DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SCHOOL OF ENGINEERING

PROJECT REPORT

HOME AUTOMATION

A PROJECT REPORT

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Introduction to Internet of Things and Laboratory

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Introduction to Internet Of Things + Lab

ABSTRACT:

This project aims to develop a home automation system that can control various appliances and devices in a residential setting. The system is designed to be user-friendly, secure, and cost-effective. The proposed system will use a combination of hardware and software components to provide users with an intuitive interface to control various home appliances such as lights, fans, air conditioning units, and parking systems. The system will also be designed to be modular, allowing users to easily expand and customize it to meet their specific needs. The hardware components of the system will include microcontrollers, sensors, and wireless communication modules. The software components will include a mobile application and a web-based interface that will enable users to remotely control the devices. The project is expected to provide a significant improvement in convenience, energy efficiency, and ease in the home environment.

INTRODUCTION

1.Overview:

Home automation is a growing trend in the field of smart technology that seeks to improve the quality of life for homeowners by providing them with greater control over their living environments. With the increasing availability and affordability of smart devices, more and more people are seeking to automate their homes to enhance comfort, convenience, and security. Home automation involves the use of various hardware and software technologies to control and monitor various appliances and systems in the home, such as lighting, heating, ventilation, air conditioning, and security systems.

2.Objective:

This project seeks to design and develop a home automation system that provides users with an intuitive and user-friendly interface to control and monitor various home appliances and devices remotely. The system will be designed to be modular, allowing users to easily expand and customize it to meet their specific needs.

3.Motivation:

There are several motivations for pursuing a home automation project. First and foremost, automation can significantly enhance the comfort and convenience of a home. With the ability to remotely control various home appliances, such as lighting and temperature, homeowners can create a more comfortable living environment that is customized to their preferences.

Another motivation for home automation is the added security it provides. With the ability to monitor and control security systems remotely, homeowners can keep their homes and families safe, even when they are away from home. Automation can also provide real-time alerts and notifications of any suspicious activity or breaches, enabling homeowners to take immediate action.

Finally, home automation is a growing trend that is expected to continue expanding in the coming years. With the increasing availability and affordability of smart devices, more and more homeowners are seeking ways to automate their homes. By pursuing a home automation project, individuals can gain valuable skills in the field of smart technology, which can be useful in a variety of applications and industries.

LITERATURE SURVEY:

Home automation is evolving the quality of human life at an unprecedented rate. This eliminates the need of labour and also helps in the consumption of electricity thereby saving energy. The motive of this paper is to supervise and operate the appliances through different methodologies from anywhere in the world just by using an android application. In this paper the various techniques of automation methodologies used in homes are compared with their speed, cost and other functions. It highlights the drawbacks and advantages of each method.

(i) Over the years there have been many definitions for home automation.

(ii) These definitions endure the phenomenon of the components of technology highlighting its functions and need to meet the aim of smart home.

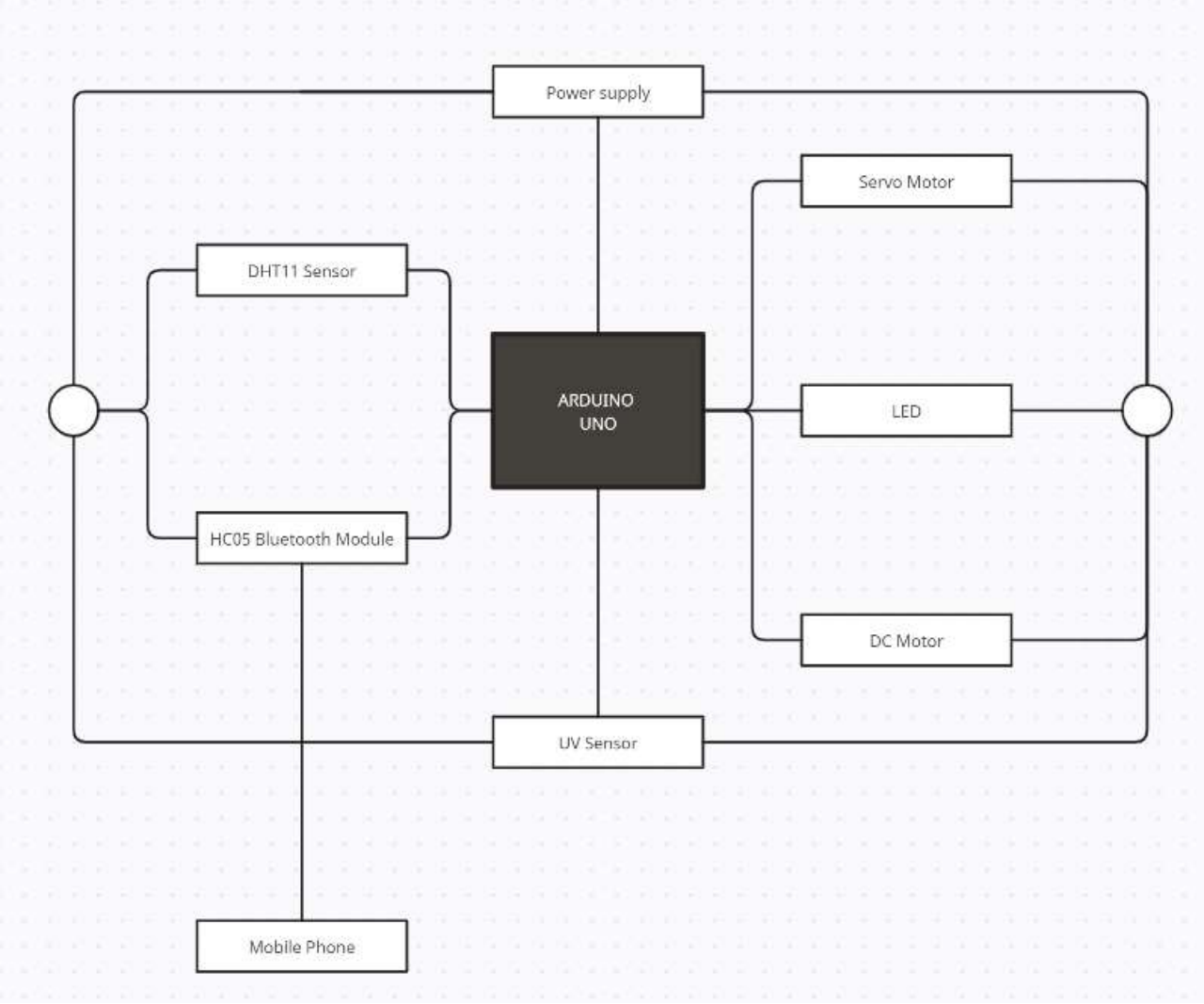
Home automation refers to the monitoring and controlling of home appliances remotely. With the never-ending growth of the Internet and its applications, there is much potential and scope for remote access and control and monitoring of such network enabled appliances. This paper deals with discussion of different intelligent home automation systems and technologies from various features. The effort targeted the home automation concept of where the controlling and monitoring operations are expediting through smart devices. Wide-ranging home automation systems and technologies considered in review with central controller based (Arduino), cloud-based, Bluetooth-based, SMS based, ZigBee based, mobile-based, RF Module based, web based and the Internet with performance.

Automation performs an increasingly vital role in daily experience and global economy. Engineers strive to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications and human activities. A home automation system means to grant the end users to manage and oversee the electric appliances. If we look at different home automation systems over time, they have always tried to provide efficient, convenient, and safe ways for home inhabitants to access their homes. Regardless of the change in user's hope, growing technology, or change of time, the appearance of a home automation system has remained the same.

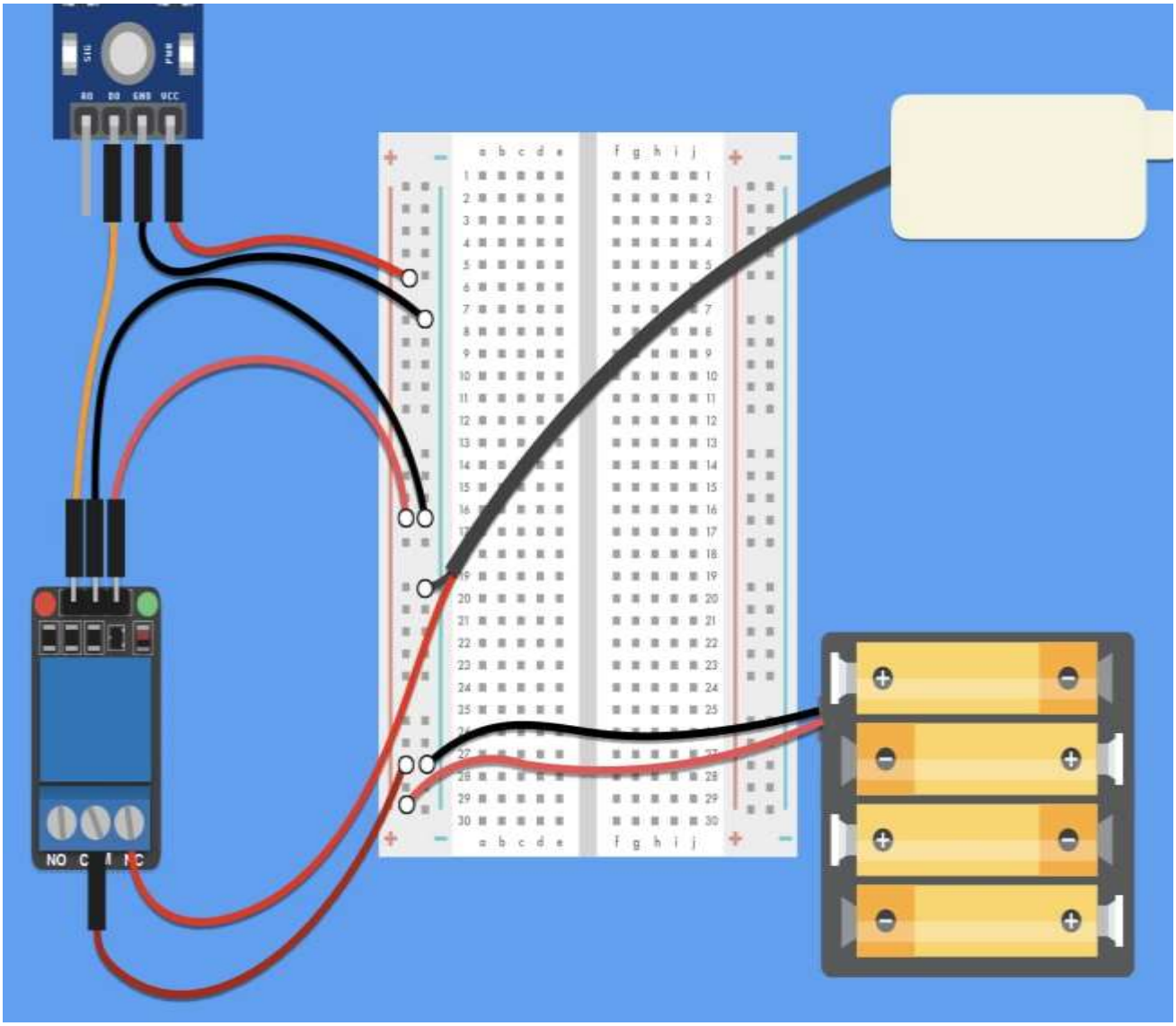
Many existing, well-established home automation systems are based on wired communication such as Arduino based and raspberry pi-based home automation systems. This does not pose a problem until the system is planned well in advance and installed during the physical construction of the building. But for already existing buildings the implementation cost goes remarkably high. In contrast, Wireless systems can be of immense help for automation systems like Bluetooth, Wi-Fi and IOT based home automation systems. With the advancement of wireless technologies such as Wi-Fi, cloud networks in the recent past.

PROPOSED METHODOLOGY:

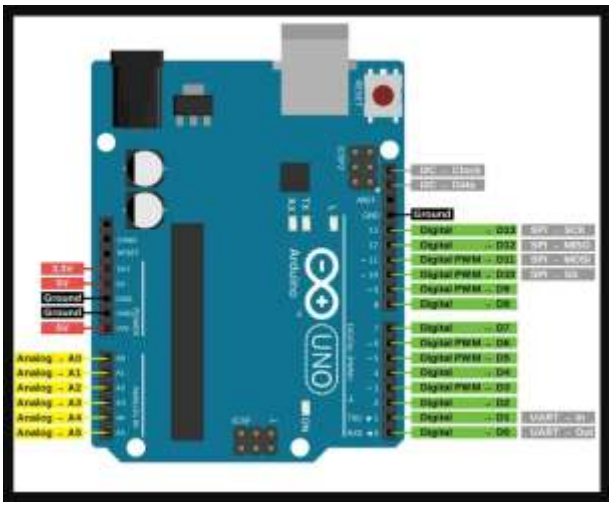
BLOCK DIAGRAM:



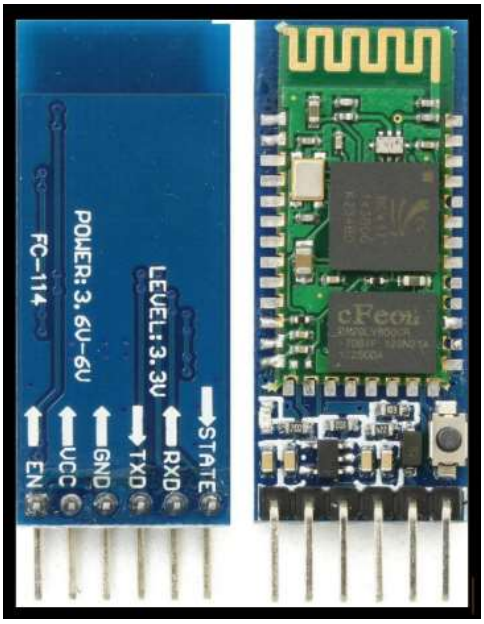
Circuit Diagram :



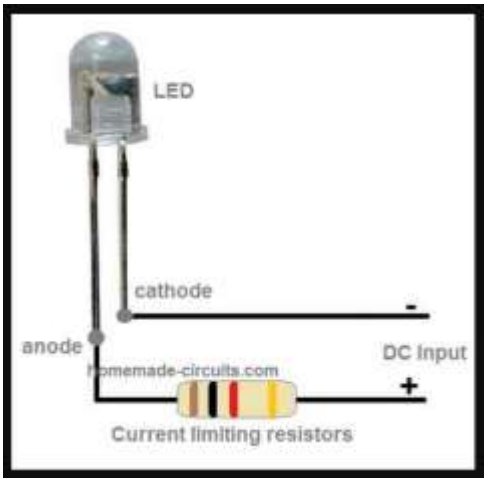
PIN DIAGRAM:

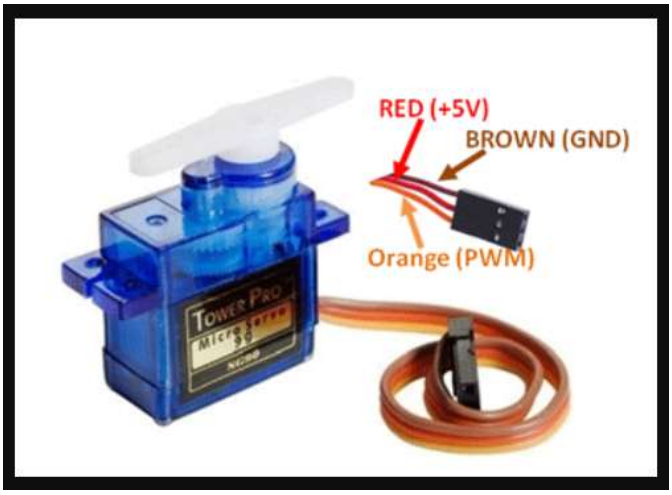


Pin Diagram of Arduino UNO



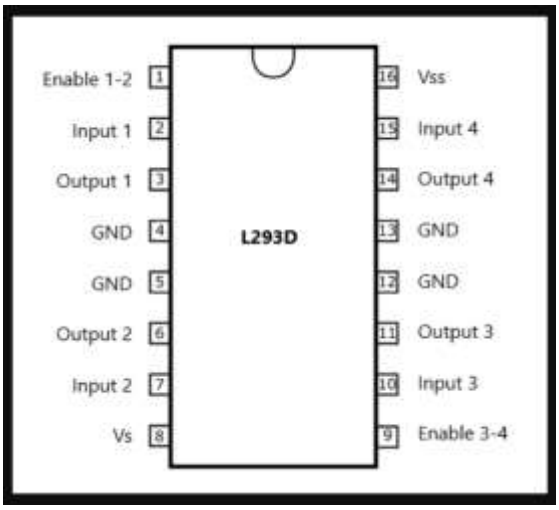
Pin Diagram of HC05 Bluetooth Module

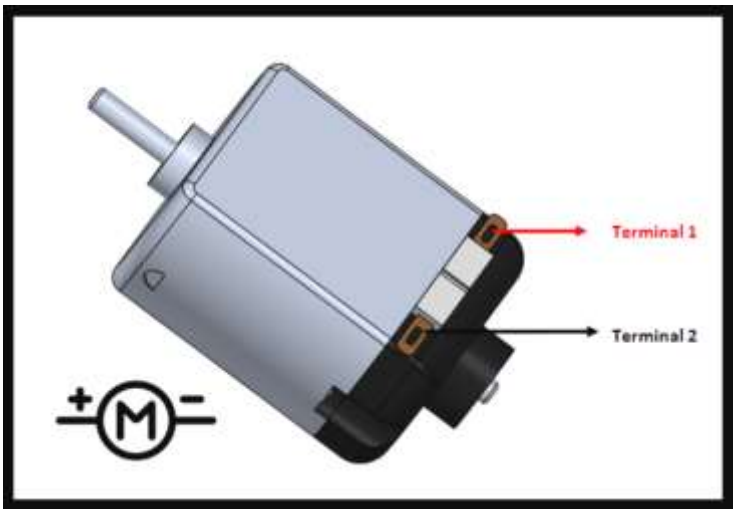




Pin Diagram of LED ⬆

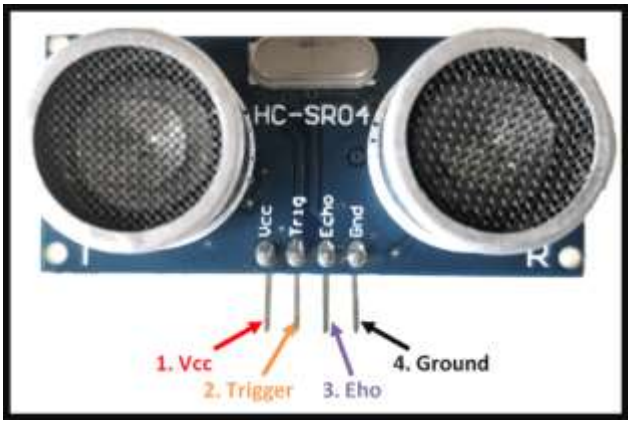
Pin Diagram of Servo Motor ⬆

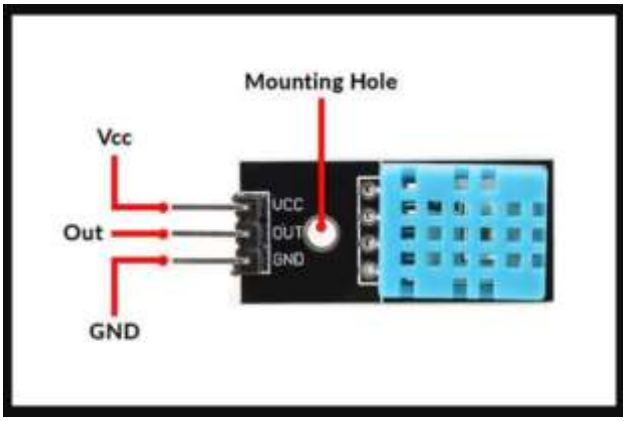




Pin Diagram of L293D Motor Drive ⬆

Pin Diagram of DC Motor ⬆





Pin Diagram of UV Sensor ⬆

Pin Diagram of DHT11 Sensor ⬆

HARDWARE AND SOFTWARE USED:

Hardware:

- ➔ Arduino UNO board
- ➔ Jumper Cables
- ➔ Bluetooth Module (HC-05)
- ➔ L293D Motor Drive
- ➔ DHT11 Sensor
- ➔ LEDs
- ➔ DC Motor
- ➔ Ultrasonic Sensors (HC-SR04)
- ➔ Servo Motor
- ➔ Bread Board
- ➔ Battery (9V)
- ➔ Soldering Iron
- ➔ Soldier

Software:

- ➔ Arduino IDE
- ➔ MIT app inventor

METHODOLOGY USED:

The following are the steps to be followed for home automation using Arduino uno:

1. Identify Requirements: Determine the specific functionalities and features you want to incorporate into your home automation system. Consider factors such as controlling lights, appliances, security systems, temperature, and energy management.

2. Plan the Architecture: Design the architecture of your IoT-based home automation system. Consider the devices, sensors, and communication protocols you will use. Decide whether you will use a centralized or decentralized approach, and plan the connectivity and data flow.

3. Select Hardware: Choose the appropriate IoT hardware components for your home automation system. This can include IoT development boards (e.g., Arduino, Raspberry Pi), sensors (e.g., motion sensors, temperature sensors), actuators (e.g., motors, relays), and communication modules (e.g., Wi-Fi, Bluetooth, Zigbee).

4. Connect Devices: Connect the selected devices to your IoT network. This may involve wiring sensors and actuators to the IoT development board or configuring wireless connections such as Wi-Fi or Bluetooth.

5. Choose a Platform: Select an IoT platform or framework to manage and control your home automation system. There are several options available, such as Home Assistant, OpenHAB, or custom-built solutions. The platform will provide tools for data management, device control, automation rules, and user interfaces.

6. Implement Control Logic: Develop the control logic for your home automation system. This involves programming the IoT devices to respond to sensor inputs and trigger appropriate actions based on predefined rules or user commands. You can use programming languages like C/C++, Python, or specific IoT frameworks depending on the hardware and platform chosen.

7. Set up Communication: Establish communication between the IoT devices and the central control unit or IoT platform. This can involve configuring network protocols like MQTT (Message Queuing Telemetry Transport) or using APIs provided by the IoT platform.

8. Implement Security Measures: Implement security measures to protect your home automation system from unauthorized access and potential cyber threats. This can include secure network configurations, encryption, authentication mechanisms, and regular software updates.

9. Test and Debug: Thoroughly test the functionality of your home automation system, ensuring that all devices are communicating correctly and actions are triggered as expected. Debug any issues that arise during testing.

10. Deploy and Monitor: Deploy your home automation system in your home and monitor its performance. Make any necessary adjustments or improvements based on user feedback and system behavior.

Remember to prioritize safety and ensure that any modifications or installations comply with local regulations and electrical standards. Home automation can offer convenience and efficiency, but it's crucial to implement it responsibly to maintain a secure and reliable environment.

PROGRAM CODE:

```
const int lm35_pin = A0;

int temp_int = 69;

int threshold_temperature = 30;


void setup() {
  Serial.begin(9600);
  pinMode(4, OUTPUT);
  pinMode(2, OUTPUT);
}
void loop() {
  float sensor_value = analogRead(lm35_pin); // read the sensor value
  float voltage = sensor_value * (5.0 / 1023.0); // convert the sensor value to voltage
  float temperature = (voltage) * 100.0; // convert the voltage to temperature
  temp_int = temperature + 0.5;
  Serial.println(temperature); // print the temperature to the serial port
  if (temperature > threshold_temperature){
```

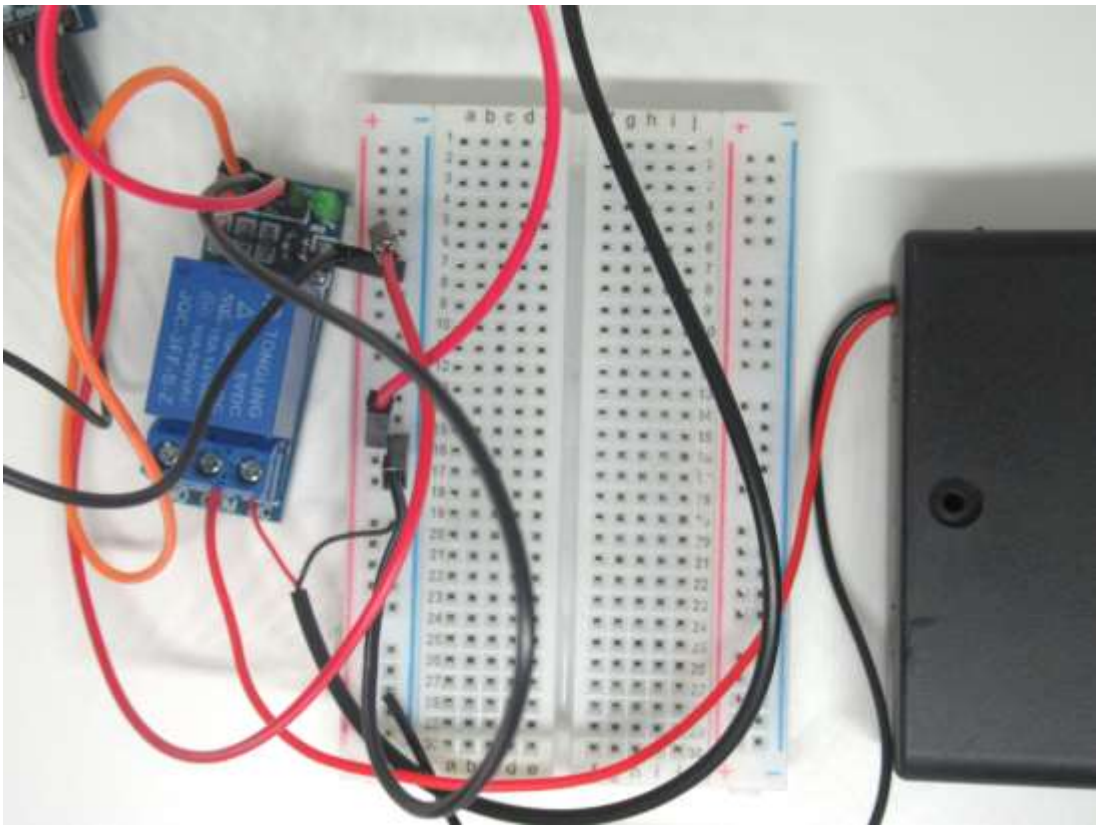
```
digitalWrite(4, HIGH);
 }
 else
{
 digitalWrite(4, LOW);
 }
  // reads the input on analog pin A0 (value between 0 and 1023)
  int analogValue = analogRead(A0);
  Serial.print("Analog reading: ");
  Serial.print(analogValue);   // the raw analog reading
  if (analogValue < 80) {
    Serial.println(" - Dark");
    digitalWrite(2, HIGH);
  } else if (analogValue < 200) {
    Serial.println(" - Dim");
    digitalWrite(2, LOW);
  } else if (analogValue < 500) {
    Serial.println(" - Light");
```

```
 digitalWrite(2, LOW);
  } else if (analogValue < 800) {
    Serial.println(" - Bright");
   digitalWrite(2, LOW);
}
else {
    Serial.println(" - Very bright");
    digitalWrite(2, LOW);
  }
  delay(500);}
int motorPin = 3; // pin that turns on the motor
int blinkPin = 13; // pin that turns on the LED
int watertime = 5; // how long it will be watering (in seconds)
int waittime = 1; // how long to wait between watering (in minutes)
void setup()
{
  pinMode(motorPin, OUTPUT); // set Pin 3 to an output
  pinMode(blinkPin, OUTPUT); // set pin 13 to an output
  Serial.begin(9600);
}
```

```
void loop()
{
  int moisturePin = analogRead(A0); //read analog value of moisture sensor
  int moisture = ( 100 - ( (moisturePin / 1023.00) * 100 ) ); //convert analog value to percentage
  Serial.println(moisture);
  if (moisture < 40) { //change the moisture threshold level based on your calibration values
    digitalWrite(motorPin, HIGH); // turn on the motor
    digitalWrite(blinkPin, HIGH); // turn on the LED
    delay(watertime * 1000);      // multiply by 1000 to translate seconds to milliseconds
  }
  else {
    digitalWrite(motorPin, LOW);  // turn off the motor
    digitalWrite(blinkPin, LOW);  // turn off the LED
    delay(waittime * 60000);      // multiply by 60000 to translate minutes to milliseconds
  }
}
```

```
void setup() {
  Serial.begin(9600); // initialize serial communication
}
void loop() {
  int moistureVal = analogRead(A0);  // read the input on analog pin 0:
  Serial.println(moistureVal); // print out the analog val
  delay(30);
```

RESULT WITH OUTPUT SCREENSHOT:



APPLICATIONS:

Home automation using the Internet of Things (IoT) has numerous applications that enhance convenience, efficiency, comfort, and security within a home environment. Some common applications of home automation using IoT include:

1. Lighting Control: IoT-based home automation allows you to control and automate lighting systems. You can remotely turn lights on or off, adjust brightness, and schedule lighting based on occupancy or time of day. Motion sensors can be used to automatically turn lights on when someone enters a room and turn them off when the room is unoccupied.

2. Appliance Control: IoT enables the control and monitoring of appliances such as TVs, air conditioners, heaters, refrigerators, and washing machines. You can remotely control these devices, monitor their energy consumption, and schedule their operation based on your preferences and energy efficiency goals.

3. Energy Management: IoT-based home automation systems can monitor and optimize energy usage. Smart meters and energy monitoring devices provide real-time energy consumption data, helping you identify energy-intensive areas and make informed decisions to conserve energy and reduce utility bills.

4. Security and Surveillance: IoT enhances home security by integrating various security devices. Smart door locks, window sensors, surveillance cameras, and motion detectors can be connected to an IoT system, allowing you to monitor and control access to your home remotely.

5. Environmental Control: IoT-based home automation systems can regulate environmental conditions. You can control and schedule thermostats, air purifiers, and humidifiers based on temperature, humidity, and air quality sensors. This ensures a comfortable living.

6. Automated Curtains and Blinds: Motorized curtains and blinds can be integrated into an IoT system, allowing you to control their opening and closing remotely. You can schedule their operation based on sunlight levels or your desired privacy settings.

7. Water Management: IoT can help in water management within your home. Smart irrigation systems can monitor weather conditions and soil moisture levels to optimize watering schedules for your garden. Leak detectors can notify you of potential water leaks or pipe bursts, helping you prevent water damage and conserve water.

8. Voice Control and Personal Assistants: IoT-enabled home automation systems often integrate with voice control platforms like Amazon Alexa or Google Assistant. This allows you to control devices, set up routines, and receive information using voice commands, providing a convenient and hands-free user experience.

These are just a few examples of how home automation using IoT can improve various aspects of daily life. The flexibility and scalability of IoT systems enable homeowners to customize their automation setup according to their specific needs and preferences.

INFERENCE:

Implementing a home automation project using IoT technology offers several key advantages and benefits:

1. Convenience and Efficiency: IoT-based home automation provides a high level of convenience by allowing users to control and monitor various devices and systems remotely. It eliminates the need for manual operation and provides automated scheduling, saving time and effort.

2. Energy Efficiency: IoT-enabled home automation systems help optimize energy

usage by providing real-time data on energy consumption and enabling automated control and scheduling of appliances and devices. This leads to reduced energy waste and lower utility bills.

3. Enhanced Security: Integrating security devices such as smart locks, surveillance cameras, and motion sensors into the IoT system enhances home security. Users can monitor their homes remotely, receive real-time notifications of security breaches, and take appropriate action to protect their property and loved ones.

4. Improved Comfort and Environment: IoT-based home automation allows users to control environmental factors such as lighting, temperature, and air quality based on their preferences and needs. This results in a more comfortable and healthy living environment.

5. Flexibility and Customization: IoT systems provide flexibility and customization options, allowing users to tailor their home automation setup to their specific requirements. They can choose from a wide range of devices, sensors, and platforms, and integrate them seamlessly into a cohesive system.

6. Integration with Voice Assistants: Many IoT-based home automation systems integrate with popular voice assistants such as Amazon Alexa or Google Assistant. This enables users to control their devices and perform tasks using voice commands, further enhancing convenience and accessibility.

7. Remote Monitoring and Control: With IoT, homeowners can monitor and control their home automation systems from anywhere using smartphones or other connected devices. This remote access provides peace of mind and the ability to manage the home even when away.

8. Scalability and Expandability: IoT-based home automation systems are scalable, allowing users to start with a basic setup and gradually expand and add new devices and functionalities as needed. This scalability ensures that the system can grow and adapt to changing requirements over time.

Overall, implementing a home automation project using IoT technology brings automation, control, and connectivity to various aspects of daily life, resulting in increased comfort, efficiency, and security for homeowners.

CONCLUSION:

In conclusion, a home automation project using IoT technology offers a range of benefits and opportunities for homeowners. By integrating devices, sensors, and actuators into a cohesive system, individuals can enjoy enhanced convenience, energy efficiency, security, and comfort within their homes.

IoT-based home automation allows users to control and monitor various aspects of their homes remotely, eliminating the need for manual operation and providing automated scheduling and customization options. This not only saves time and effort but also optimizes energy usage, resulting in reduced utility bills and a more sustainable living environment.

With the integration of security devices and sensors, homeowners can enhance the safety of their homes by monitoring and responding to security breaches or suspicious activities in real-time. Additionally, the ability to control lighting, temperature, and air quality based on individual preferences improves overall comfort and creates a healthier living space.

Furthermore, the scalability and flexibility of IoT systems ensure that users can start with a basic setup and expand their home automation capabilities over time as needed. Integration with voice assistants adds an extra layer of convenience and accessibility, allowing users to control their devices using simple voice commands.

Overall, a home automation project using IoT technology empowers homeowners to transform their houses into smart homes, providing a connected, automated, and personalized living experience.

By harnessing the power of IoT, individuals can enjoy greater convenience, energy efficiency, security, and comfort within their homes, making everyday life more enjoyable and efficient.

FUTURE WORKS:

The future of home automation in IoT holds exciting possibilities and potential advancements. Here are some potential future works and trends in the field:

1. Integration of Artificial Intelligence (AI): AI can play a significant role in the future of home automation. AI-powered virtual assistants can provide personalized recommendations and make proactive adjustments to optimize energy usage and enhance user comfort.

2. Enhanced Energy Management: Future home automation systems will focus on advanced energy management techniques. This includes integrating renewable energy sources like solar panels, energy storage systems, and smart grid integration.

3. Integration with Smart Cities: Home automation systems will increasingly integrate with smart city infrastructure.

4. Advanced Security and Privacy Measures: As IoT adoption grows, ensuring robust security and privacy will become paramount. Future home automation systems will incorporate advanced encryption, authentication mechanisms, and secure communication protocols to protect against cyber threats.

5. Health and Wellness Monitoring: Future home automation systems will increasingly focus on health and wellness monitoring. IoT devices can track vital signs, sleep patterns, and other health metrics, providing valuable insights and enabling personalized recommendations for a healthier lifestyle.

REFERENCES:

JOURNAL PAPERS:

H. K. Singh, S. Verma, S. Pal and K. Pandey, "A step towards Home Automation using IOT," 2019 Twelfth International Conference on Contemporary Computing (IC3), Noida, India, 2019, pp. 1-5, doi: 10.1109/IC3.2019.8844945.

M. Asadullah and A. Raza, "An overview of home automation systems," 2016 2nd International Conference on Robotics and Artificial Intelligence (ICRAI), Rawalpindi, Pakistan, 2016, pp. 27-31, doi: 10.1109/ICRAI.2016.7791223.

RESEARCH PAPERS:

A. P. Nirmala, V. Asha, P. Chandra, H. Priya and S. Raj, "IoT based Secure Smart Home Automation System," 2022 IEEE Delhi Section Conference (DELCON), New Delhi, India, 2022, pp. 1-7, doi: 10.1109/DELCON54057.2022.9753086.

M. Al-Kuwari, A. Ramadan, Y. Ismael, L. Al-Sughair, A. Gastli and M. Benammar, "Smarthome automation using IoT-based sensing and monitoring platform," 2018 IEEE 12th International Conference on Compatibility, Power Electronics and Power Engineering (CPEPOWERENG 2018), Doha, Qatar, 2018, pp. 1-6, doi: 10.1109/CPE.2018.8372548.

S. Dey, A. Roy and S. Das, "Home automation using Internet of Thing," 2016 IEEE 7th Annual Ubiquitous Computing, Electronics & Mobile Communication Conference (UEMCON), New York, NY, USA, 2016, pp. 1-6, doi:10.1109/UEMCON.2016.7777826.