor's Signature **Guide Signature**

Project Completion Certificate

I, **Venkatesh S** (Roll No: 1AP22CS408), hereby declare that the material presented in the Project Report titled **" Smart Home System Using AIOT"** represents original work carried out by me in the **Department of computer science** at the **APS college of Engineering, Bangalore** during the tenure **2 October, 2024 – 12, December, 2024**.

With My signature, I certify that:

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Advisor's Name: **Guide Name:**

Dr Shivamurthaiah M Sai Charan Teja

Advisor's Signature **Guide Signature**

Evaluation Sheet

Title of the Project: Smart home system using AIOT

Name of the Students : 1. VENKATESH S(1AP22CS408)

2. SUHAAN S(1AP21IS035)

3. SOHAN M K(1AP21IS032)

External Supervisor:

Mr. Sai Charan Teja

Internal Supervisor:

Prof. Shivamurthaiah M

Date:12-12-2024

Place: APS collage of Engineering, Bangalore

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Chapter 1

ABSTRACT

The concept of smart homes has revolutionized modern living, offering unprecedented levels of convenience, safety, and energy efficiency. This project introduces a Smart Home System, an innovative solution designed to automate various aspects of a residential environment using a robust combination of sensors integrated with a Raspberry Pi. The system employs a suite of sensors tailored to monitor and respond to critical environmental factors.

A light sensor gauges the intensity of ambient light, enabling automatic adjustments to lighting systems to maintain optimal illumination levels. An ultrasonic sensor detects proximity, which can trigger actions such as opening or closing doors or activating lighting in response to motion. To ensure a comfortable indoor climate, a temperature and humidity sensor dynamically regulates heating or cooling systems. Furthermore, the inclusion of a gas sensor enhances safety by continuously monitoring air quality and detecting hazardous gases, alerting users to potential dangers.

At the heart of the system lies the Raspberry Pi, a versatile and cost-effective microcontroller that serves as the central processing unit. It interprets real-time data from the sensors, making intelligent decisions to control various appliances and systems within the home. For example, the Raspberry Pi can autonomously activate lights based on ambient light levels, adjust climate controls according to temperature and humidity readings, and issue immediate alerts in case of gas leaks or poor air quality.

Chapter 2

INTRODUCTION

The smart home system is a technologically advanced security and automation solution designed to provide controlled access and enhance safety. The system leverages a Raspberry Pi to orchestrate the interaction between various hardware components, With the advancement of technology, smart homes are becoming a reality, where automation is used to enhance the quality of life. A Smart Home System using Raspberry Pi integrates multiple sensors to control and monitor various aspects of a home, including lighting, climate, safety, and security. The use of sensors like the light sensor, ultrasonic sensor, temperature and humidity sensor, and gas sensor makes it possible to monitor the home environment in real-time and respond accordingly. By combining these sensors, a Raspberry Pi can effectively manage different systems to create an efficient, safe, and comfortable home.

2.1 Objective

The primary objective of this Smart Home System is to create an automated, energy-efficient, and safe living environment using Raspberry Pi and various sensors. The system aims to:

1. Automate Home Environment: Using sensors to control the lighting, temperature, and air quality, making the home more energy-efficient and comfortable.
2. Enhance Safety: Through gas detection sensors, the system aims to detect hazardous gases like carbon monoxide and methane, triggering alarms and notifying users in case of a gas leak.
3. Provide Remote Monitoring and Control: Allow users to monitor and control devices remotely, providing convenience and flexibility.
4. Promote Energy Efficiency: Reduce electricity consumption by automating light control based on ambient light intensity and regulating temperature based on real-time readings.
5. Improve User Comfort: Automatically adjust home conditions based on environmental data (light, temperature, humidity), ensuring a pleasant living space.

2.2 Problem Statement

The traditional home environment requires constant manual management of lights, temperature, and safety monitoring systems. Additionally, maintaining safety and comfort in the home environment can be challenging, especially when monitoring conditions like gas leaks, temperature variations, and ambient light manually.

This Smart Home System aims to address these issues by integrating multiple sensors (light, ultrasonic, temperature and humidity, and gas) with a Raspberry Pi to automate home systems.

- Reduce human intervention and energy waste.
- Provide enhanced safety by detecting gas leaks and proximity.
- Improve living conditions by maintaining optimal temperature and humidity levels.

Chapter 3

APPLICATIONS

- Home Automation: Automatic control of lights, fans, and air conditioning based on sensor inputs.
- Energy Efficiency: The system reduces energy consumption by controlling devices based on real-time environmental conditions.
- Safety: Gas sensors ensure safety by detecting any leakage of harmful gases like CO or methane.
- Smart Living: Provides the convenience of remotely monitoring and controlling home devices through a mobile app or web interface.
- Health and Comfort: Temperature and humidity sensors ensure a comfortable living environment, contributing to overall well-being.

Chapter 4

COMPONENTS

4.1 Raspberry pi 4 Model B

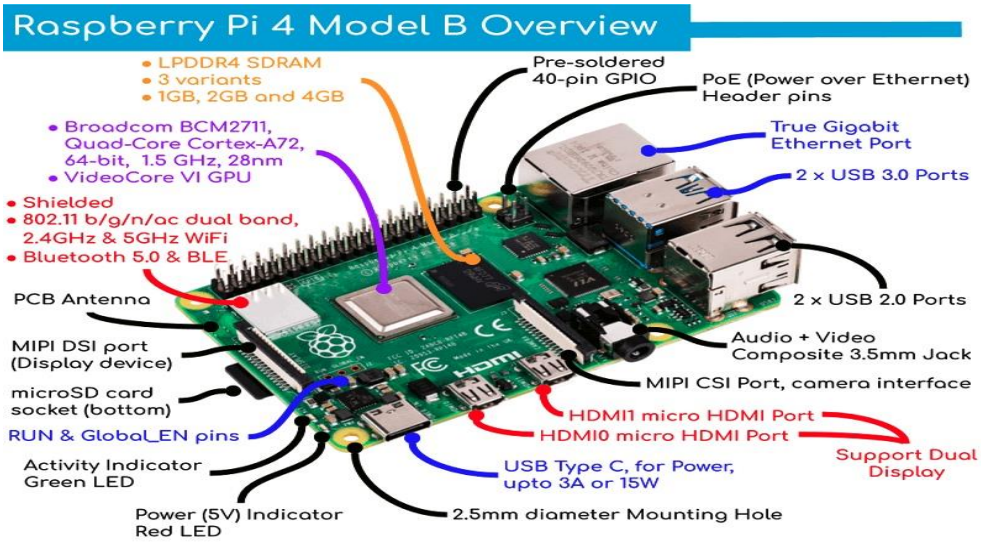


Figure 4.1: Raspberry pi 4 Model B.

The Raspberry Pi 4 Model B is a powerful single-board computer designed for a variety of applications, from education to industrial automation. It features a quad-core ARM Cortex-A72 processor, up to 8GB of RAM, dual micro-HDMI ports supporting 4K output, and USB 3.0 connectivity. Its GPIO pins enable easy interfacing with sensors, motors, and other peripherals, making it ideal for hardware projects. Built-in Wi-Fi, Bluetooth, and Ethernet provide versatile networking options. The Pi 4 is a versatile platform for learning, prototyping, and deploying IoT and embedded systems solutions.

4.2 Light Sensor (LDR)

the LDR sensor is the most important piece of equipment in our circuit. Without it, we wouldn't be able to detect whether it is dark or light.

Figure 4.2: light sensor

4.3 Ultrasonic Sensor

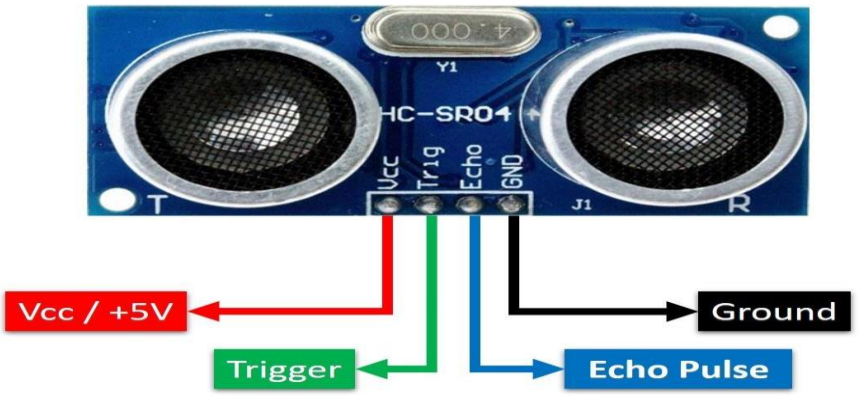


Figure 4.3: Ultrasonic Sensor.

An ultrasonic sensor measures distance using sound waves. It sends out ultrasonic pulses through the TRIG pin and measures the time it takes for the reflected sound to return to the ECHO pin. The time difference is used to calculate the distance. These sensors are widely used in robotics and security systems to detect obstacles or movement. The ultrasonic sensor in the code is used to detect the presence of a human or an object by measuring the distance between the sensor and the obstacle. It uses the TRIG pin to emit ultrasonic pulses and the ECHO pin to receive the reflected signal. The time taken for the pulse to return is used to calculate the distance. If the detected distance is less than 50 cm, the system assumes a human is present and activates further functionalities.

4.4 Temperature and Humidity Sensor

Fig 4.4: Temperature and Humidity Sensor

A Temperature and Humidity Sensor is a device used to measure and monitor both the temperature and humidity levels in a given environment. These sensors are commonly used in a wide range of applications, including weather stations, HVAC systems, agricultural monitoring.

4.5 Gas Sensor

Fig 4.5: gas sensor

A gas sensor is a device used to detect the presence and concentration of gases in the environment. These sensors are designed to measure specific gases such as oxygen (O_2), carbon dioxide (CO_2), carbon monoxide (CO), methane (CH_4), ammonia (NH_3), or hazardous gases. Gas sensors are widely used in safety, environmental monitoring, industrial applications, and healthcare.

Chapter 5

FLOW CHART

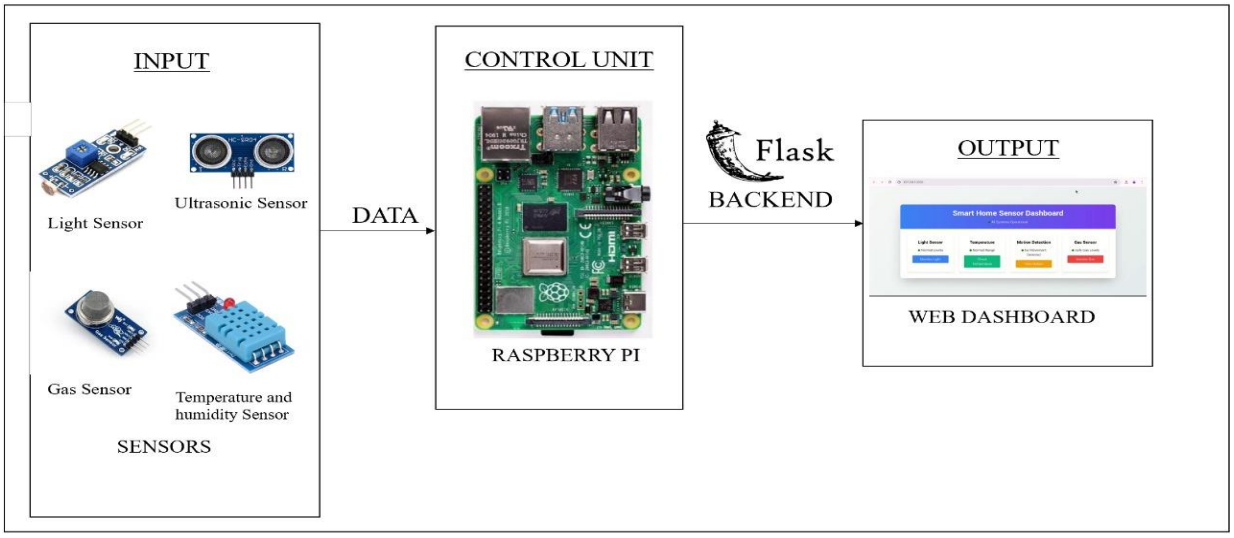


Figure 5.1 flowchart

The brief explanation of the components in the figure 5.1 which is the flowchart of the project is as follows

- **Sensor Unit:**
  - Ultrasonic Sensor: Detects human presence by measuring distance.
- **Control Unit:**
  - Raspberry Pi (GPIO): Handles input processing, decision-making, and triggering actions.
- **Input Devices:**
  - Keypad: Captures user input for password verification and panic control.
- **Output Devices:**
  - **Light Sensor (LDR)**: Detects the ambient light intensity
  - **Ultrasonic Sensor**: Measures the distance to detect human presence or proximity
  - **Temperature and Humidity Sensor**: Measures temperature and humidity in the home environment.
  - **Gas Sensor**: Detects the presence of harmful gases (e.g., CO, methane)

CONCLUSION

The Smart Home System, built upon the integration of Raspberry Pi and advanced sensor technology, delivers a comprehensive solution for automating residential environments. By seamlessly combining light, ultrasonic, temperature and humidity, and gas sensors, this system addresses critical aspects of home management, including energy efficiency, safety, and comfort.

The system's capability to manage lighting, regulate indoor climate, and monitor air quality underscores its effectiveness in creating a more sustainable and secure living space. Its automated operations minimize human intervention, while its intelligent design adapts to real-time environmental changes, making it a reliable and user-friendly solution.

This Smart Home System represents a significant leap forward in modern living, offering not just convenience but also proactive measures to enhance safety and well-being. Its successful implementation highlights its potential as a valuable addition to any household, paving the way for smarter, more efficient homes in the future.

Chapter 7

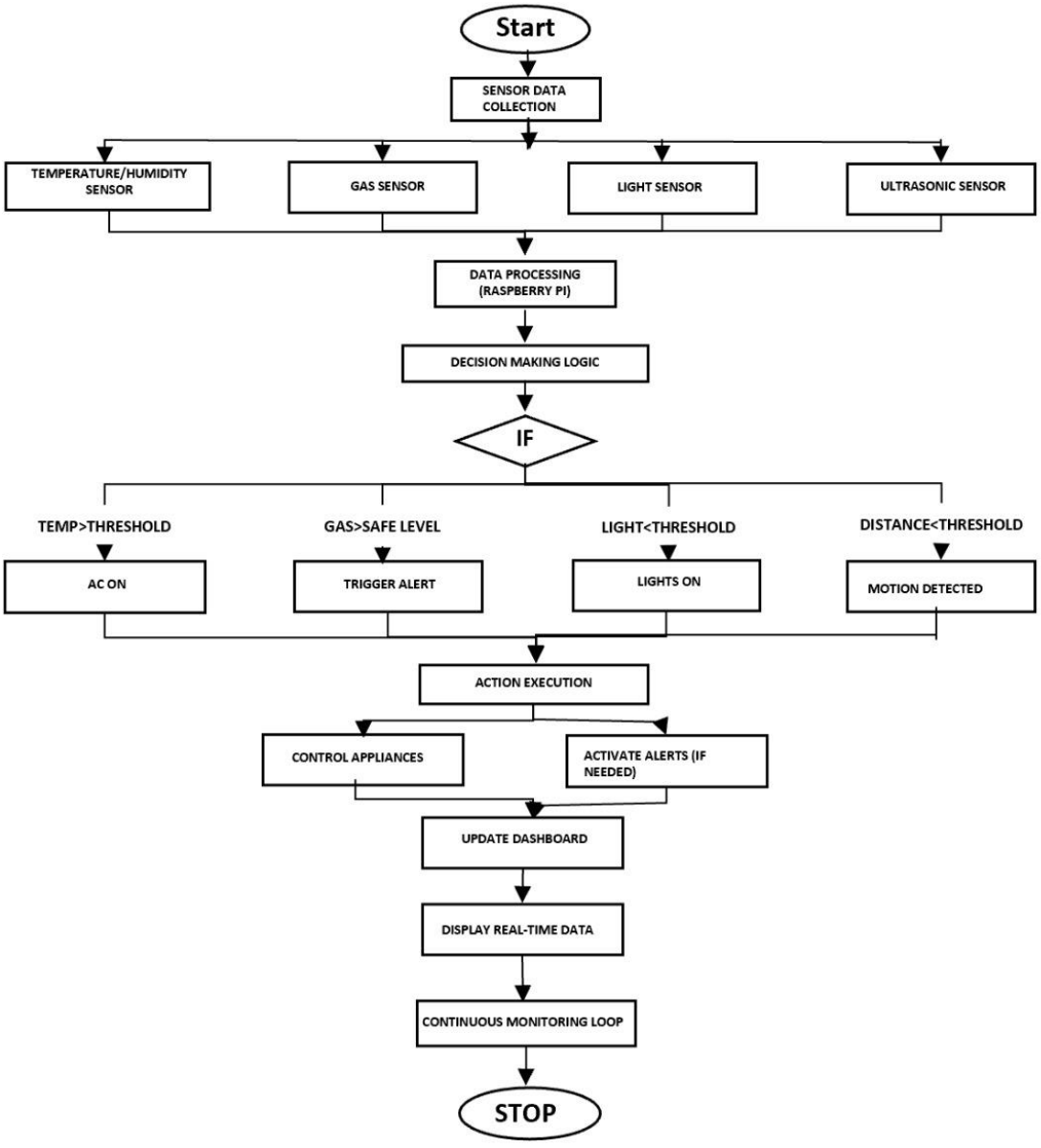
FUTURE WORK

- Integration with Smart Assistants: Future versions of the system can integrate with virtual assistants like Amazon Alexa, Google Assistant, or Apple Siri for voice control.
- Mobile App Integration: Develop a mobile application for remote monitoring and control of home devices.
- Data Logging and Analysis: Implement data logging and analytics to predict trends in energy usage, environmental conditions, and optimize home automation routines.
- Security Features: Add cameras, motion detectors, and facial recognition for enhanced security.
- Machine Learning: Use machine learning algorithms to predict user behavior and automate tasks more efficiently.

Chapter 8

APPENDIX

8.1 Pseudocode



Steps and Discription :

Initialize system

Initialize sensors (Light Sensor, Ultrasonic Sensor, Temperature and Humidity Sensor, Gas Sensor)

Initialize devices (Lights, Fans, AC, Alarm)

```
# Main loop
while True:
    Read Light Sensor value
    Read Ultrasonic Sensor value
    Read Temperature and Humidity Sensor values
    Read Gas Sensor value

    # Check Light Sensor (auto-light control)
    if light_intensity < threshold:
        Turn on lights
    else:
        Turn off lights
# Check Ultrasonic Sensor (proximity detection)
    if distance < threshold:
```

```
    Turn on fan or AC (based on temperature)
  else:
    Turn off fan or AC

  # Check Temperature and Humidity
  if temperature > 25°C:
    Turn on AC
  elif temperature < 18°C:
    Turn on heater

  # Check Gas Sensor (safety check)
  if gas_concentration > threshold:
    Activate alarm
    Send alert to user

  # Wait before reading sensor data again
  Wait for 1 second
```