माधव प्रौद्योगिकी एवं विज्ञान संस्थान, ग्वालियर (म.प्र.), भारत
MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR (M.P.), INDIA
Deemed to be University
(Declared under Distinct Category by Ministry of Education, Government of India)
NAAC ACCREDITED WITH A++ GRADE

A Skill Based Mini Project Report
on

"Smart Home Automation System"

Submitted by

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Submitted to

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Jan – Jun 2024

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DECLARATION

We hereby declare that the work being presented in this skill based mini project report, for the partial fulfilment of requirement for the award of the degree of Bachelor of Technology in Internet of Things at Madhav Institute of Technology & Science, Gwalior is an authenticated and original record of my work under the mentorship of **Dr. Praveen Bansal**, Assistant Professor, Centre for Internet of Things.

We declare that We have not submitted the matter embodied in this report for the award of any degree or diploma anywhere else.

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CERTIFICATE

This is certified that **Rakhi Yadav (0901eo221049), Krishna Prajapati (0901eo221036) & Simmi Mittal (0901eo221062)** has submitted the skill based mini project report titled "**Smart Home Automation System"** under the mentorship of **Dr. Praveen Bansal**, in partial fulfilment of the requirement for the award of degree of Bachelor of Technology in Internet of Things from Madhav Institute of Technology and Science, Gwalior.

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ACKNOWLEDGEMENT

The full semester project has proved to be pivotal to my career. I am thankful to my institute, **Madhav Institute of Technology & Science** to allow me to continue my disciplinary/interdisciplinary project as a curriculum requirement, under the provisions of the Flexible Curriculum Scheme approved by the Academic Council of the institute. I extend my gratitude to the Director of the institute, **Dr. R. K. Pandit** and Dean Academics, **Dr. Manjaree Pandit** for this.

I would sincerely like to thank my department, **Centre for Internet of Things,** for allowing me to explore this project. I humbly thank **Dr. Praveen Bansal**, Assistant Professor and Coordinator, Centre for Internet of Things, for his continued support during the course of this engagement, which eased the process and formalities involved.

I am sincerely thankful to my faculty mentors. I am grateful to the guidance of **Dr. Praveen Bansal**, Assistant Professor, and Centre for Internet of Things, for his continued support and guidance throughout the project. I am also very thankful to the faculty and staff of the department.

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ABSTRACT

Title: Smart Home Automation System

In recent years, the concept of smart home automation has gained significant attention due to its potential to revolutionize the way we live. A smart home automation system refers to the integration of technology into residential spaces to automate and control various household functions, thereby enhancing convenience, comfort, efficiency, and security for occupants. This abstract delves into the key components, functionalities, benefits, and challenges of smart home automation systems.

The core components of a smart home automation system typically include sensors, actuators, controllers, communication protocols, and a central hub or gateway. These components work in harmony to monitor and manage different aspects of the home environment, such as lighting, temperature, security, entertainment systems, appliances, and energy usage.

One of the primary functionalities of a smart home automation system is remote access and control. Through mobile apps or web interfaces, homeowners can monitor and control various devices and systems in their homes from anywhere, providing unprecedented convenience and flexibility.

Moreover, smart home automation system in our project offer several benefits, including:

1. **Smart Lighting:** In our Project, for Smart Lighting we have used some LEDs & Bluetooth module. We can turn the LED ON & OFF by using the Bluetooth module. We can use Bluetooth module by the mobile application. So in this way we have shown Smart Lighting in our project.

2. **Smart Parking:** In our Project, for Smart Parking we have used IR sensor. IR sensor detects weather the car is in the parking or not. Also we can check the status of our parking by our mobile phone using a Bluetooth module. So in this way we have shown Smart Parking in our project.

3. **Smart Street Lighting:** In our Project, for Smart Street Lighting we have used LDR sensor. LDR sensor detects darkness in the surroundings. Then as it detects darkness it turn ON the lights automatically and when it detects light it turns OFF the lights automatically. So in this way we have shown Smart Street Lighting in our project.

4. **Smart Temperature & Weather Monitoring:** In our Project, for Smart Temperature & Humidity Monitoring we have used DHT11 sensor. DHT11 sensor detects Temperature & Humidity in the surroundings. Then as it shows the data to the mobile application of the user which helps to know about the surrounding environment. So in this way we have shown Smart Temperature & Humidity Monitoring in our project.

5. **Smart Irrigation:** In our Project, for Smart Irrigation we have used Soil Moisture, Relay Module, DC pump and a battery. Soil moisture sensor detects the moisture level of the soil and shows that to the user by the mobile application. Then if the moisture level of the soil is low, it automatically turns ON DC pump and then the moisture level of soil is maintained it turns OFF DC pump automatically. So in this way we have shown Smart Irrigation in our project.

6. **Smart Dustbin:** In our Project, for Smart Dustbin we have used Ultrasonic sensor and a servo moto. Ultrasonic sensor detects any object in a specified range then it will open automatically with the help of Servo Motor. Then after a time it will shut automatically. So in this way we have shown Smart Dustbin in our project.

So, in all, to make our home smart we have used some sensors, motors and Bluetooth module that can work automatically without too much manpower. Also we can view the data on our mobile app from anywhere.

In conclusion, smart home automation systems represent a transformative technological advancement with the potential to enhance quality of life, promote sustainability, and redefine the concept of modern living. As technology continues to evolve, addressing challenges and improving interoperability and security will be crucial for the widespread adoption and success of smart home automation systems.

LIST OF COMPONENTS

Figure No.	Components caption
1.	Arduino UNO
2.	Breadboard
3.	IR Sensor
4.	LDR Sensor
5.	Ultrasonic Sensor
6.	Soil Moisture
7.	DHT11
8.	Relay Module
9.	Bluetooth Module
10.	Servo Motor
11.	DC Pump
12.	Battery
13.	Jumper Wires
14.	LEDs

Chapter 1:
Introduction

Introducing our innovative smart home automation project, where we have seamlessly integrated a range of cutting-edge technologies to create a truly intelligent and efficient living space. Our project harnesses the power of advanced sensors and modules, including the DHT11 sensor for monitoring temperature and humidity levels, the ultrasonic sensor for proximity detection and obstacle avoidance, the soil moisture sensor for automated plant care, the IR sensor for motion detection and security, the LDR sensor for managing lighting based on ambient light levels, the Bluetooth module for wireless communication, and the servo motor for physical actuation tasks.

By combining these components into a cohesive system, we have redefined the concept of home automation, offering unparalleled convenience, comfort, and control to homeowners. The DHT11 sensor ensures optimal indoor climate control, creating a pleasant environment tailored to individual preferences. The ultrasonic sensor adds a layer of safety by detecting obstacles and preventing collisions, enhancing the overall security of the home.

Our smart irrigation system, powered by the soil moisture sensor, automatically waters plants based on real-time moisture levels, promoting plant health and reducing water wastage. The IR sensor contributes to home security by detecting motion and triggering alerts or actions as needed, providing peace of mind to occupants. The LDR sensor intelligently adjusts lighting to suit the ambient light conditions, optimizing energy usage and creating a cozy atmosphere.

The integration of a Bluetooth module enables seamless wireless communication and control, allowing users to monitor and manage various aspects of their home remotely via smartphones or tablets. Furthermore, the servo motor adds a physical dimension to automation, facilitating tasks such as opening and closing doors, windows, or curtains with precision and reliability.

In essence, our smart home automation project represents the pinnacle of modern technology, offering a glimpse into the future of intelligent living spaces. As we continue to refine and expand upon these capabilities, we envision a world where homes are not just automated but truly intuitive, adaptive, and responsive to the needs of their inhabitants.

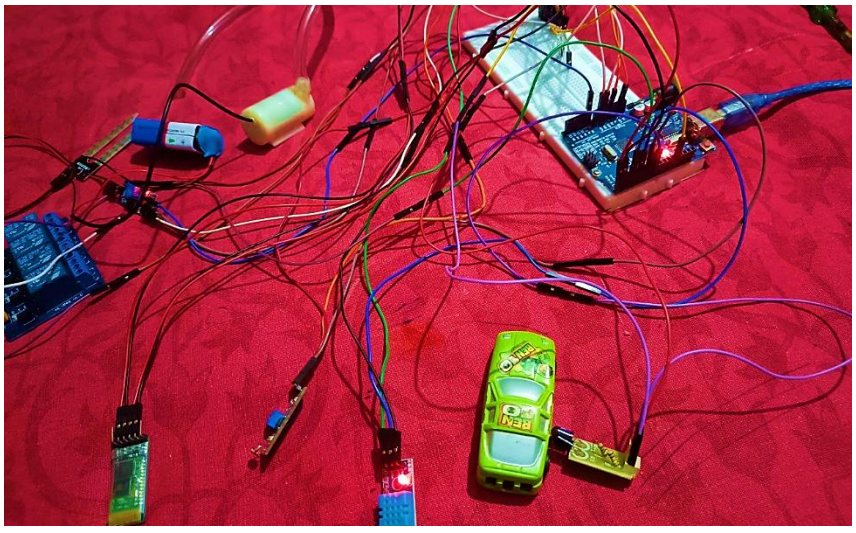
1.1 Overview of Project:

The smart home automation project we've developed encompasses a sophisticated array of components to create a seamlessly interconnected and automated living environment. Our system integrates a DHT11 sensor for monitoring temperature and humidity levels, ensuring optimal comfort and energy efficiency indoors. The ultrasonic sensor plays a pivotal role in proximity detection, enhancing safety by preventing collisions and providing accurate object detection within the home.

For efficient plant care, we've incorporated a soil moisture sensor that automates watering based on real-time soil moisture levels, promoting plant health and reducing manual intervention. The infrared (IR) sensor contributes to security measures by detecting motion and triggering alerts or actions as needed, bolstering the safety of the premises.

The light-dependent resistor (LDR) sensor optimizes energy consumption by adjusting lighting based on ambient light levels, contributing to energy conservation. Our system also includes a Bluetooth module for wireless communication, allowing users to remotely interact with and control the smart home system via mobile devices, offering convenience and accessibility.

Furthermore, the integration of a servo motor adds a physical actuation element, enabling automated tasks such as opening and closing doors or windows based on user preferences or predefined conditions. This comprehensive combination of sensors, modules, and actuators forms the backbone of our smart home automation project, offering an intelligent, efficient, and user-centric home environment that aligns with modern technological advancements and the evolving needs of homeowners.



1.2 Objective of Project:

The objective of our smart home automation project, incorporating components such as the DHT11 sensor for temperature and humidity monitoring, ultrasonic sensor for proximity detection, soil moisture sensor for plant care, IR sensor for motion detection, LDR sensor for light intensity measurement, Bluetooth module for wireless communication, and servo motor for actuation, is to create a seamlessly integrated and intelligent home environment.

Our primary goal is to enhance the convenience, comfort, efficiency, and security of occupants by leveraging these advanced technologies. The DHT11 sensor allows us to maintain optimal indoor climate conditions by continuously monitoring temperature and humidity levels, ensuring a comfortable living space while also contributing to energy savings.

The ultrasonic sensor plays a crucial role in detecting objects and obstacles, particularly in automated door or gate systems, preventing collisions and improving safety. Incorporating a soil moisture sensor enables automated irrigation based on real-time soil moisture levels, promoting efficient water usage and healthy plant growth in indoor or outdoor gardens.

The IR sensor enhances security by detecting motion and triggering appropriate actions or alerts, adding an additional layer of protection to the smart home system. Similarly, the LDR sensor contributes to energy conservation by adjusting lighting levels based on ambient light conditions, reducing energy waste and enhancing sustainability.

The integration of a Bluetooth module enables seamless wireless communication and control, allowing users to remotely monitor and manage various aspects of the smart home system through mobile devices. Finally, the servo motor provides physical actuation capabilities, enabling tasks such as opening and closing doors, windows, or blinds, enhancing accessibility and automation within the home.

Overall, our objective is to showcase the potential of smart home automation in creating a more connected, efficient, and user-centric living environment, where technology works harmoniously to improve daily life and optimize resource utilization.

Chapter 2:
Functionalities

The functionalities of our smart home automation project, incorporating a range of sensors and modules including DHT11, ultrasonic sensor, soil moisture sensor, IR sensor, LDR sensor, Bluetooth module, and servo motor, are diverse and impactful.

Firstly, the DHT11 sensor enables precise monitoring of temperature and humidity levels within the home environment, allowing for automated climate control and ensuring optimal comfort for occupants. Additionally, it contributes to energy efficiency by adjusting heating and cooling systems based on real-time data.

The ultrasonic sensor adds a layer of safety and convenience by detecting objects and obstacles in the proximity of doors or pathways, preventing collisions and accidents. It also aids in smart lighting systems, automatically adjusting lighting intensity based on occupancy to conserve energy.

The soil moisture sensor plays a crucial role in smart gardening and irrigation systems, ensuring plants receive the right amount of water based on soil moisture levels. This not only promotes plant health but also reduces water wastage through efficient watering practices.

The IR sensor enhances home security by detecting motion and triggering alarms or notifications, alerting occupants to potential intrusions or unauthorized access. It can also integrate with surveillance systems for enhanced monitoring capabilities.

The LDR sensor contributes to energy conservation by adjusting indoor lighting according to natural light levels, optimizing energy usage and creating a comfortable lighting environment. This feature is particularly beneficial in areas with varying natural light throughout the day.

The Bluetooth module enables wireless communication and control of various smart devices within the home, allowing users to remotely manage and monitor their automation systems via mobile applications or voice commands. This adds a layer of convenience and accessibility to the smart home ecosystem.

Finally, the servo motor provides physical actuation capabilities, allowing for automated opening and closing of doors, windows, or other mechanical systems. This feature enhances convenience, accessibility, and security within the home environment.

Collectively, these functionalities create a comprehensive smart home automation system that prioritizes comfort, safety, energy efficiency, and convenience for users, showcasing the potential of integrating multiple sensors and modules into a cohesive and intelligent home ecosystem.

2.1 Working of Project

Our smart home automation project incorporates a range of sensors and modules to create a seamless and intelligent system. The DHT11 sensor, responsible for monitoring temperature and humidity levels, ensures optimal comfort within the home environment by automatically adjusting heating or cooling systems as needed. This contributes to energy efficiency and enhances the overall living experience.

The ultrasonic sensor plays a critical role in detecting obstacles and measuring distances, particularly useful in automated door opening systems or for adjusting lighting based on occupancy. Its ability to sense proximity enables enhanced safety and convenience within the smart home setup.

For plant care and irrigation automation, we've integrated a soil moisture sensor. This sensor monitors soil moisture levels, allowing the system to water plants only when necessary, thereby conserving water and promoting healthy plant growth.

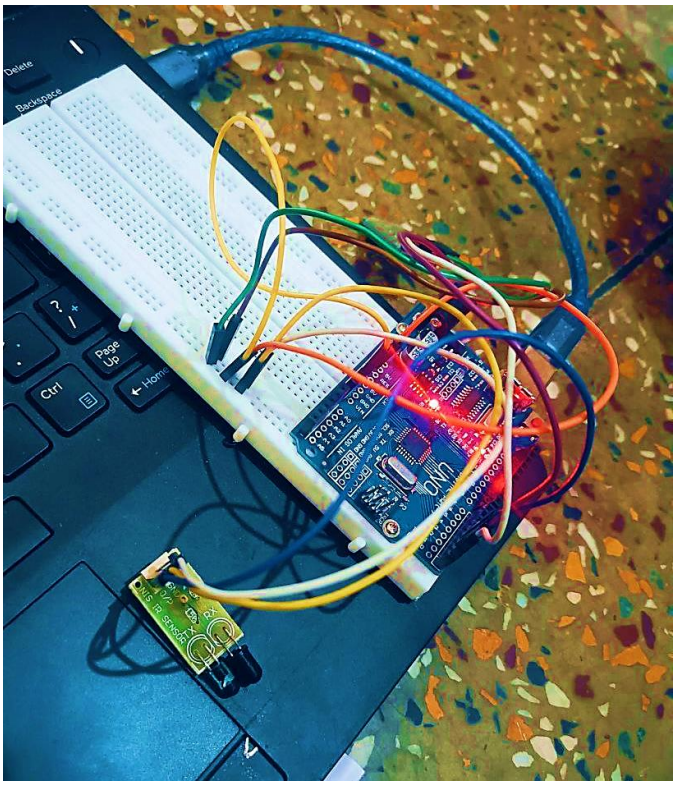
The IR sensor, designed for motion detection, enhances security by triggering alarms or activating surveillance systems in response to unauthorized movement. This feature adds an extra layer of safety and peace of mind for homeowners.

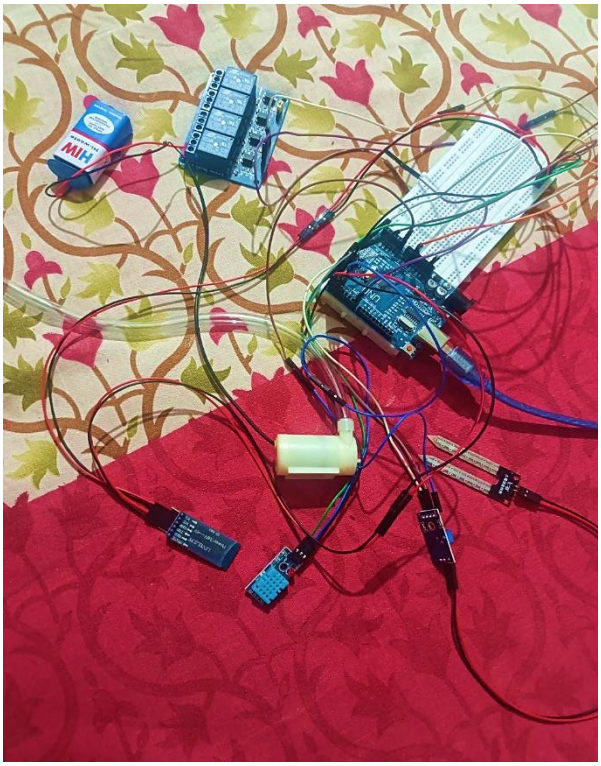
To manage lighting based on ambient conditions, we've included an LDR sensor. This sensor detects changes in light intensity and adjusts indoor lighting accordingly, contributing to energy savings and creating a comfortable living environment.

For wireless communication and control, we've incorporated a Bluetooth module. This module enables users to interact with the smart home system remotely via smartphones or tablets, offering convenient access to monitoring and control features from anywhere within the Bluetooth range.

Finally, the servo motor serves as a physical actuator, enabling automated tasks such as opening and closing doors, windows, or blinds based on preset conditions or user commands. This adds a tangible, interactive element to the smart home automation system, enhancing functionality and usability.

Overall, the seamless integration of these sensors and modules allows our smart home automation project to operate efficiently, providing a range of benefits including energy savings, enhanced security, convenience, and improved quality of life for occupants.





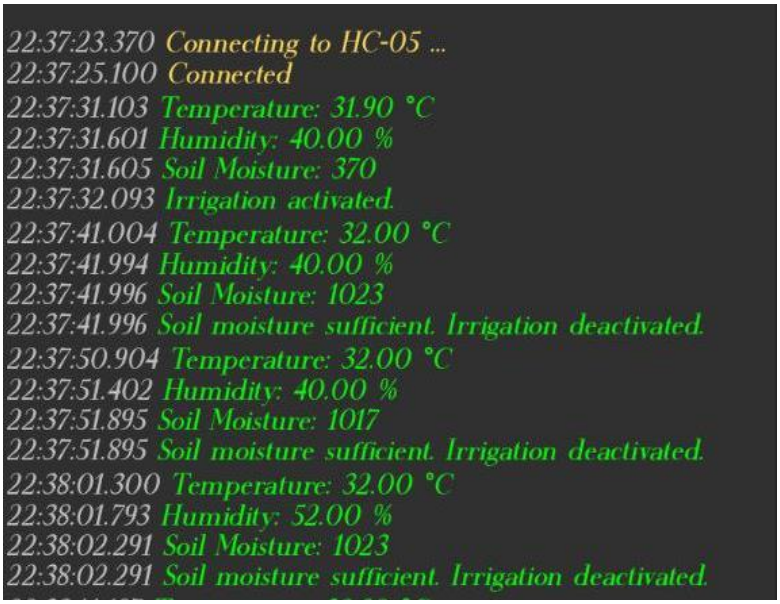
2.2 Coding Screenshots

```
#include <SoftwareSerial.h>
#include <DHT.h>

#define LDR_PIN 5
#define LED_PIN 13
#define DHTPIN 2       // Digital pin connected to the DHT sensor
#define DHTTYPE DHT11  // DHT sensor type
#define SOIL_MOISTURE_PIN A0  // Analog pin connected to soil moisture sensor
#define RELAY_PIN 7
#define IR_PIN 3
bool objectDetected = false;

SoftwareSerial bluetooth(0,1);  // RX, TX pins for Bluetooth module
DHT dht(DHTPIN, DHTTYPE);

void setup() {
  Serial.begin(9600);
  bluetooth.begin(9600);
  dht.begin();
  pinMode(LDR_PIN,INPUT);
  pinMode(LED_PIN,OUTPUT);
  pinMode(SOIL_MOISTURE_PIN, INPUT);
  pinMode(RELAY_PIN, OUTPUT);
  pinMode(IR_PIN, INPUT);

  // Print header to serial monitor
  Serial.println("Smart Irrigation System");
  Serial.println("Smart Parking System");
  Serial.println("Reading data from sensors...");
}
```

```
34  void loop() {
35    float temperature = dht.readTemperature();  // Read temperature from DHT sensor
36    float humidity = dht.readHumidity();        // Read humidity from DHT sensor
37    int soilMoisture = analogRead(SOIL_MOISTURE_PIN);  // Read soil moisture level
38
39    // Send data to Bluetooth device
40    bluetooth.print("Temperature:");
41    bluetooth.println(temperature);
42    bluetooth.print("Humidity:");
43    bluetooth.println(humidity);
44    bluetooth.print("Soil Moisture:");
45    bluetooth.println(soilMoisture);
46
47    // Print data to serial monitor
48    Serial.println("-----------------------------------");
49    Serial.println("Sensor Readings:");
50    Serial.print("Temperature:");
51    Serial.println(temperature);
52    Serial.print("Humidity:");
53    Serial.println(humidity);
54    Serial.print("Soil Moisture:");
55    Serial.println(soilMoisture);
57    if( digitalRead( LDR_PIN ) == 1){
58        digitalWrite( LED_PIN,HIGH);
59    }
60    else{
61        digitalWrite( LED_PIN , LOW);
62    }
63
64    Serial.println( digitalRead( LDR_PIN));
65    delay(100);
66
67    int irValue = digitalRead(IR_PIN);
68
69    if (irValue == LOW) {
70      if (!objectDetected) {
71        objectDetected = true;
72        bluetooth.println("Car is not Parked!");
73        Serial.println("Car is not Parked!");
74      }
75    } else {
76      if (objectDetected) {
77        objectDetected = false;
78        bluetooth.println("Car Parked!");
79        Serial.println("Car is Parked!");
80      }
81    }
```

```
  // Check soil moisture level and control irrigation
  if (soilMoisture < 500) {
    Serial.println("Soil moisture low. Turning on irrigation...");
    digitalWrite(RELAY_PIN, HIGH);  // Turn on irrigation
    delay(10000);  // Irrigation duration (adjust as needed)
    digitalWrite(RELAY_PIN, LOW);   // Turn off irrigation
    Serial.println("Irrigation complete.");
  }

  delay(5000);  // Delay between readings
}
```

```
Temperature: 32.10 °C
Humidity: 39.00 %
Soil Moisture: 1023
Soil moisture sufficient. Irrigation deactivated.
Temperature: 32.10 °C
Humidity: 39.00 %
Soil Moisture: 279
Irrigation activated.
Temperature: 32.00 °C
Humidity: 39.00 %
Soil Moisture: 336
Irrigation activated.
```



Chapter 3:

Conclusion

In conclusion, our smart home automation project utilizing a combination of sensors and modules such as DHT11 for temperature and humidity monitoring, ultrasonic sensor for proximity detection, soil moisture sensor for plant care, IR sensor for motion detection, LDR sensor for light intensity measurement, Bluetooth module for wireless communication, and servo motor for actuation has been a significant success.

By integrating these components into a cohesive system, we have achieved a comprehensive smart home solution that offers a range of benefits. The DHT11 sensor ensures optimal indoor climate control by monitoring temperature and humidity levels, enhancing comfort and energy efficiency. The ultrasonic sensor plays a crucial role in detecting objects and preventing collisions, improving safety within the home environment.

The inclusion of a soil moisture sensor enables automated plant watering based on real-time soil moisture levels, promoting plant health and reducing manual intervention. The IR sensor enhances security by detecting motion and triggering alerts or actions as needed, enhancing the overall safety of the premises. The LDR sensor contributes to energy conservation by adjusting lighting based on ambient light conditions, optimizing energy usage.

The Bluetooth module facilitates wireless communication and control, allowing users to interact with the smart home system remotely via mobile devices. Finally, the servo motor adds a physical actuation element, enabling the automation of tasks such as opening and closing doors or windows, enhancing convenience and accessibility.

Overall, our smart home automation project demonstrates the potential of integrating diverse sensors and modules to create an intelligent, efficient, and user-friendly home environment. As technology continues to advance, we envision further enhancements and innovations in smart home automation, paving the way for a more connected and automated future.

Chapter 6:

References

[1]. https://www.techtarget.com/iotagenda/definition/smart-home-or-building

[2]. https://www.security.org/home-automation

[3]. https://youtu.be/WqnqBXMAPHw?si=7Wg8Z1jWmLq_nf5r

[4]. https://www.google.com/url?url=https://xilirprojects.com