Smart Home

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Abstract: *The smart home system is helpful to provide manual and automatic device operations even from remote locations to stay connected with your home. This system is based on the IoT concept. To achieve this system ESP32MC plays an important role. To program ESP32MC we prefer ArduinoIDE to code, compile and burn code into MC. Sinric pro website helps to connect with the sinric pro IOT platform to perform device operations remotely. This system allows you to stay connected with your home by using Google Assistant Smart Things and Amazon Alexa platforms too. The system improves user's flexibility with the feature of real-time feedback on any platform.*

Keywords: ESP32 = MC with inbuilt wifi and Bluetooth module, MC = Microcontroller, IOT=internet of things, ArduinoIDE = Arduino integrated development environment, Relay.

I. INTRODUCTION

In the modern age, we all are surrounded by devices. Careless use of these devices leads to high maintenance cost or sometimes leads to risky issues. With the help of the IoT platform, we are making our home more intelligent, remote controllable and interconnected. Before the 1990s high-speed internet was absent due to this factor our devices weren't interconnected but nowadays we are living in an era where all devices are capable to use of high-speed internet. This factor leads to gather these device data, store data, analyse data and perform the desired task using these data. This is the main concept of the internet of things.

The smart home system is doing the same work for you. This will keep connected your home using ESP32MC which sends data to the IoT platform and by using the IoT platform we can turn on or off our devices as per our need from remote locations. We can also use Artificial intelligent personal assistant i.e. Google Assistant and Amazon Alexa to control our devices from a remote location. This system also provides real-time feedback. In case of an internet issue, we can use these devices manually. According to a survey of Strategy Analytics, 54% of households owning at least one smart home system.

II. LITERATURE SURVEY

2.1 Existing System

Our conventional home uses devices that are not interconnected. Due to this factor, we cant operate them from remote locations. Whenever any family going on a long journey for a few days or weeks then keeping eye on the home is not possible. Even sometimes we forget to turn off our devices, for example, if we forget to turn off our home lights and after living home for a particular work you gets realized that I haven't turned off home lights, so at that time you can't turn off your lights till your not at home. Hence that extra electricity bill you have to pay. That example was only about home lights where you have to pay extra bills but this careless behaviour sometimes leads to device failure issues/devices get damaged, if you forget to turn off your heater, induction stove, microwaves, mobile power banks etc. These devices can lead to a failure due to electrical overheating and the short circuit of the device connections.

In Fig. 1 we can see that due to electrical overheating microwave fuse has blown. we have to replace this fuse for the proper working of a microwave oven.

Figure 1: The microwave fuse has blown due to overheating.

In Fig .2 we can see that due to electrical overheating furnace or heater fuse has blown. In blown fuse electrical connection gets damage.

Figure 2: The furnace or heater fuse has blown.

2.2 Goal

India imports 25% of its energy needs. If we use energy wisely we will save our money because we wouldn't need to import electricity. 0.8 kg of CO_2 released to produce 1 unit of electricity. One tree can absorb 12kg of CO_2 in one year i.e. one tree, in a year can absorb CO_2 produced for generating 15 units only. In Fig. 3 it is the graph of electricity consumption by a person in units(kWh).

Per Capita Electricity Consumption in India (in kWh)

| Year	kWh
2008-09	734
2009-10	779
2010-11	819
2011-12	884
2012-13	914
2013-14	957
2014-15	1010
2015-16	1075
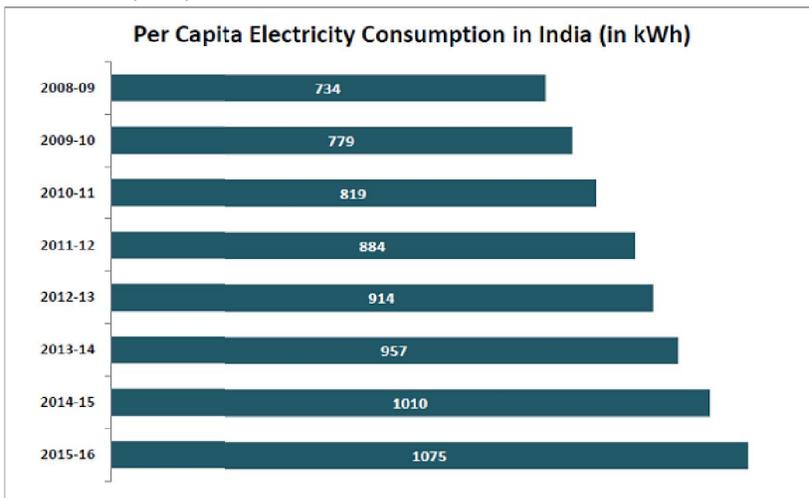
Figure 3: Per capita electricity consumption in India

In Fig 4 it is the graph of a survey of 2014 and 2015 where we can figure out that users are understanding the value of saving energy hence smart home adoption as well as purchase intentions rate increase rapidly in the year 2015 as compared to the year 2014. Our goal is to increase awareness about electricity usage smartly with tons of features and user flexibility.
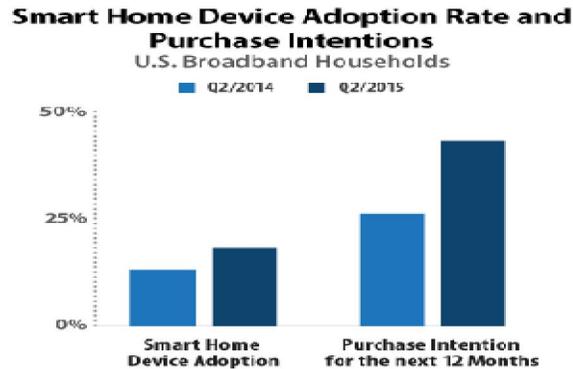
Figure 4

III. PROBLEM STATEMENT

Electricity is playing an important role in the development of the country, if we use this valuable electricity with careless behaviour then we would lose our natural resources to produce electricity i.e coal, natural gas, nuclear energy, petroleum etc. Aware people about electricity usage. Keep connecting people with their homes from remote locations leads to the use of devices automatically and energy efficiently.

IV. IMPLEMENTATION DETAILS

4.1 Hardware Requirements

- ESP32
- Relay module.
- Wifi router.
- Light Bulb.
- Breadboard.
- Connecting wires.

4.2 Software Requirements

- Arduino IDE
- Sinric pro.
- Google Assistant.
- Amazon Alexa.
- Smart things application.
- HTML,CSS,JavaScript
- C,C++

Before moving on to the actual implementation let us get introduced to the hardware that we will be using in this project

A. ESP32

ESP32 is an open-source development board that consists of an ESP32 D0WDQ6 chip. The Board consists of the number of pins for various operations such as input and output pins known as IO pins for connecting various sensors and output devices. The Board has a total of 48 IO pins. Out of which it has 18 ADC pins and 2 DAC pins. It has 3 UART, SPI interface and 2 I2C interfaces. It has 16 PWM output channels. It has 2 I2S interface and 10 Capacitive interface pins.
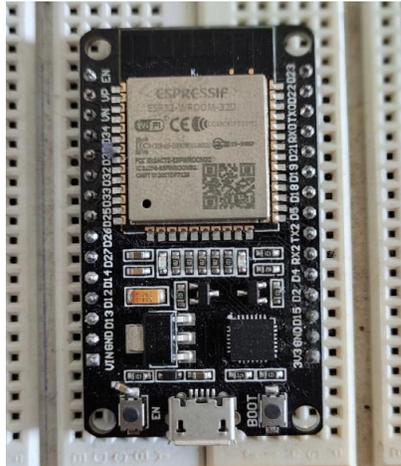
Figure 5: Standard Arduino Uno Board

Figure 6: Relay module

Above Fig 6 shows the relay module, which is a two-channel relay module that is operated as an active low. It is operated on a 5V DC supply. The relay acts as a switch to operate various devices.

Figure 7: 5V 1A power adapter

Above Fig. 7 shows the power adapter, To provide power to the circuit. As we have used a 5V relay module hence we prefer a 5V 1A power adapter. Adapter converts AC to DC supply.

B. Sinric pro

It provides an IoT platform To store device data, analyze data and perform the desired task.
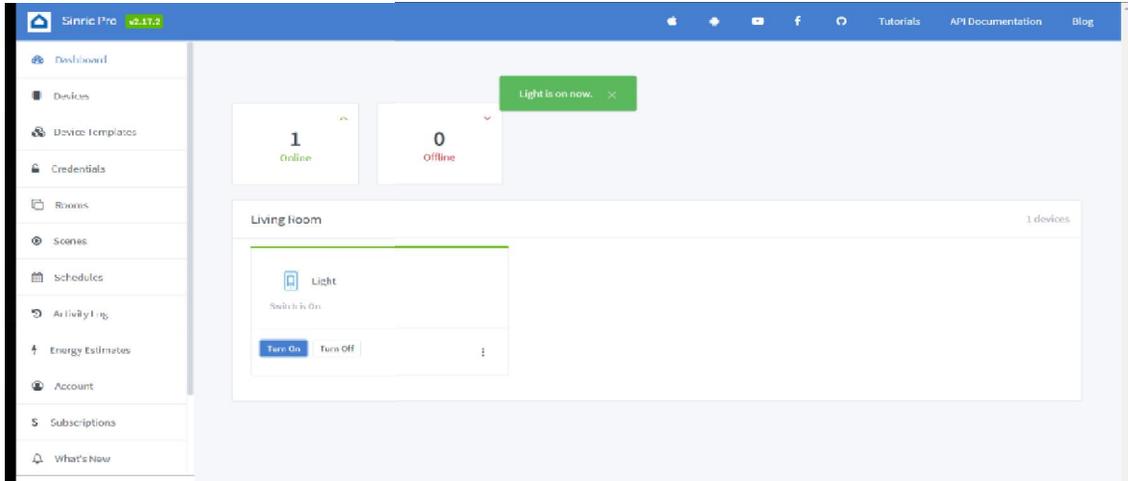
C. Google Assistant

Device operations remotely using Google assistant.
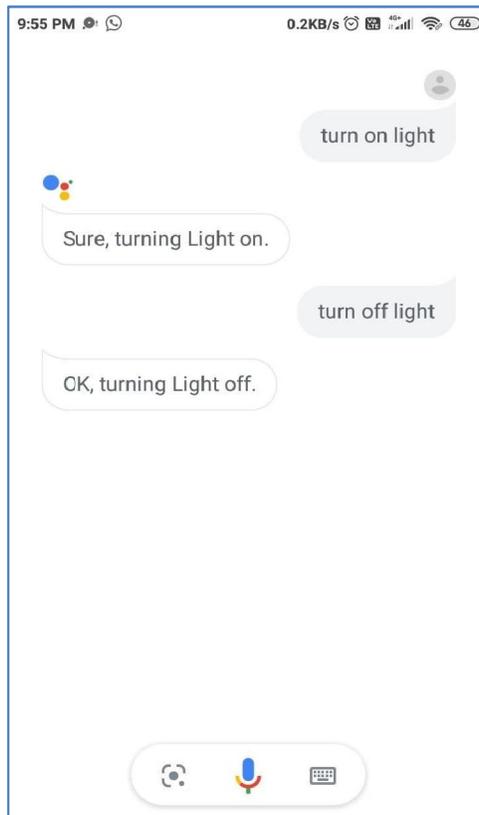
D. Amazon Alexa

Device operations remotely using Amazon Alexa.
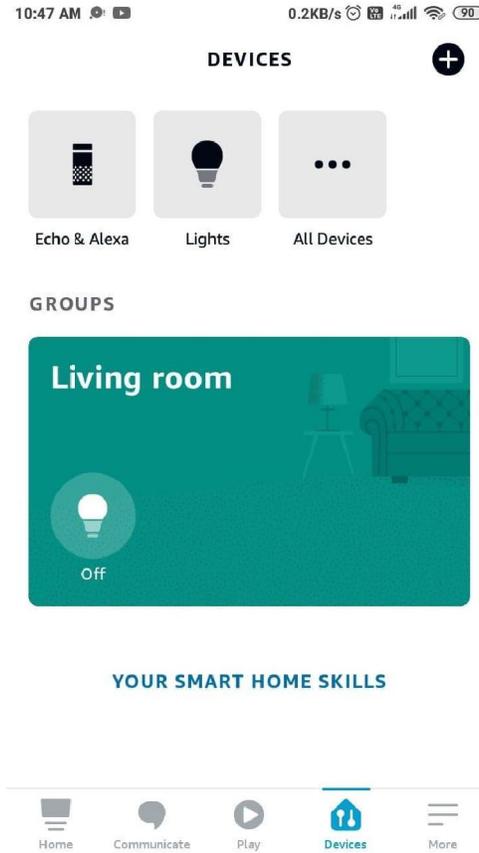
V. ACTUAL IMPLEMENTATION

By considering this block diagram, To convert AC supply to DC supply we use a 5V 1A power adapter which provides DC power to the circuit for the proper working of the circuit to get desired output. If there is an internet issue, We can control this system manually also using switches..
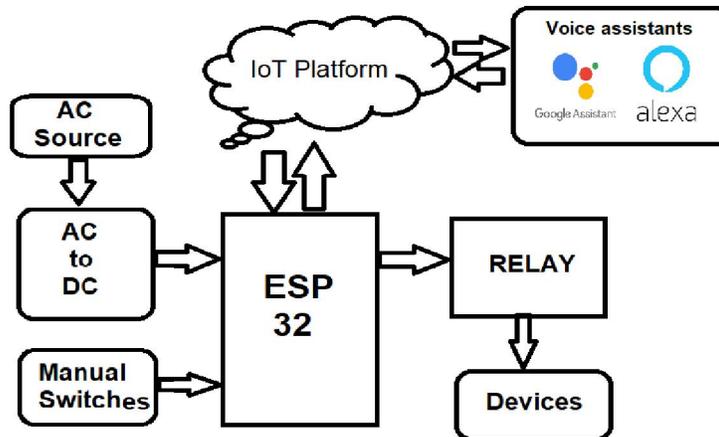
As the system has tons of feature we can control devices using a voice assistant like google assistant, amazon Alexa and smart things application. When we want to control any devices we give a command or manually switch the devices then ESP32 gets that command from the user and sent to the IoT platform in our case which is sinric pro. IoT platform read that device status and again send back a signal to ESP32 and according to that relay will trigger device. Here relay acts as a switch between ESP32 and the home device. This system also provides real-time feedback i.e. when we 'turn on' home device using google assistant or any other provided platform, then this 'device on' status also change to 'device on' on all other platforms too. This feature provides user's flexibility to control home devices from any platform, any location and at any time

5.1 Flowchart
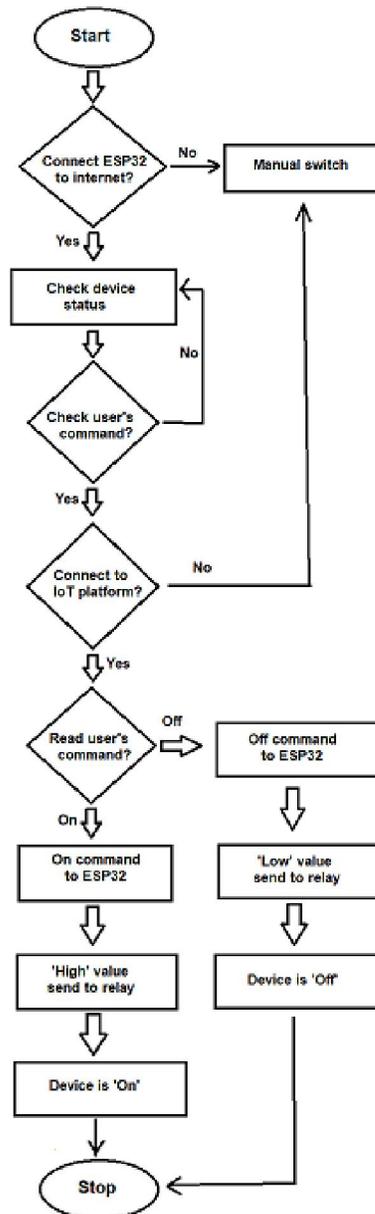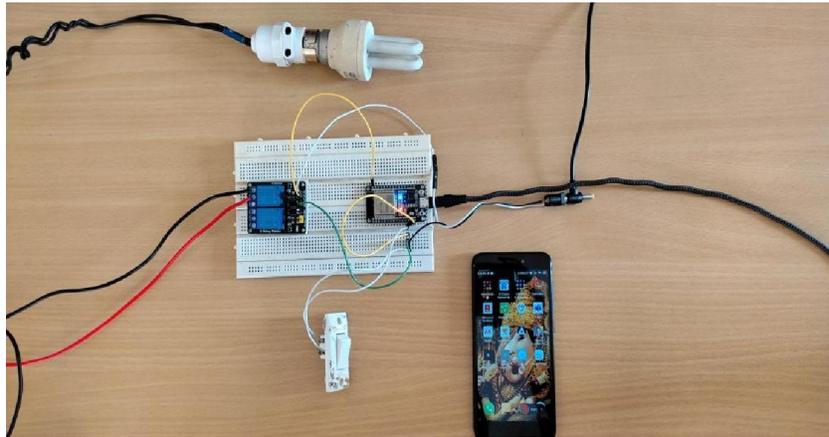
Figure 8: System setup in 'off' state.
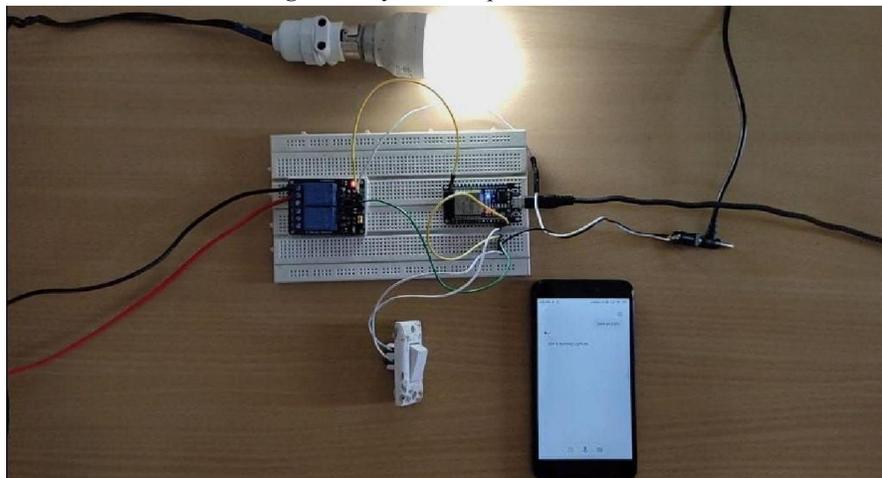
Figure 9: System setup in 'on' state.

VI. ADVANTAGES

- Easy to access i.e. user friendly with a lot of features.
- The controller is efficient as it has a dual-core with BLE and WiFi support.
- The standalone system has a different mode as per need.
- To control appliances you get manual and internet mode.
- Google Assistant/ Amazon Alexa/ smart things support which makes it even smarter.

VII. CONCLUSION

The main purpose of a home automation system is to provide ease to people to control different home appliances with the help of the concept of the internet of things technology. This system is capable of saving electrical energy, time and money. It also helps to keep eye on homes from remote locations. This system provides less physical contact with devices due to the remote operation feature.

REFERENCES

[1] Open Source Home Automation: Introduction to Home Assistant (Hass.io) and ESP32 based Automation.
[2] https://help.ubidots.com/en/articles/1731879-home-automation-with-google-assistant-and-ubidots .

[3] https://www.espressif.com/en/products/socs/esp32

[4] D. Mukherjee, S. Kundu, T. Kar and A. Chakraborty, "Controlling multiple Home appliances through Google assistant and monitoring sensor's data from server," 2019 9th Annual Information Technology, Electromechanical Engineering and Microelectronics Conference (IEMECON), Jaipur, India, 2019, pp. 179-181, doi: 10.1109/IEMECONX.2019.8876977

[5] Y. Yu, "A practical digital door lock for smart home," 2018 IEEE International Conference on Consumer Electronics (ICCE), Las Vegas, NV, USA, 2018, pp. 1-2, doi: 10.1109/ICCE.2018.832