Controlling Appliances Through Google Assistant Using NODE MCU

Harini Haridasyam
M. Tech, Wireless and Mobile Communications
G. Narayanamma Institute of Technology & Science
Hyderabad, India

Dr. K. Rama Linga Reddy
HOD, ETM department
G. Narayanamma Institute of Technology & Science
Hyderabad, India

***Abstract* – This paper proposes a design of home automation using Google Assistant and Node MCU. The main objective of the proposed design is to reduce the cost and to provide an efficient home automation system. There are many home automation systems using GSM, web page based system, hand gesture based systems. ZigBee, Google Home, Alexa, Amazon Echo are some devices in market. But the cost of the proposed system is very less than these systems. Google Assistant and Node MCU (ESP8266) are the prime components in this design. The protocol used is MQTT (Message Queueing and Telemetry Transport). IFTTT (If This Then That) application and Adafruit MQTT applications are used to implement the system.**

Index Terms – Home Automation, Google Assistant, Node MCU, MQTT, IFTTT, Adafruit MQTT.

I. INTRODUCTION

Home automation gives you access to control devices in our home from a mobile device anywhere in the world. It is a part of "Internet of Things". The path how devices and appliances can be networked together to provide a seamless control over all aspects of our home and more. Home automation has been around for many decades in terms of controlling simple appliances. Recent technology depicts the idea of the interconnected world at the touch of our fingertips or a simple voice command to Siri, Alexa and Cortana. With home automation we can decide how a device should respond, when it should respond and why it should respond.

All the things will become easier and helpful if a voice command can change the environment around us. The voice commands are given to Google Assistant which indeed transfers these commands to the Node MCU [1] to which our devices and appliances are connected. In this system Node MCU, Google assistant [2], IFTTT application [3], Adafruit MQTT application [4], Relay board and driver and LED bulbs are used.

A. NODE MCU

Node MCU (Node Micro Controller Unit) is an open-source, interactive, programmable, low cost, simple, smart, Wi-Fi enabled Arduino like hardware IO. It is an advanced API for hardware IO, which can dramatically reduce the redundant work for configuring and manipulating hardware. It is coded like Arduino, but interactively in Lua script. It is an event driven API for networking applications, which helps developers to write code running on a 5mm*5mm sized MCU in Nodejs style. It greatly speeds up the IOT application developing process. It is less than $2 Wi-Fi MCU ESP8266 integrated and easy to prototyping development kit.

Node MCU has powerful processor than the Arduino's Atmega328, the flash memory is 4Mb and it has much more RAM. It is very similar to UNO and has additional features.. It has less GPIO, ADC and PWM options than the Arduino UNO, but it supports serial communication protocols. Node MCU is not as powerful as the Raspberry Pi, since the Pi is an actual computer and the Node MCU is just an embedded microprocessor system on chip. The best advantage that it has over a Raspberry Pi is the price, allowing it to be a perfect choice for specific IOT applications.

Figure 1: Node MCU

B. RELAYS

Relays are switches that open and close circuits. Relays can control one electrical circuit by opening and closing contacts in another circuit. Relay operates in only two modes, they are NO and NC. When the relay is not powered then if it is in normally open (NO) mode then the relay contacts are open and if the relay is in normally closed (NC) mode then the relay contacts are closed. By applying electrical current in both the modes the state of relay can be changed. Most widely used relay modules are 5v/12v. Using relays is safer as there is no any physical contact between Node MCU and the devices connected.

C. RELAY DRIVER

ULN 2803 is the relay driver used which is a high voltage and high current Darlington array IC. These ICs are used while driving a wide range of loads and are used as relay drivers and display drivers, line drivers etc.

D. GOOGLE ASSISTANT

Google Assistant is a virtual assistant developed by google which is an artificial intelligence based product it is a mobile application which can be incorporated into smart home devices. The Assistant can engage in two way communication which is the main difference between its previous version Google Now.

Google Assistant which is the advanced version of Google Now has the ability to search the internet, it helps in scheduling events and alarms, it is used to adjust hardware settings on the user's device, and display information from the user's account. The assistant works on the natural language processing algorithm. The special feature of assistant is that it will support a keyboard for typed input and visual responses, support identifying objects and gather visual information through the devices's camera, and support purchasing products and sending money.

E. ADAFRUIT MQTT

Adafruit IO is a cloud service which displays the real-time, online data. It makes our project internet connected-control motors, read sensor data. It connect projects to web services like Twitter, RSS feeds, weather services, etc. it also connects project to internet enabled devices. Dashboards are a feature integrated into Adafruit IO which allows us to chart, graph, gauge, log, and display data. We can view our dashboards from anywhere in the world. Use Triggers in Adafruit IO to control and react to the data. We can configure triggers to mail us when our system goes offline, react to a temperature sensor getting too hot, and publish a message to a new feed.

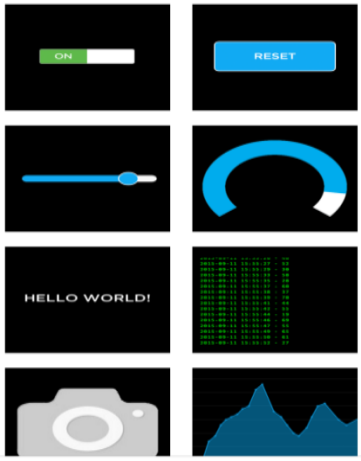


Figure 2: Feeds in Adafruit IO

F. IFTTT APPLICATION

IFTTT stands for If This Then That, which is a web based service used to createapplets. An applet is a conditional statement which triggered only when there are changes which occured within other web services such as Gmail, Facebook, Telegram, Instagram, or Pinterest. For example, an applet may send an e-mail message if the user tweets using a hashtag, or copy a photo on facebook to a user's archieve if someone tags a user in a photo. In addition to the web based application, this runs on iOS and Android.

Figure 3: IFTTT

The "This" part in IFTTT of an applet is the trigger which triggers the action. For example, we can receive a notification based on the keyword received via RSS feed.

The "That" part in IFTTT of an applet indicates the Actions. Triggers are the inputs where the outputs are the respective Actions. Applets are the predicates made from Triggers and Actions. For example, when we like a picture on Instagram which is the trigger, the IFTTT app is able to send the photo to our Dropbox account, which is the respective action. IFTTT has ability to automate web application tasks, such as posting the same data on several social networks. Marketing professionals can use IFTTT to track information of companies in RSS feeds. IFTTT is also used in home automation, for example switching on a light when detecting motion in a room.

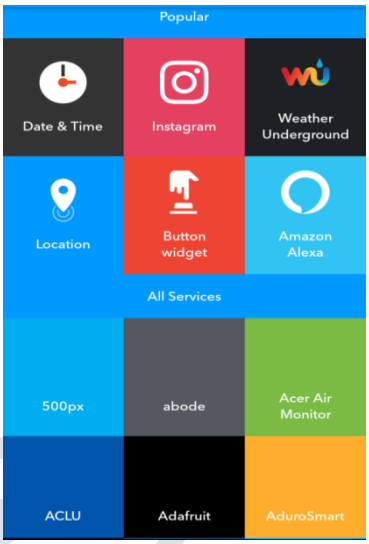


Figure 4: Applets

II. SYSTEM DESIGN AND IMPLEMENTATION

A. BLOCK DIAGRAM

The block diagram of the proposed system consists of different blocks such as, Node MCU, Power supply, Relays, Relay driver. The diagram consists of hardware components only.

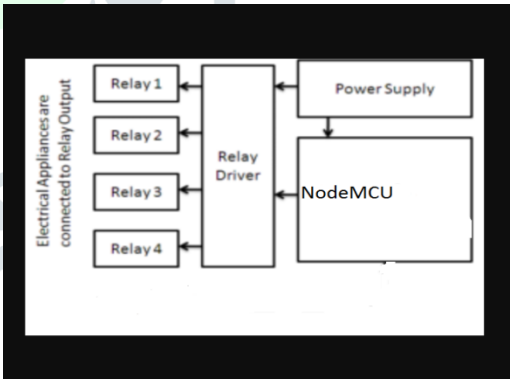


Figure 5: Block Diagram

The whole setup works on the MQTT principle and the IFTTT application which integrates the applets.

B. MQTT PROTOCOL

MQTT is the light weight protocol which is widely used in IOT projects. It is a messaging protocol that uses publish and subscribe operations to exchange data between clients and the broker. Furthermore, its small size, low power usage, minimized data packets and ease of implementation make the protocol ideal of the "machine-to-machine" or "internet of things" world.

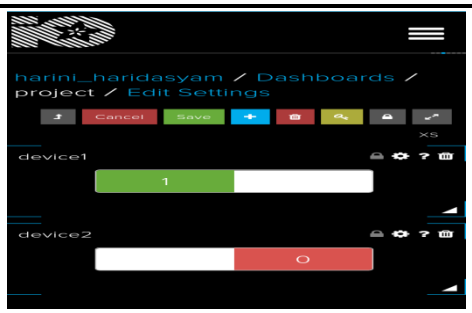


Figure 6: Final Feeds

MQTT server is also known as a broker and the clients are the connected devices. When a device (a client) wants to send data the broker, this operation is called "publish". When a device (a client) wants to receive data from the broker, this operation is called "subscribe".

Here the MQTT broker used is Adafruit MQTT. In this Adafruit IO the feeds are created by first creating an account in the website. Every user is given a Auth code which is unique code. The Auth key is called AIO key and we can regenerate it. Firstly, we need to create the block which may contain slider or a trigger and name it. The block is assigned with ON and OFF values and a test value. We can change the name or any other settings of the block in edit option.

C. IFTTT

We need to create triggers in IFTTT application. In IFTTT, the two applets which interacts to each other are Google Assistant and Adafruit MQTT. First search for the google assistant applet and then create a trigger by mentioning a phrase or sentence or mobile number etc. This is a step by step process which follows:

1. In IFTTT we have two parts "THIS" part and "THAT" part.
2. In "THIS" part the conditions are given to Google Assistant and Select the service name as Google Assistant.
3. Give the details of Google Assistant.

Figure 7: THIS part of IFTTT

4. After giving the commands for Google Assistant create the trigger by completing the "THIS" part.
5. In "THAT" part of IFTTT we need to give the commands for Adafruit MQTT.
6. Now select the required feed to which the data is to be sent and send the data.

Figure 8: THAT part of IFTTT

7. After creating action once review the trigger created, the data sent to the respective feed and then complete the applet creation by clicking the finish button.
8. Thus completes the creation of feeds and sending data to feeds.

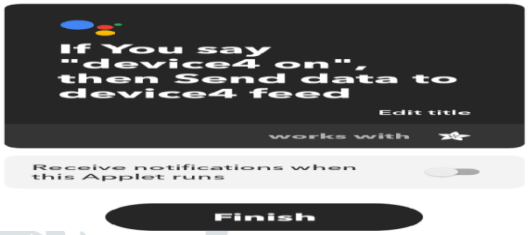


Figure 9: After the creation of Applet

D. FLOWCHART

Initially when we give commands through google assistant, the commands from google assistant are passed to Adafruit MQTT broker to publish data to the devices which are subscribed to the particular data with the help of IFTTT application. We can also check the status of the feed in Adafruit account we have created.

The flowchart given is for signal passing from Google Assistant to MQTT server. The steps followed are

1. Initialise the system bye powering the hardware.
2. Open Google Assistant check if it is active or not. And give the command to Assistant.
3. If the given command matches with the command given in IFTTT then the data will be published to the particular feed.

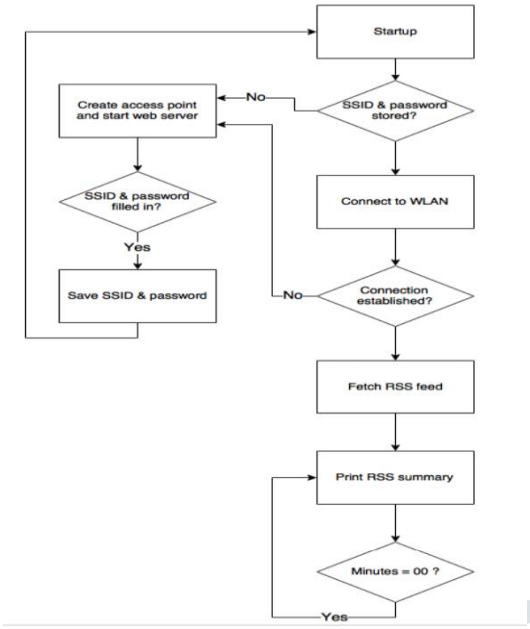


Figure 10: Flowchart

4. The respective action occurs i.e., the load will be turned ON or OFF.
5. This process runs until the power is supplied to the system.
6. If any break in power supply occurs then the entire system is stops working.

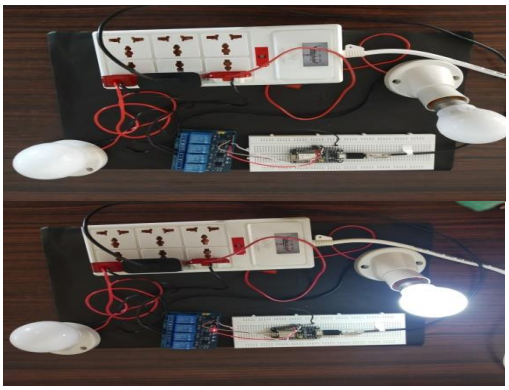
The Node MCU interacts with the MQTT broker. The procedure is given as

1. Verify whether the SSID and Password are stored in the memory, if stored then check for the establishment of connection.
2. If the connection is established then fetch the value of the feed and print the value.
3. If the connection is not established then again store SSID and Password and check for the connection establishment.
4. Continue this process until the connection is established and the feed value is fetched.

The whole process is written as a code for Node MCU using Arduino IDE. The code is written for MQTT client and broker, so we need to install the MQTT library.

III. RESULTS

The results of the prototype of this project are positive and the system responded well with the voice commands. The pictures given are the results of the proposed system.



IV. CONCLUSION

This system is highly reliable and efficient for the aged people and differently abled person on a wheel chair who cannot reach the switch for the switching ON/OFF the device and are dependent on others. The cost of the proposed system is reduced to one fourth of the total cost of the other devices like Alexa, Google Home etc., which will help people to automate their homes easily.

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