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Multi-Communication Enabled Smart Home Automation Using ESP-32, 3-Generation Echo Dot and Blynk

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ABSTRACT:Ambient intelligence automation is an emerging discipline that brings intelligence to our everyday environments and makes those environments sensitive to us. Ambient intelligence automation (AIA) research builds upon advances in sensors and sensor networks, pervasive computing, and artificial intelligence. Because these contributing fields have experienced tremendous growth in the last few years, AIA research has strengthened and expanded. Because AIA research is maturing, the resulting technologies promise to revolutionize daily human life by making people's surroundings edible and adaptive. This paper is focused on converting a non-smart home to a smart home with multiple communication, compact size, and a cost-effective system that can be used for daily life. In this design, we are controlling the system with 3-Generation eco dote, AWS, Blynk app, and switches. The core hardware part is ESP-32 for this system for enabling the features. With this project, we show that our system works effectively with multi-communication to switch ON and switch OFF our home appliances effortlessly.

KEYWORDS:Multiple communication, Internet of Things, ESP 32, 3-Gen eco dote, AWS,Blynk, home automation.

I.INTRODUCTION

Echo dote is a voice-enabled wireless speaker, it is a product of amazon. This device connects to the voice-controlled intelligent assistant service, which response to the word "Alexa". The device is capable of voice interaction and real-time information. It is also capable of connecting its self with smart devices using itself as a central hub. People think the conversion of a home to a smart home is a status of luxury and having a perspective that it would be expensive but that's not true. The moto of our product is to provide an inexpensive and compact way to convert the basic home into a smart home with small changes which would automatically convert your non-smart devices to smart devices effortlessly. We are using the echo dot as a communicating path with our ESP 32 to control our appliances. The Amazon echo runs on Nodejs program and ESP 32 runs a Python program to communicate with each other and control the appliances. Whenever we want to turn on or turn off our appliances, we ask the amazon Echo with voice command to turn the appliance on or off, the same way we can also control it by app, and in absence of a network, the switches are always a control option.

II.MYTHODOLOGY

This Design of the system has two main parts, software, and hardware. Hardware is design includes esp-32, sensors relays, and software design includes programming which will be uploaded in ESP-32. Here appliances are controlled using relays via the internet and also by manual switching operation. The user is given the option to click on the buttons present on the app interface or send a voice command.
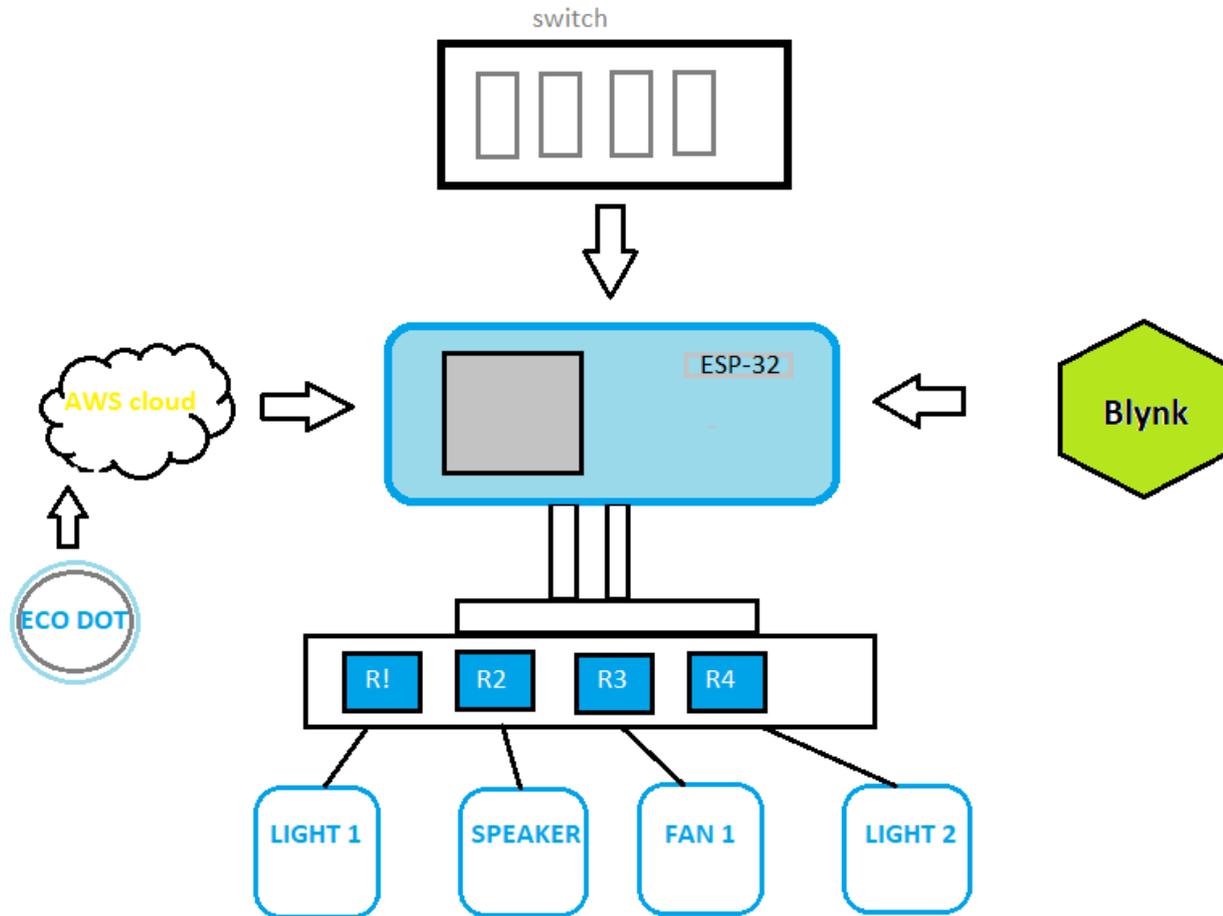
Fig. 1 Block diagram of Multi Communication system

There are 3 ways to control the appliance here, one way is that the user can directly command with voice, in that case, Alexa will catch up the voice from the user and pass on the information to esp-32 and after that, the micro-controller will give a pulse to relay module that will turn ON or OFF the light and the 3rd way is that the user can use the Blynk app from phone to control appliance. the command will reflect on esp-32 and from there it will pass on the information to esp-32 and after that, the micro-controller will give a pulse to the relay module that will turn ON or OFF the light.

III.SYSTEM MODEL AND ASSUMPTIONS

i.Module

The full System is core part is Wi-Fi module ESP32 and Alexa. Main controlling is done by the ESP-32 (ESP-wroom-32) only, where all the communication controlling is being done with the Wi-Fi module ESP32. ESP32 module direct communicates with the private server and passes on the pules command from the Alexa or Blynk app to relays. Fig.1 shows the architecture model of the proposed system. Here, we just used four loads as a prototype. But, in future systems, multiple numbers of loads of home appliances can be connected with this system as per user requirements.
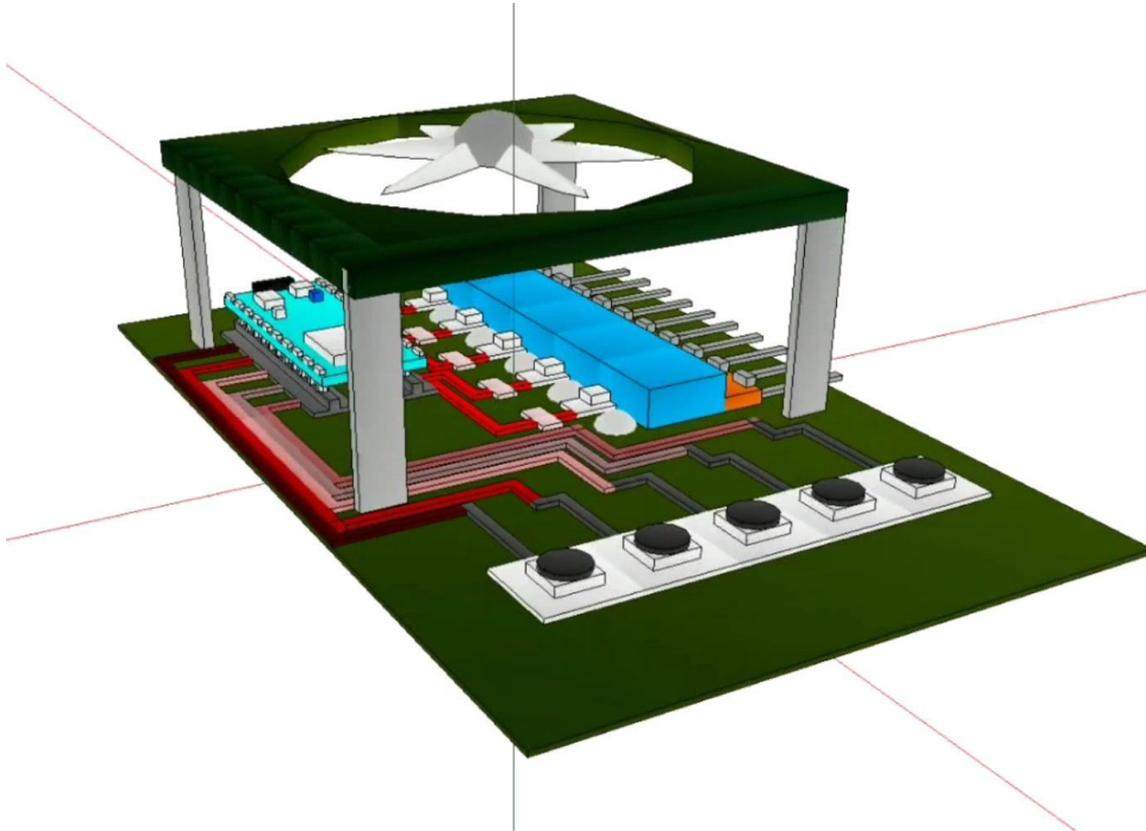
Fig. 2 Design planfor home automation system

ii.Relay Module

As we know relays are so far known as electrically operated switches. The basic working principle is it can be turned on or off based on letting current go through or not. By this, it can turn any load ON or off. This on and off is controlled by the esp32. We have used here 5V one channel four relay modules. When any changes are made in the server the data is processed by ESP32, then ESP will give a pulse to the relay module channel which will turn on or off the load.

If the ESP-32 module is connected with the Wi-Fi then you can control the home appliances from Amazon Alexa App and also from the manual switches. You can control, monitor the real-time status of the relays in the Alexa App from any corner. You don't need an eco-dot device for this home automation project for long distance.

iii.ESP-WROOM-32

ESP-WROOM-32 is a powerful, Wi-Fi and BT module that targets a wide variety of applications, ranging from low power sensor network to the most high-endtasks.

The chip embedded is designed to be adaptive. There are two CPU cores that can be controlled one by one, and the CPU clock frequency is versatile to change from 80 MHz to 240 MHz's

The user can also power off the CPU and make use of the low power co-processor to constantly watch the peripherals for changes of thresholds. ESP32 integrates a high set of peripherals, ranging from capacitive touch sensors, Hall sensors, Ethernet.

iv.Alexa Eco

Amazon Alexa is a virtual assistant AI technology launched by Amazon; it is a voice-enabled wireless speaker. This device connects to the voice-controlled intelligent assistant service, which response when we call up the word "Alexa". The device is capable of voice interaction and capable of sharing real-time information. It is also capable of connecting its self with smart devices using itself as a central hub.

v.Blynk

Blynk was developed for IoT projects, it can control IoT system hardware remotely, it can share real-time information and store data example sensor data. Blynk is a Platform with IOS and Android apps to control Arduino, Raspberry Pi, and the likes over the Internet. It's a digital dashboard, on which you can build a graphic associate for your project by simply dragging or dropping buttons. The major components in the platform are Blynk App, Blynk Server, Blynk Libraries. the major components in the platform are Blynk App, Blynk Server, Blynk Libraries.

It's open-source, could easily handle thousands of devices, and can even be launched on a Raspberry Pi.

Blynk Libraries - for all the popular hardware platforms (like Arduino ide which we will be using for programming esp32) - enables communication with the server and process all the incoming and outcoming commands

IV. RESULT AND DISCUSSION

The proposed system of using Voice commands to control household appliances was successfully developed. The application is connected to the same IP as the ESP32 so that it can be controlled using any device that is connected to a network. No unwanted traffic can enter as the application is protected with the password on your phone and your Wi-Fi. The developed system helps us in achieving our goal of home automation since it was successful in controlling the appliances using either the application on your smart device or through voice commands. The appliances were also be able to be controlled automatically through the different timing set with Alexa.
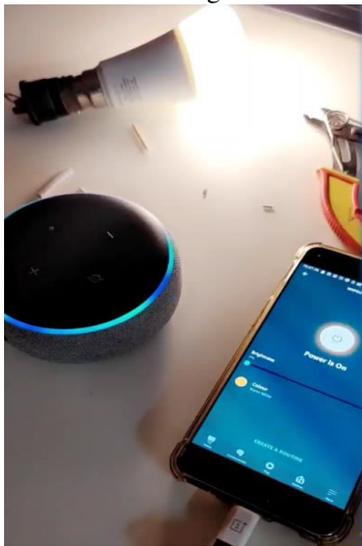

Fig. 3 Photo taken after successful test of Alexa controlling light.

The controlling of appliance with the Blynk application was successfully developed and the appliance was turning ON and OFF according to user's use as showen in Fig. 3 and Fig. 4.
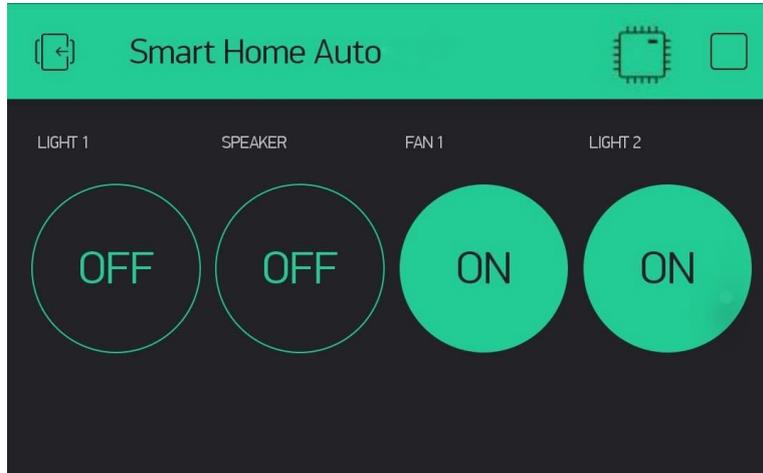
Fig. 4 Screen of Blynk application showing two relays on and two relays off.
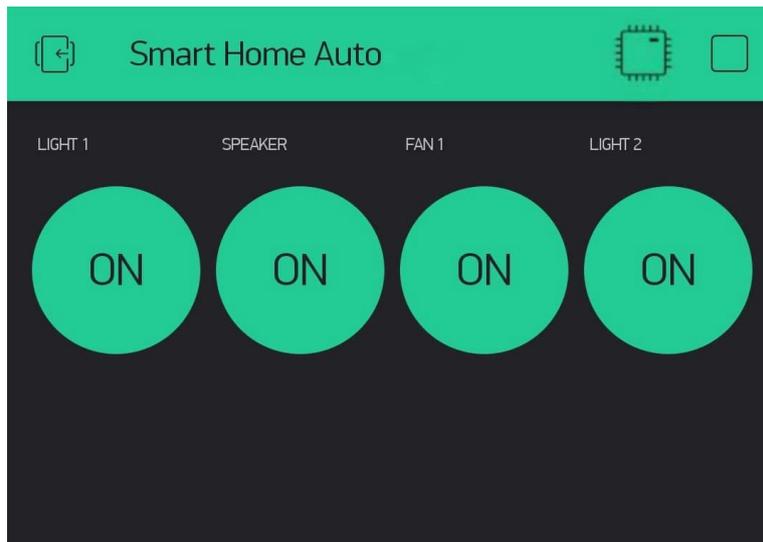

Fig. 5 Screen of Blynk application showing all relays ON

V. CONCLUSION

This system can further be upgraded by using sensors and different home appliances. Since smart appliances are widely used nowadays, this system can be used for benefiting the lifestyle of people.
The cost of the system is also in reach. Many advantages can be added like automatic turn off and sending emergency notification can be extended to devices like motors, geyser, and air conditioners. Mobile
application development companies with dedicated teams are working extensively on IOT based applications that are connected to the cloud. Not only old aged or physically challenged people can be benefitted using this, but any person with a smart phone can keep a watch and control the appliances without much difficulty. In future the adoption rate of this system is likely to increase for IOT based solutions that will automate life style, business operations and end to end process.

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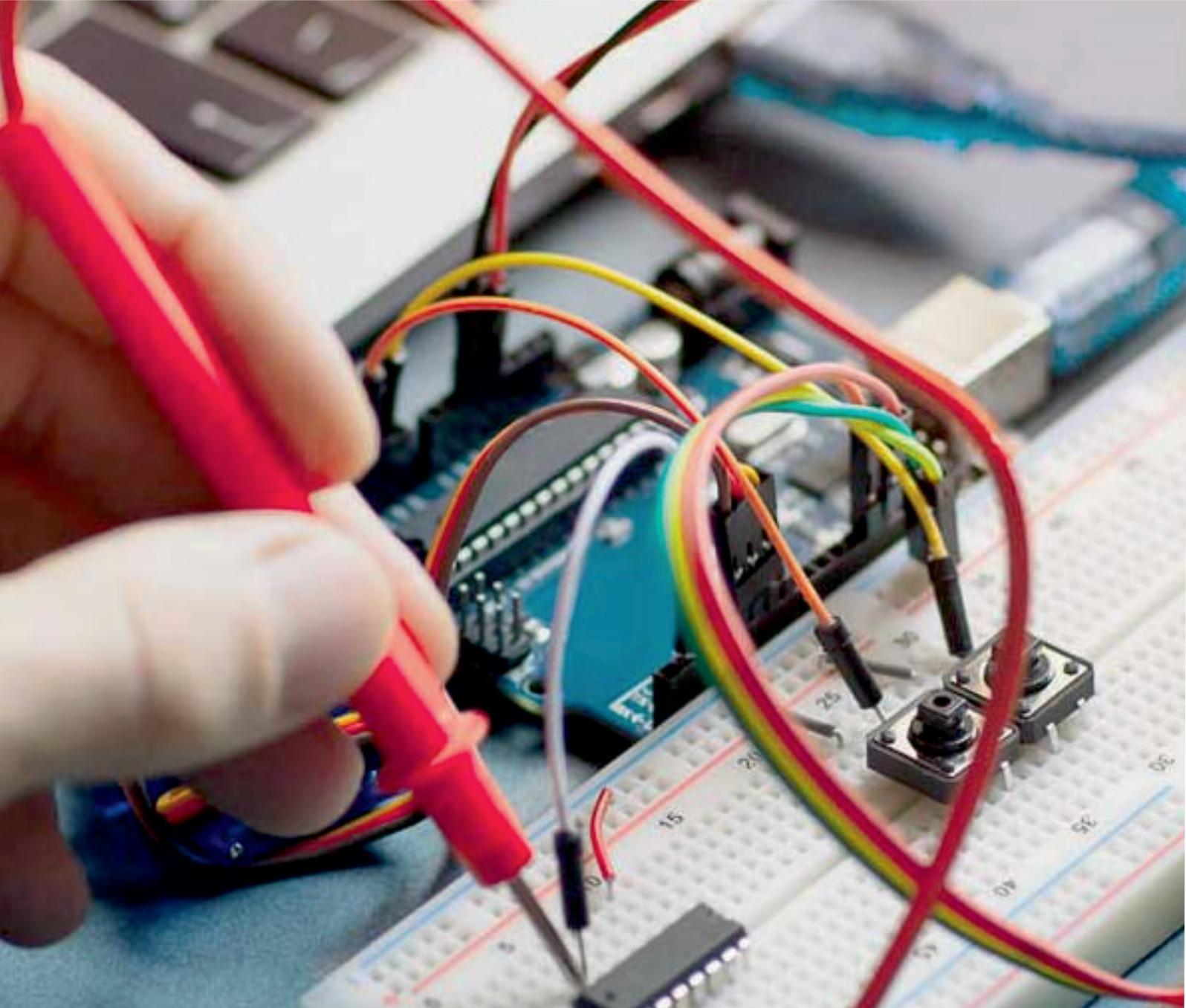
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