ESP32

CONTROLLING LIGHTS USING ESP32

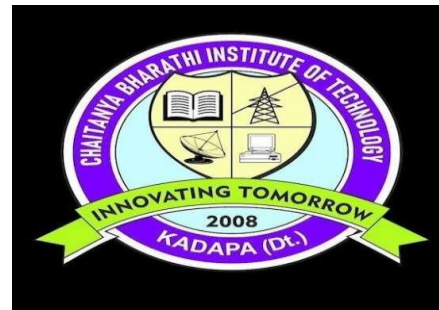| Roll Number	Name of the student
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Title of the Project

Controlling Lights Using ESP32

Components

- ESP32
- 4 Channel Relay Module
- Jumper Wires
- Breadboard
- Bulbs & Bulb Holders
- Switch Buttons
- Connecting wires

By combining the **ESP32's** Wi-Fi capabilities and its web server functionality, we will create a web-based system that allows users to remotely switch Lights ON and OFF from any device with a web browser, such as a computer, smartphone, or tablet.
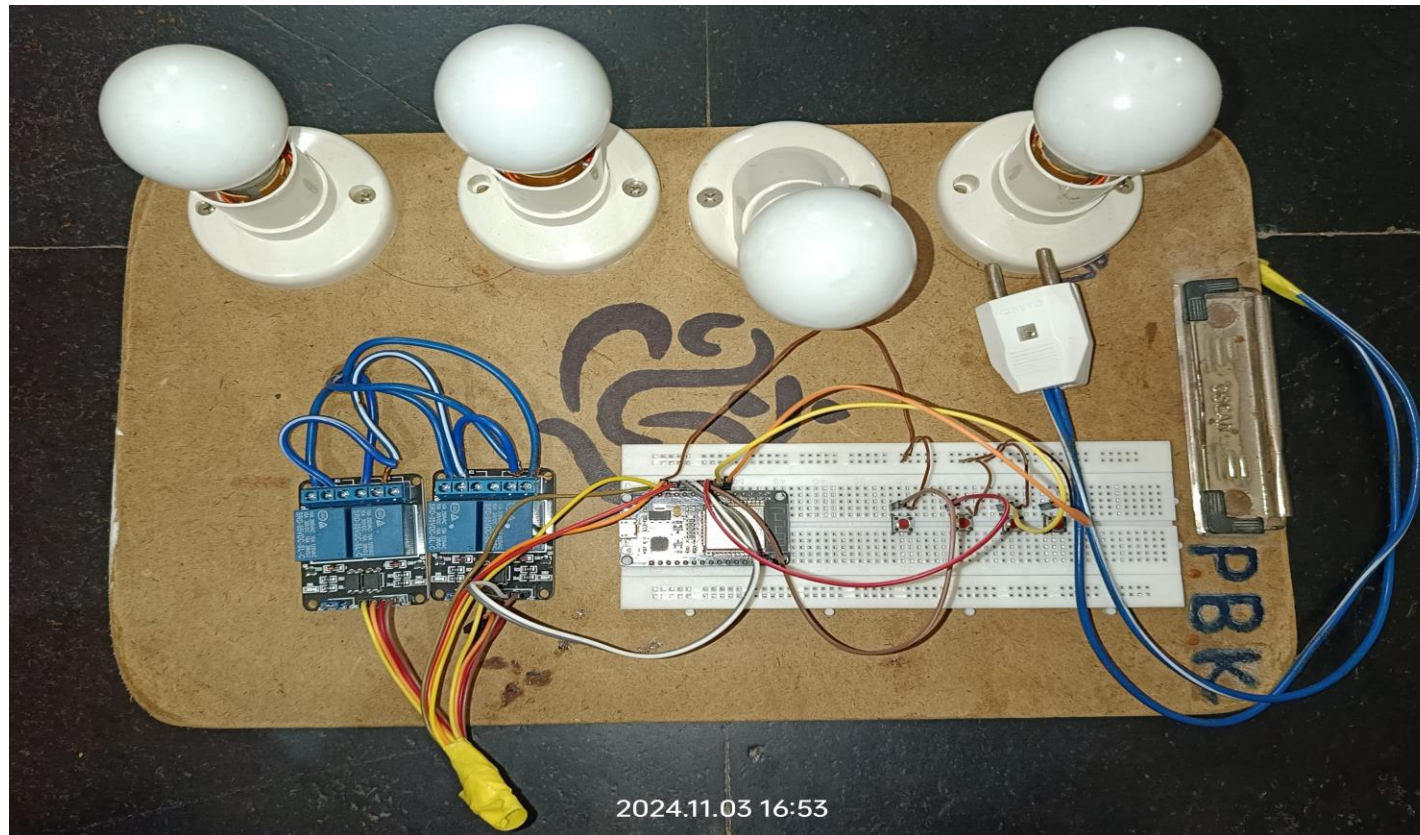
ESP32

ESP32 is a series of low-cost, low-power system-on-chip microcontrollers with integrated Wi-Fi and dual-mode Bluetooth. The ESP32 series employs either a Tensilica Xtensa LX6 microprocessor in both dual-core and single-core variations, an Xtensa LX7 dual-core microprocessor, or a single-core RISC-V microprocessor and includes built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power-management modules.

Relay Module

A relay module is an electronic device that acts as a switch to control high-power devices using low-power signals. It's commonly used in various applications, such as controlling motors, lights, and other appliances.

Brief overview of how it works:

•**Relay**: The core component is an electromagnet that creates a magnetic field when energized, which moves contacts to open or close a circuit.

•**Module**: The relay is mounted on a circuit board with additional components like LEDs, diodes, and resistors for protection and indication.

•**Control Signal**: A low-voltage signal (e.g., from a microcontroller like Arduino) activates the relay, allowing it to switch a higher voltage circuit.

Circuit Diagram

Advantages:

Using an ESP32 to control light bulbs offers several advantages:

Wireless Connectivity: The ESP32 has built-in Wi-Fi and Bluetooth, allowing for easy and flexible wireless control of light bulbs.

Cost-Effective: ESP32 modules are relatively inexpensive, making them a cost-effective solution for home automation projects.

Versatility: The ESP32 can be programmed to control various devices, not just light bulbs, making it a versatile choice for home automation systems.

Ease of Use: With platforms like Blynk, you can create a user-friendly interface on your smartphone to control the lights, without needing extensive programming knowledge.

High Processing Power: The ESP32 is a powerful microcontroller that can handle multiple tasks simultaneously, ensuring smooth operation of your home automation system.

Energy Efficiency: The ESP32's low power consumption makes it ideal for battery-powered or energy-efficient applications.

Applications:

Remote Control: Use your smartphone or voice assistants to turn lights on or off from anywhere.

Presence Simulation: Automate lights to turn on and off at random intervals when you're not home to simulate occupancy and deter potential intruders.

Adaptive Lighting: Adjust lighting based on ambient light levels or time of day to assist those with visual impairments.

Weather-responsive Lighting: Adjust outdoor or indoor lighting based on weather conditions (e.g., increase brightness on cloudy days).

Circadian Lighting: Implement lighting systems that adjust color temperature and intensity to align with natural circadian rhythms, promoting better sleep and overall health.

Alert Systems: Connect to security systems so that lights can flash or change color during an alert situation, providing visual cues for emergencies.

Scheduling: Set up schedules for your lights to turn on or off at specific times, which helps in energy saving and convenience.

Conclusion

The project was aimed at using IoT to control an AC light bulb via a mobile app. We have successfully shown that we can convert the traditional AC light bulb to smart light bulb with ESP32 , Arduino, and the Blynk app.