IOT PROJECT

SMART AC MANAGEMENT

INTRODUCTION :

A Smart AC Management System is a network of interconnected devices, sensors, and software that integrate with air conditioning (AC) systems to optimize for better performance, energy efficiency, comfort, and automation.

PROBLEM STATEMENT :

The problem statement of the smart AC management system is that whenever a person enters the home, the sensors detects their presence,and also measures the room's temperature and humidity, and automatically turns on the AC without human interference.

EXISTING SOLUTIONS :

Some existed solutions for smart AC management that utilize advanced technologies to optimize air conditioning systems for comfort and energy efficiency:

1. Smart Thermostats
2. Occupancy Sensors
3. Smart AC Controllers
4. IoT-Enabled AC Units
5. Home Automation Hubs

PROPOSSED SOLUTION :

The proposed solution is to connect the AC with WiFi. When a person enters the home, sensors will detect their presence and measure the room's temperature and humidity. Based on these readings, the AC will automatically turn on. The temperature and humidity will be monitored live through the Blynk IoT app. Additionally, the user can control the AC remotely, even before arriving home, using the Blynk IoT app.

COMPONENTS :
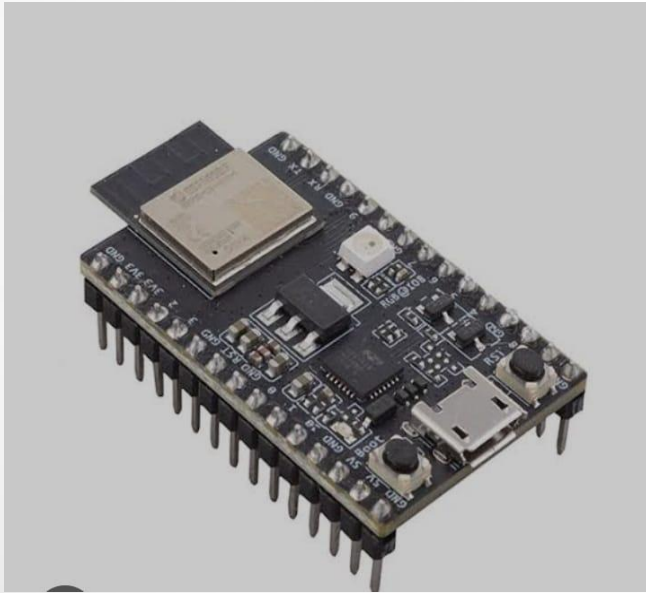
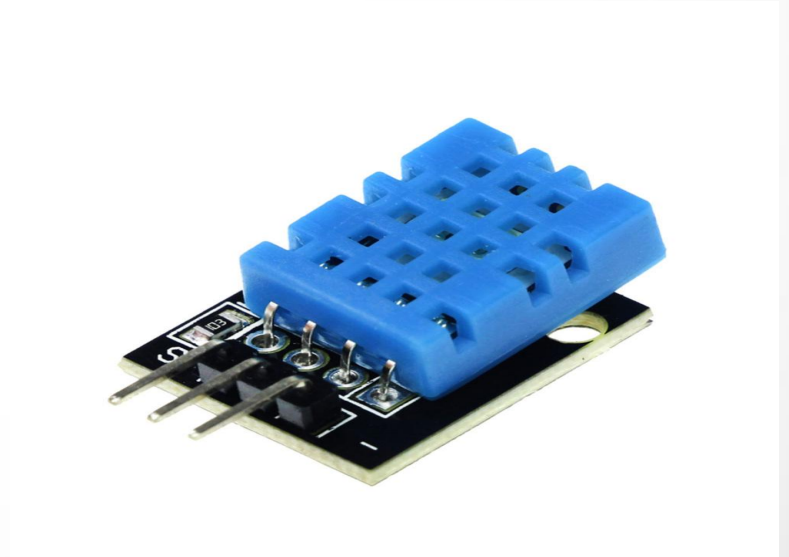1.ESP32 :   2.IR SENSORS :   3.DHT11 SENSOR :
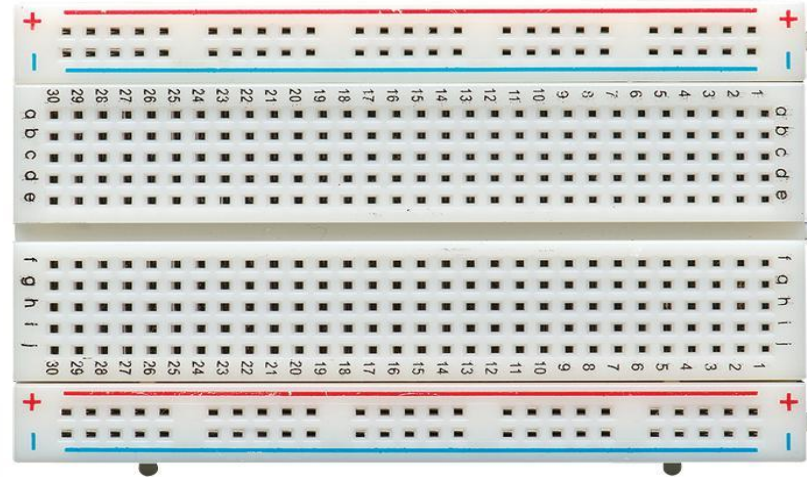
4.SERVO MOTOR :   5.BREAD BOARD :   6.ZUMPPER WIRES :

ARCHITECTURE :

A smart AC management system integrates multiple components, including sensors, communication protocols, and control systems to manage air conditioning based on real-time environmental data and user inputs.

Sensors and Input Devices :

1. IR SENSOR: Here IR SENSOR is a input device,An IR sensor (Infrared Sensor) is an electronic device that detects and measures infrared radiation (IR light) in its surroundings.

Transmission and Detection: An IR sensor typically has an IR LED (Light Emitting Diode) that emits infrared light, and a photodiode or phototransistor that detects the reflected IR light. When an object comes into proximity or radiates IR energy (like a human body), the sensor detects the IR radiation and triggers an action.

2. DHT11 : The DHT11 is a input devies used for measuring temperature and humidity.
The DHT11 sensor contains two main components:
Thermistor: Measures temperature.
Capacitive Humidity Sensor: Measures the humidity in the air by detecting the change in capacitance caused by the moisture content in the air.

3. SERVO MOTOR:A servo motor is a rotary actuator or linear actuator that allows for precise control of angular or linear position, velocity, and acceleration. Pulse Width Modulation (PWM): Servo motors are controlled by sending a PWM signal, which determines the position of the servo. The motor interprets the pulse duration to adjust its position.

4. ESP32 : The ESP32 is a powerful, low-cost microcontroller with integrated Wi-Fi and Bluetooth capabilities. It is widely used in IoT (Internet of Things) applications, home automation, and embedded systems due to its versatile features, high processing power, and energy efficiency.

Key Features of ESP32 :
1.Dual-Core Processor
2.Wi-Fi and Bluetooth Integration
3.Flash Memory
4.GPIO Pins
5.Ultra-Low Power Consumption
6.On-Chip Peripherals

CONNECTIONS:

- If the two VCC pins of the IR sensor are shorted and connected to one side of the breadboard it considered as a VCC.
- If the two GND pins of the IR sensor are shorted and connected to another side of the breadboard it considered as GND.
- The OUTPUT pin of the 1st IR SENSOR is connected to the 12th pin of the ESP32.
- The OUTPUT pin of the 2nd IR SENSOR is connected to the 14th pin of the ESP32.
- The VCC of the DHT11 SENSOR is shorted on VCC of the bread board.
- The GND of the DHT11 SENSOR is shorted on GND of the bread board.
- The D0 pin of the DHT11 SENSOR is connected to 4th pin of the ESP32.
- The red wire of the SERVO MOTOR is connected to the 3V3 of the ESP32.

- The brown wire of the SERVO MOTOR is connecetd to the GND of the ESP32.
- The yellow wire of the SERVO MOTOR is connected to the 2nd pin of the ESP32.
- The shorted VCC is connected to the 5V pin of the ESP32.
- The shorted GND is connected to the GND pin of the ESP32.
- IN these BLYNK IOT software is used for monitoring of temperature and humidity and also for remote control.

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|      Sensors        |
|                     |
| - IR Sensor         |
| - Temperature Sensor |
| - Humidity Sensor   |
+-----------+---------+
            |
            v
+-----------+---------+            +-------------------+
|      ESP32          |    ----->  |     AC Unit       |
| (Microcontroller, WiFi |        | Smart AC or       |
| Module, Decision Logic)|<-----  | Servo motor       |
+-----------+---------+            +-------------------+
            |
            v
+---------------------+            +-------------------+
|    IoT Cloud        |  <----     |   BLYNK IOT App   |
| (Blynk, Data Storage|---->       | (Remote Control,  |
|   Monitoring)       |            |   Real-Time Data) |
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CONCLUSTION :

The Smart AC Management System offers an efficient, automated solution for controlling air conditioning units, enhancing convenience, energy efficiency, and user comfort. By integrating sensors to detect presence, temperature, and humidity, the system automates the activation and adjustment of the AC, reducing the need for manual intervention.

The proposed solution, using IoT technologies like the ESP32 microcontroller and the Blynk IoT app, allows for real-time monitoring and remote control of the AC via a smartphone. Users can pre-cool their homes before arrival and monitor environmental conditions remotely, leading to smarter energy usage and reduced operational costs.