IoT Based Smart Home Using ESP32 Development Kit

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ABSTRACT:

This project is based on IoT Home Automation System. The aim of the project is to control all home appliances like fan, light, etc., using Mobile, Manual switches, IR Remote and Sensors. Improving technology is for making our lives easier, using smart home system helps our busy life more convenient and simpler. ESP32 is the core of the project which is made for IoT. ESP rainmaker is a cloud that provides free remote application and establish connections with voice assistance and it provides automation based on scheduling.

Keywords: ESP32, ESP-Rainmaker, Smart Home, Home Automation.

INTRODUCTION:

Internet of Things (IoT) describes the network of physical objects "things" that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

A smart home refers to a convenient home setup where appliances and devices can be automatically controlled remotely from anywhere with an internet connection using a mobile.

This Project is about to archive the smart home requirements and give the user most reliable life. The main moto of our project is making the home automation services available with low investment along with efficiency to every person. Even a non-technical person can be able to use these services without any hesitation.

ARCHITECTURE:

The system creates a QR code through serial communication onto the computer (save QR for future use). To connect the system and the mobile phone scan the QR with the ESP-Rainmaker application and provide the Wi-Fi credentials to the system from the mobile. Then the system can be controlled by mobile Application.

It is possible to control these devices using voice assistance like Alexa and Google Home by linking these with Rainmaker.

PIR motion sensor turns ON devices when it detects the humans otherwise it turns OFF the devices. This action can be turned off if it was not necessary.

And also, all the devices can be controlled using manual switches and the IR-remote.

When the state of device changes by Manual switches or PIR sensor or IR-remote, these changes are reflected back to the mobile app.

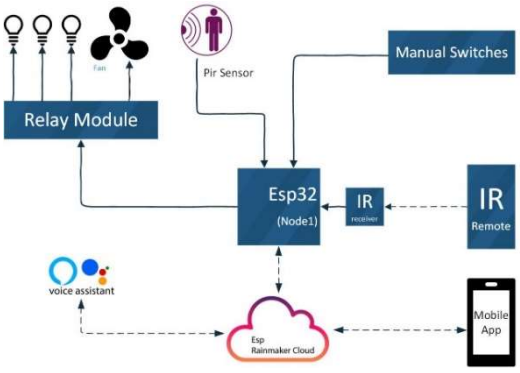

Figure 1: Block Diagram of The System

It can also be possible to reset the system to connect with any other mobile or to change the Wi-Fi credentials of the system. To reset the system, press and hold the system reset button for ten seconds.

HARDWARE:

I. ESP32 development kit.
II. Relay module.
III. TSOP 1738 IR-Receiver.
IV. IR-Remote.
V. PIR Sensor.
VI. Push Buttons.
VII. Required Wires.

REMOTE APP:

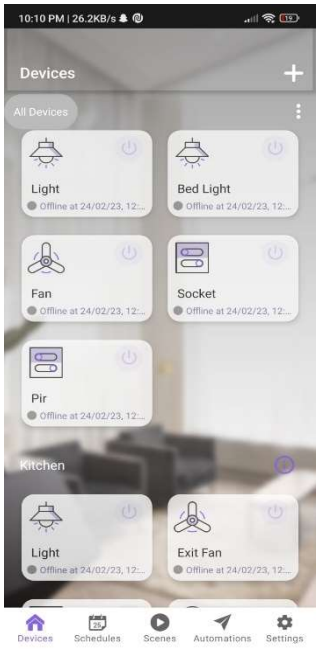

Figure 2: ESP-Rainmaker APP

ESP32 DEVELOPMENT KIT:

ESP32 is a low-cost, low-power System on Chip microcontroller integrated with Wi-Fi and Bluetooth. ESP32 employs Xtensa dual core microprocessor. It was created and developed by Espressif Systems.

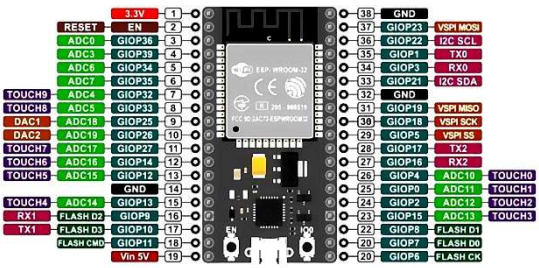

Figure 2: ESP32 DEV KIT

Features:

1. Frequency: 240 MHz
2. Memory: 320 KB RAM
3. Flash Memory: 4 MB
4. Connectivity:
   - Wi-Fi: 802.11 b/g/n
   - Bluetooth: v4.2 BR/EDR / BLE
5. Ultra-low-power management
6. Supply Volage: 3.3v
7. Data Rate: 54 Mbps

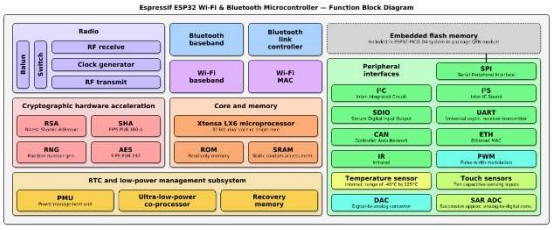

Figure 3: Function Diagram of ESP32

RELAY MOBULE:

A relay module is an electromechanical switch that is activated by electrical signal (logical signal) and a control circuit. Relays are commonly used in automations and control systems. These are come in different sizes and features and can be used for either AC or DC voltages sometimes for both. They are mostly mounted on a PCB and controlled by microcontroller, PLC, or other control devices.

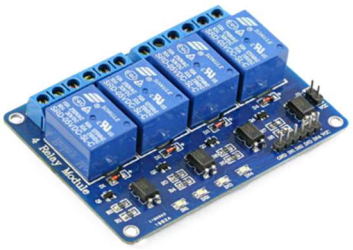

Figure 4: Relay Module

PIR SENSOR:

A Passive Infrared (PIR) Sensor is an electronic device that detects motion by sensing changes in infrared radiation levels emitted by living beings or objects that emit heat. PIR sensors are widely used in home security systems, lighting control systems, and other applications where detection of motion is required.

Figure 5: PIR Sensor

TSOP 1738:

The basic purpose of TSOP is to convert the IR signal to electric signals. Every IR receiver has a special frequency to operate. TSOP operates on 38 K-Hz IR frequency. In case of higher or lower frequency, it may act due to a current leakage or some other errors but it won't fully operate. It uses silicon-based technology, which works at the micro level and very sensitive and efficient to its functions. TSOP may be smaller in size but its usage with microcontroller and microprocessors makes it smart and secure.

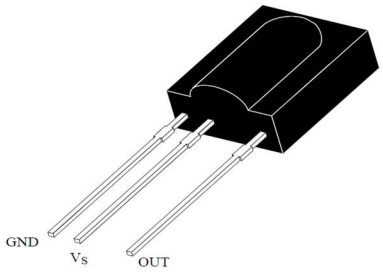

Figure 6: TSOP 1738

CONCLUSION:

The home automation system has been experimentally proven to work well by connecting sample appliances to it and the appliances were successfully controlled from a mobile device. In future this product has a potential demand in marketing and it may see in every house hold.

RESULT:

The devices connected to the system was successfully controlled from anywhere by mobile and controlled locally with manual switches and IR-remote.

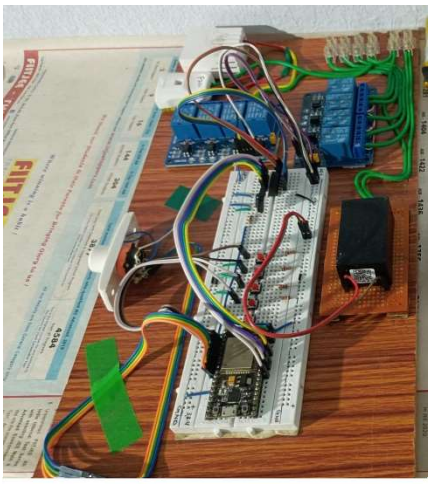

Figure 7: Final Home Automation System

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