



**MGM's COLLEGE OF ENGINEERING AND
TECHNOLOGY KAMOTHE, NAVI MUMBAI.**

**PROJECT REPORT ON
GOOGLE ASSISTANT AND WIRELESS CONTROLLED
HOME AUTOMATION**

**UNDER THE
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CERTIFICATE

This is to certify that the sensor lab project entitled “**Google Assistant and Wireless controlled Home Automation**” is a bonafide work of) Suryawanshi Rohit Vijay (117IT1010A), Sonawale Dhiraj Dattatray (117IT1221A), Rane Tanmay Sandeep (117IT1519A) submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of “Undergraduate” in “Information Technology”.

Internal Examiner

External Examiner

HOD

DECLARATION

We declare that this project report entitled “**Google Assistant and Wireless controlled Home Automation**” represents our ideas in our own words and where others ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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ABSTRACT

We saw many home automation technologies introduced over these years from Zigbee automation to Amazon Echo, Google Home and Home from Apple. It has become a craze these days. Google Home price is around 150\$ (USD) with an additional cost of the devices to be connected to, the total cost of the system reaches over 250\$ (USD). Apple Home Kit too is pretty more expensive, over 100\$ (USD) more than the Google Home just for a basic setup. Philips Hue, a smart light which is controlled by the Google Assistant, Amazon Echo and Siri, voice assistant by Apple is priced around 145\$ (USD). Similarly, Belikin's Wemo light is priced around 44\$ (USD) per unit and this can be controlled both by Siri and Google Assistant. So, overall we can see here that to make our home smart we need to invest quite a lot, let's say some 250\$ (USD) for a basic setup. What if we can automate our house within (cost of the Smartphone is not included as it is assumed to be owned by every individual these days) 10\$ (USD) and can control up to 8 appliances using Google Assistant? Well, this paper describes the implementation of such a system. The system is implemented using ordinary household appliances. Natural language voice commands are given to the Google Assistant and with the help of IFTTT (If This Then That) application and the Blynk application the commands are decoded and then sent to the microcontroller, the microcontroller in turn controls the relays connected to it as required, turning the device connected to the respective relay On or OFF as per the users request to the Google Assistant. The microcontroller used is NodeMCU (ESP8266) and the communication between the microcontroller and the application is established via Wi-Fi (Internet).

Key Words: Home Automation, NodeMCU (ESP8266), IFTTT (If This Than That) Application, Blynk Application, Internet of Things (IoT), Google Assistant, Voice Control, Smartphone

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CHAPTER 1

1.1 INTRODUCTION

Home, it is the place where one fancies or desires to be after a long tiring day. People come home exhausted after a long hardworking day. Some are way too tired that they find it hard to move once they land on their couch, sofa or bed. So any small device/technology that would help them switch their lights on or off, or play their favorite music etc. on a go with their voice with the aid of their smart phones would make their home more comfortable.

Moreover, it would be better if everything such as warming bath water and adjusting the room temperature were already done before they reach their home just by giving a voice command. So, when people would arrive home, they would find the room temperature, the bath water adjusted to their suitable preferences, and they could relax right away and feel cozier and rather, feel more homely.

Human assistants like housekeepers were a way for millionaires to keep up their homes in the past. Even now when technology is handy enough only the well to do people of the society are blessed with these new smart home devices, as these devices costs are a bit high. However, not everyone is wealthy enough to be able to afford a human assistant, or some smart home kit. Hence, the need for finding an inexpensive and smart assistant for normal families keeps growing.

This paper proposes such inexpensive system. It uses the Google Assistant, the IFTTT [1] application, the Blynk [2] application and the NodeMCU [3] microcontroller as the major components along with a relay board comprising of 4/8 relays along with ULN 2803 IC. Natural language voice is used to give commands to the Google Assistant [4]. All of the components are connected over the internet using Wi-Fi which puts this system under the IoT [5].

1.2 NEED FOR HOME AUTOMATION

The benefits of home automation typically fall into a few categories, including savings, safety, convenience, and control. Additionally, some consumers purchase home automation for comfort and peace of mind.

Here's a closer look at some of the biggest benefits that home automation provides.

- **Savings:** [Smart thermostats](#) and smart lightbulbs save energy, cutting utility costs over time. Some home automation technologies monitor water usage, too, helping to prevent exorbitant water bills. Certain devices even offer rebates.
- **Safety:** Many home automation technologies fall under the umbrella of [home security](#). Consumers purchase these devices because they want to make their homes safer and more secure. Automated lighting thwarts would-be burglars, and [motion sensors](#) help people enter doors and walk hallways late at night Security cameras offer benefits through either remote monitoring of package deliveries or real-time video of home inhabitants or unwanted visitors.
- **Convenience:** Because home automation technology performs rote tasks automatically, end users experience great convenience. Lots of smart gadgets are compatible with one another, and you can set different triggers between devices to

automate regular home processes. For instance, you could set your [smart locks](#) to turn on your smart lighting when you unlock the front door.

- **Control:** Consumers also choose smart home devices to better control functions within the home. With home automation technology, you can know what's happening inside your home at all times.
- **Comfort:** Some people use smart technology to record shows or to play music throughout the home. Connected devices can also help create a comfortable atmosphere—they provide intelligent and adaptive lighting, sound, and temperature, which can all help create an inviting environment.
- **Peace of Mind:** Finally, many consumers invest in home automation technology for peace of mind. A new mom or dad can check on their little one thanks to smart cameras and other technologies. Or, if you can't remember whether you closed the garage after you left, you can verify remotely with an app.

1.3 PROBLEM STATEMENT

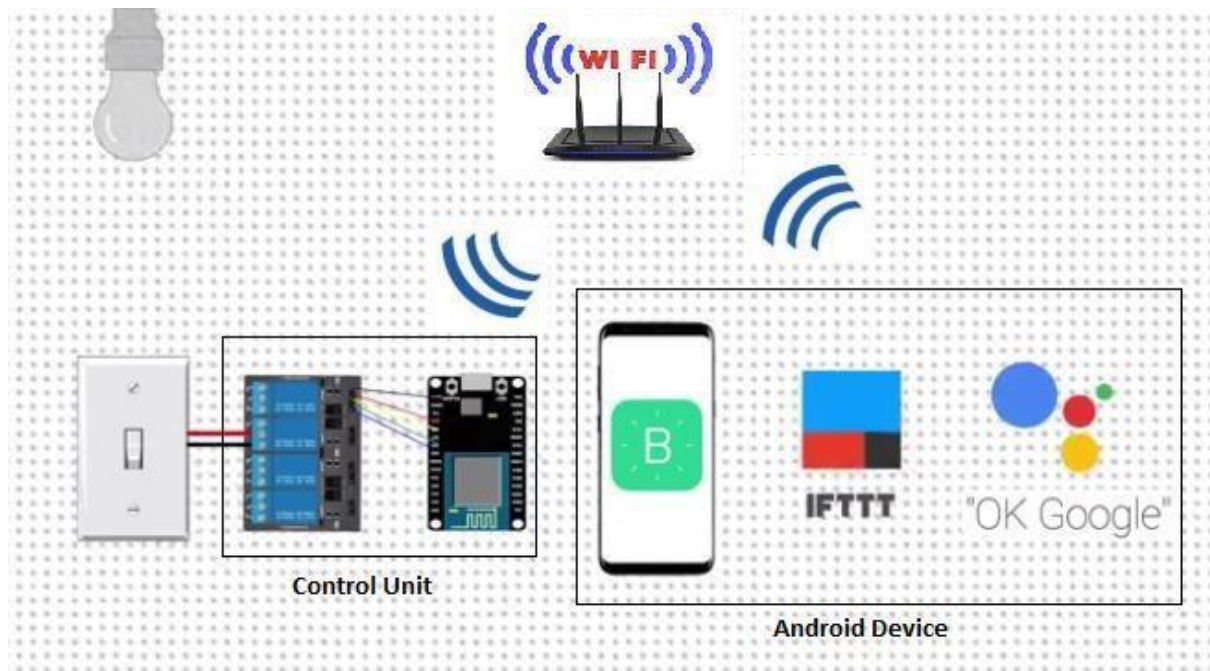
Ever thought of a life where you could just command your home appliances to work as you need just by using your voice? Gone are the days where you have to be a billionaire like Tony Stark to have an automated house which is voice activated. In this project are going our electronic appliances like T.V, fans, lights etc over the internet with our voice and that to under a budget of \$20.

1.4 Problem Solving Approach

The system design is broken down into two main categories,

- i. The hardware- It has the capability to connect to the router. It would also be able to turn on/off specified devices, such as lights and fans. It is called the 'Control Unit'. And,
- ii. The Software- The Blynk app, the IFTTT app and the Google Assistant constitute the software of the design and these applications would be integrated in the Android device.

The Control Unit comprises of the microcontroller- NodeMCU and the 4/8 Channel Relay board. Relay board uses ULN 2803 IC to control the relays. The Blynk app on an Android device communicates with the microcontroller and sends the desired signal via the internet. Figure 1 below shows the basic system design architecture The hardware also called the Control Unit comprises of the NodeMCU microcontroller and the Realy board. NodeMCU's digital output pins are connected to the Relay pins of the Relay board. Finally, each Relay is connected to an appliance. In the fig- 1 above the second relay is connected to a bulb.



CHAPTER 2

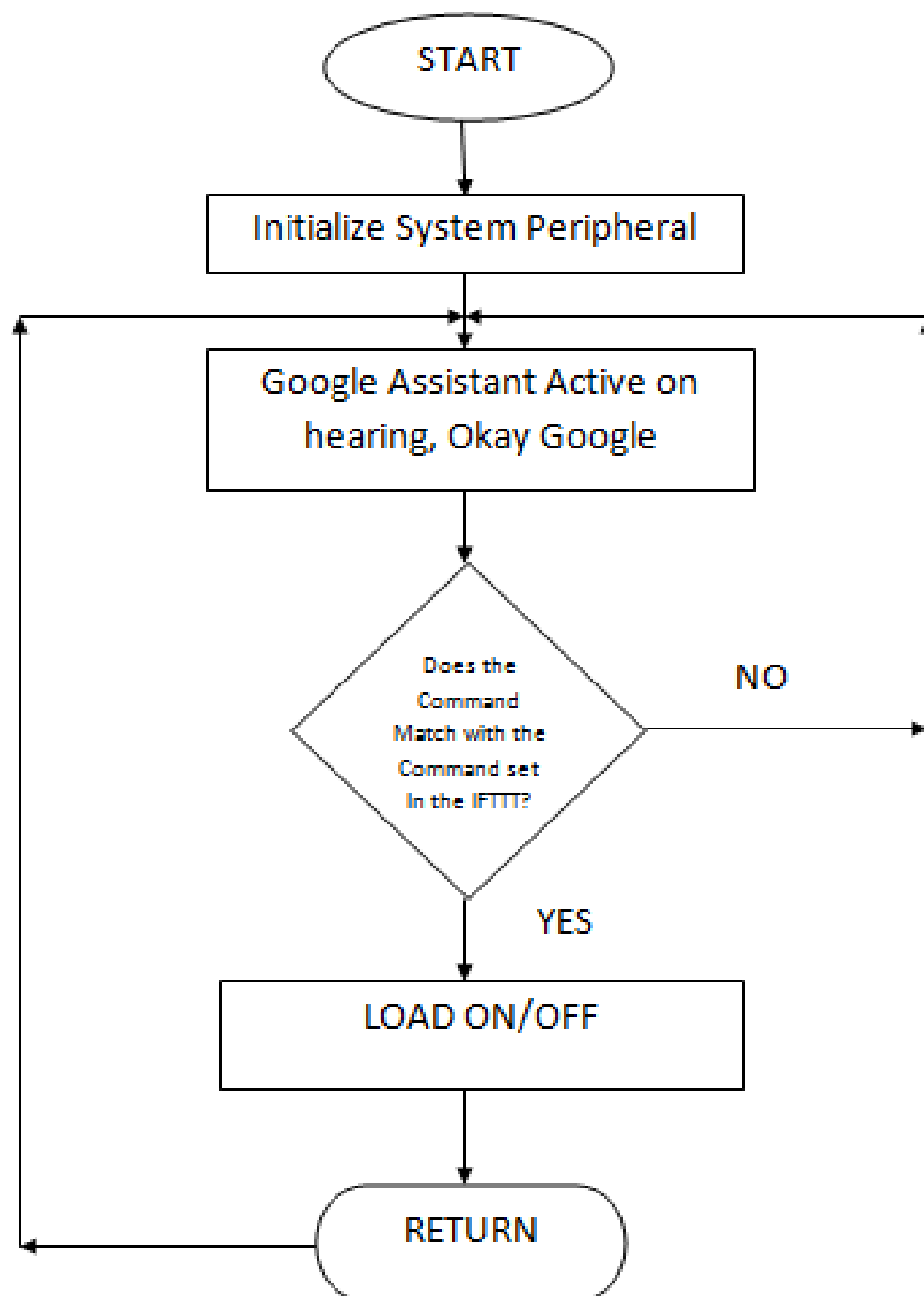
2.1 Overview

Human assistants like housekeepers were a way for millionaires to keep up their homes in the past. Even now when technology is handy enough only the well to do people of the society are blessed with these new smart home devices, as these devices costs are a bit high. However, not everyone is wealthy enough to be able to afford a human assistant, or some smart home kit. Hence, the need for finding an inexpensive and smart assistant for normal families keeps growing.

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The system is implemented using ordinary household appliances Natural language voice commands are given to the Google Assistant and with the help of IFTTT (If This Then That) application and the Blynk application the commands are decoded and then sent to the microcontroller, the microcontroller in turn controls the relays connected to it as required, turning the device connected to the respective relay On or OFF as per the users request to the Google Assistant. The microcontroller used is NodeMCU (ESP8266) and the communication between the microcontroller and the application is established via Wi-Fi (Internet).

2.2 Basic Flowchart:



2.3 LIST OF COMPONENTS:

2.3.3 Hardware Used

- NodeMCU
- Relay Board
- Jumper Cables
- Bread Board
- Smartphone.

2.4 Software Used

- Arduino IDE : You will be needing Arduino IDE software to write and upload the programming logic onto the Arduino Uno board
- Programming Language: C/C++ programming language.

CHAPTER 3

LITERATURE SURVEY

3.1 Hardware

3.1.1 NodeMCU(ESP8266)

The NodeMCU [3] (Node MicroController Unit) is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266 is designed and manufactured by Express, contains all crucial elements of the modern computer: CPU, RAM, networking (wi-fi), and even a modern operating system and SDK. When purchased at bulk, the ESP8266 chip costs only \$2 USD a piece. That makes it an excellent choice for this system design.

The NodeMCU aims to simplify ESP8266 development. It has two key components.

- i. An open source ESP8266 firmware that is built on top of the chip manufacturer's proprietary SDK. The firmware provides a simple programming environment based on eLua (embedded Lua), which is a very simple and fast scripting language with an established developer community. For new comers, the Lua scripting language is easy to learn. And to add on NodeMCU can be programmed with the Android IDE too.
- ii. A development kit board that incorporates the ESP8266 chip on a standard circuit board. The board has a built-in USB port that is already wired up with the chip, a hardware reset button, Wi-Fi antenna, LED lights, and standard-sized GPIO (General Purpose Input Output) pins that can plug into a bread board. Figure 2 below shows the NodeMCU development board.



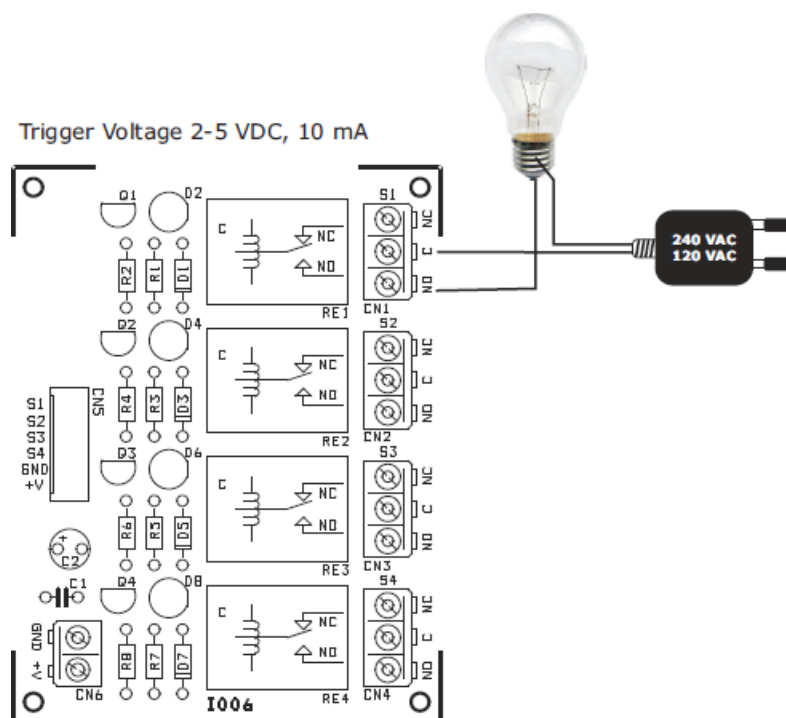
3.1.1.1 Features Of NodeMCU

- Finally, programable WiFi module.
- Arduino-like (software defined) hardware IO.
- Can be programmed with the simple and powerful Lua programming language or Arduino IDE.
- USB-TTL included, plug & play.
- 10 GPIOs D0-D10, PWM functionality, IIC and SPI communication, 1-Wire and ADC A0 etc. all in one board.
- Wifi networking (can be used as access point and/or station, host a web server), connect to internet to fetch or upload data.
- Event-driven API for network applications.
- PCB antenna.

3.1.2 Relay Board

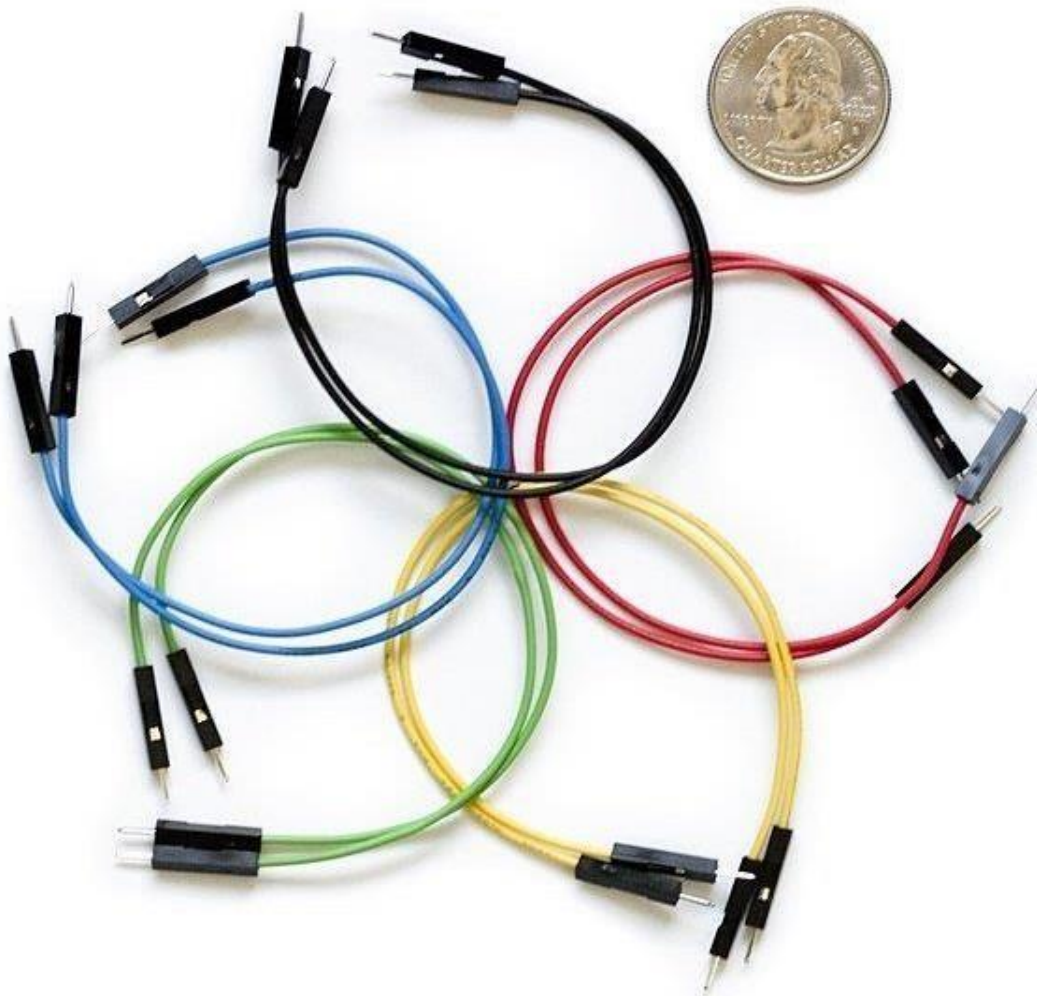
A relay is an electromagnetic switch. It is activated when a small current of some microampere is applied to it.

Normally a relay is used in a circuit as a type of switch, an automatic switch. There are different types of relays and they operate at different voltages. When a circuit is built the voltage that will trigger it has to be considered. In this system the relay circuit is used to turn the appliances ON/OFF. The high/low signal is supplied from the NodeMCU microcontroller. When a low voltage is given to the relay of an appliance it is turned off and when a high voltage is given it is turned on. The relay circuit to drive four appliances in the Home automation system is shown below in figure 3. The number of appliances can be modified according to the user's requirements



3.3.2. JUMPER WIRE:

Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed. Fairly simple. In fact, it doesn't get much more basic than jumper wires.



What Do the Colors Mean?

Though jumper wires come in a variety of colors, the colors don't actually mean anything. This means that a red jumper wire is technically the same as a black one. But the colors can be used to your advantage in order to differentiate between types of connections, such as ground or power.

Make Your Own Jumper Wires

While jumper wires are easy and inexpensive to purchase, it can also be a fun task to challenge students to make their own. Doing so requires insulated wire and wire strippers. However, beware that it is important not to nick the wire when stripping off the insulation.



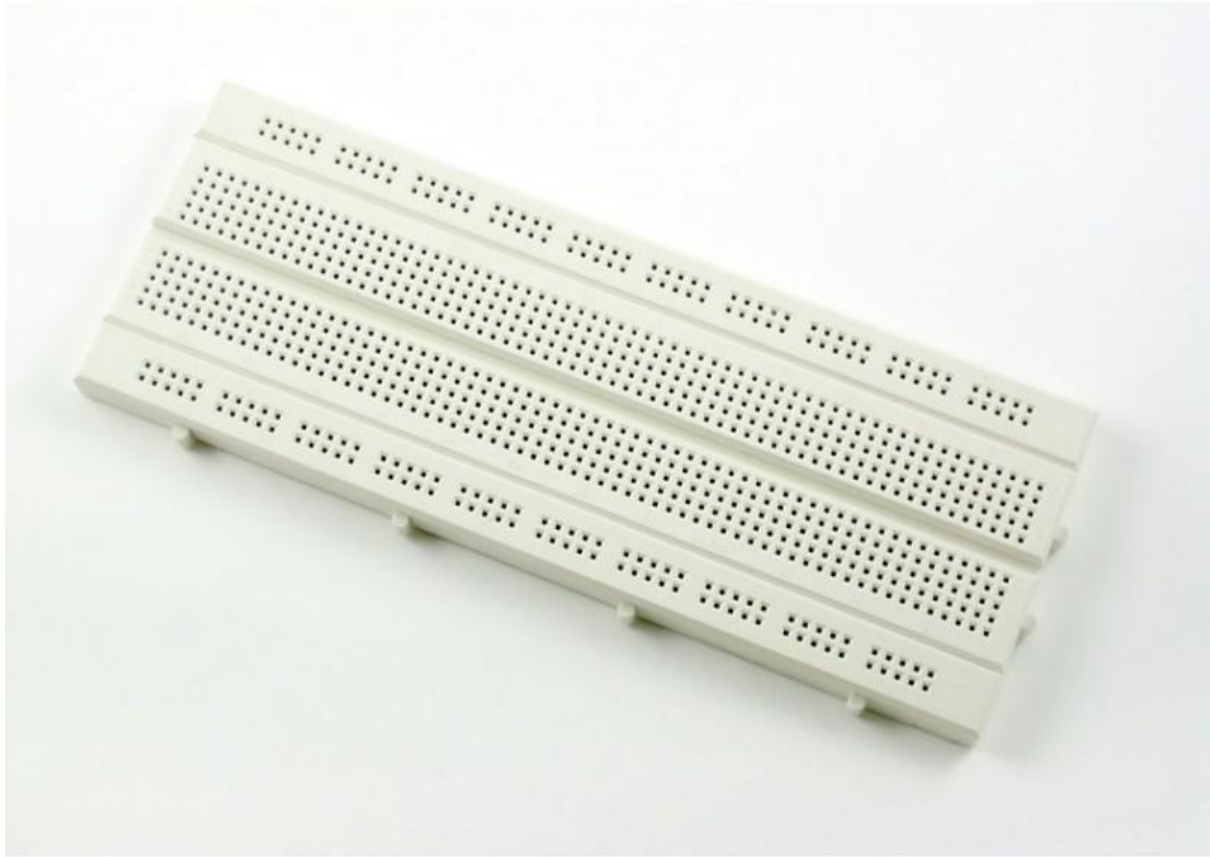
Types of Jumper Wires:

Jumper wires typically come in three versions: male-to-male, male-to-female and female-to- female. The difference between each is in the end point of the wire. Male ends have a pin protruding and can plug into things, while female ends do not and are used to plug things into. Male-to-male jumper wires are the most common and what you likely will use most often. When connecting two ports on a breadboard, a male-to-male wire is what you'll need



3.3.3 .Breadboard:

A breadboard is a solderless device for temporary prototype with electronics and test circuit designs. Most electronic components in electronic circuits can be interconnected by inserting their leads or terminals into the holes and then making connections through wires where appropriate. A breadboard is used to build and test circuits quickly before finalizing any circuit design. The breadboard has many holes into which circuit components like ICs and resistors can be inserted. What is inside a breadboard? The leads can fit into the breadboard because the inside of a breadboard is made up of rows of tiny metal clips. This is what the clips look like when they are removed from a breadboard. When you press a component's lead into a breadboard hole, one of these clips grabs onto it. Breadboards are used to help you connect components to complete your basic circuit. The reason it's called breadboard dates back to when electronics components were much bigger and people would actually use wooden breadboards (boards used to cut bread) to connect electronic circuits.

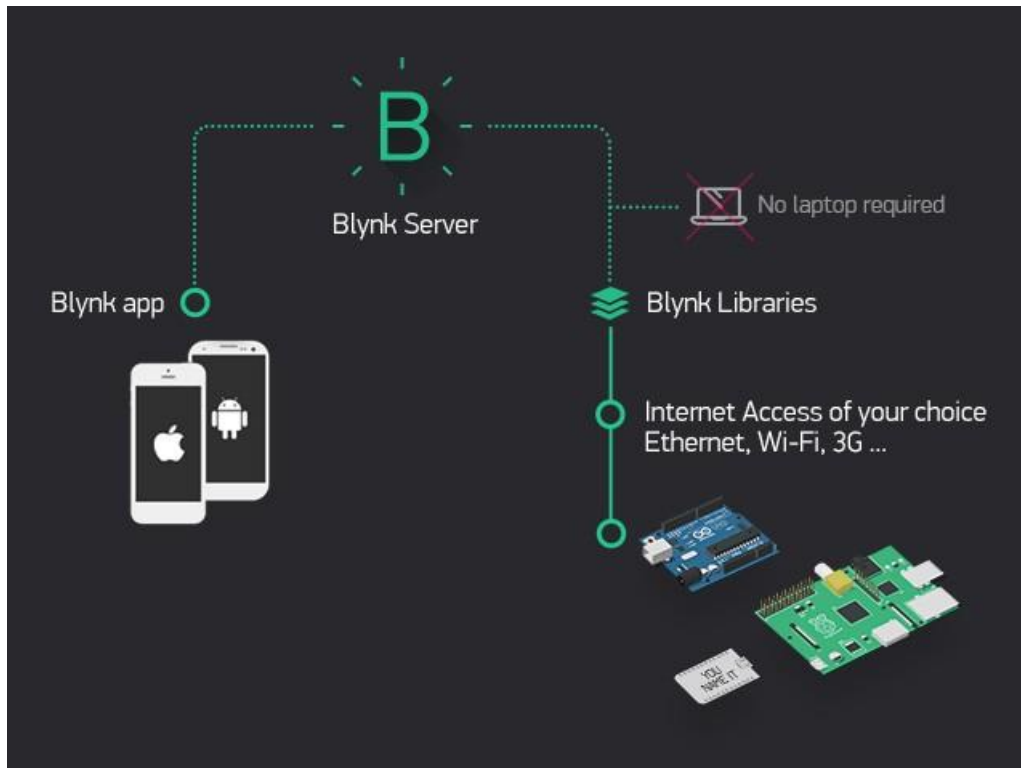


3.2 SOFTWARE:

3.2.1. BLYNK APPLICATION

Blynk [2] is a Platform with iOS and Android apps to control Arduino, Raspberry Pi, NodeMCU and several other boards over the Internet. Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things.

Blynk App setup is required; we set it up as per the requirement. We begin by creating a project and then selecting the microcontroller we are using. After which we create the toggle buttons for each relay associated with the digital pins of the microcontroller. Once this is done, Blynk sends an authentication token to the registered email id for this particular project. This token should be noted and saved for its use while programming the NodeMCU and setting up the IFTTT application.



3.2.2. IFTTT APPLICATION

IFTTT [1] derives its name from the programming conditional statement “if this, then that.” IFTTT is both a website and a mobile app that launched in 2010 and has the slogan “Put the Internet to work for you”. The idea is that you use IFTTT to automate everything from your favourite apps and websites to app-enabled accessories and smart devices. What the company provides is a software platform that connects apps, devices and services from different developers in order to trigger one or more automations involving those apps, devices and services. Here, IFTTT application is used to bridge the gap between the Google Assistant commands and the Blynk app.

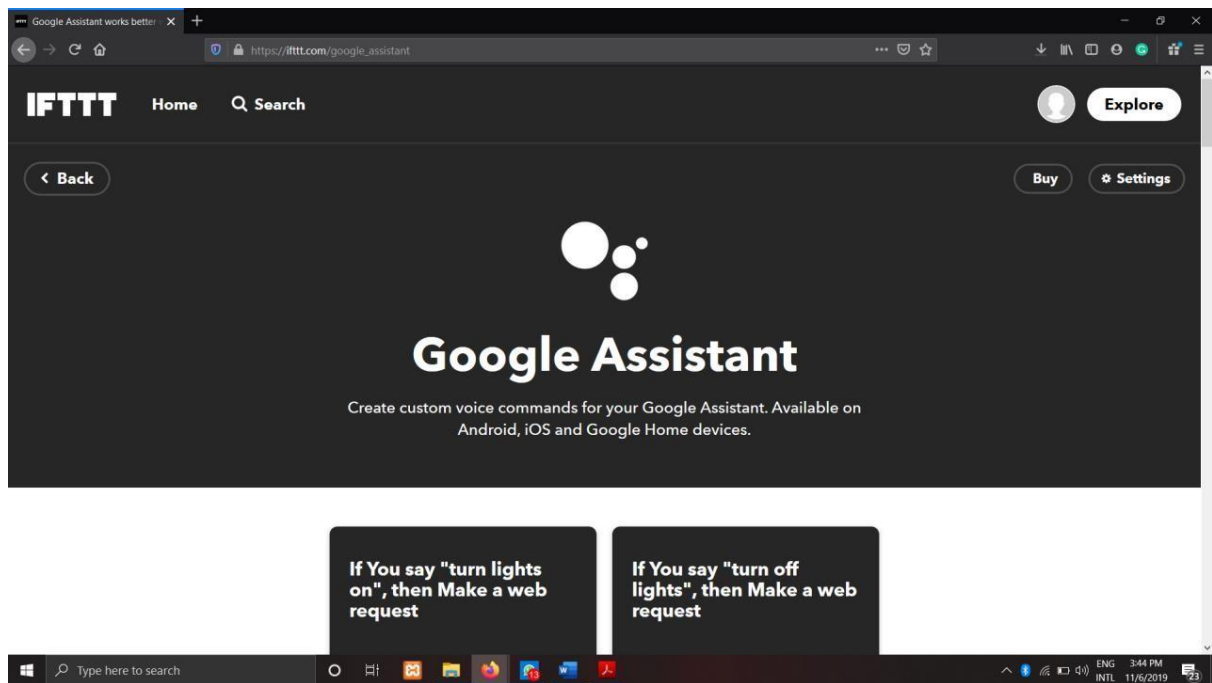
Setting up the IFTTT application first requires logging in after which we need to create an applet and then “This”, i.e. the trigger, here we select Google Assistant and then we will type in the commands to which the Google Assistant should respond and to this command it should control the appliance/relay associated with it. The response command from the Google Assistant can also be typed in as desired.

After configuring the trigger, i.e. “This” of the application we need to configure the “That”. What should be done once the Google Assistant hears the command which we just configured? This is decided by setting “That” of the app. We click “That” and then select webhooks [7] and click connect. Webhooks will allow us to send commands to the Blynk Server. Now, in the URL we type the IP address of the Blynk server followed by the Authentication token sent by the Blynk and then the pin number of the microcontroller to which the device to be controlled is connected. The URL should be in the following format:

<http://188.166.206.43/AuthToken/pin/CorrespondingDigit alPinNo>

Then in the method we select ‘PUT’ and the content type is ‘Application/JSON’ [8] and in the body we write [“1”] to turn ON and [“0”] to turn OFF. This creates the action for the

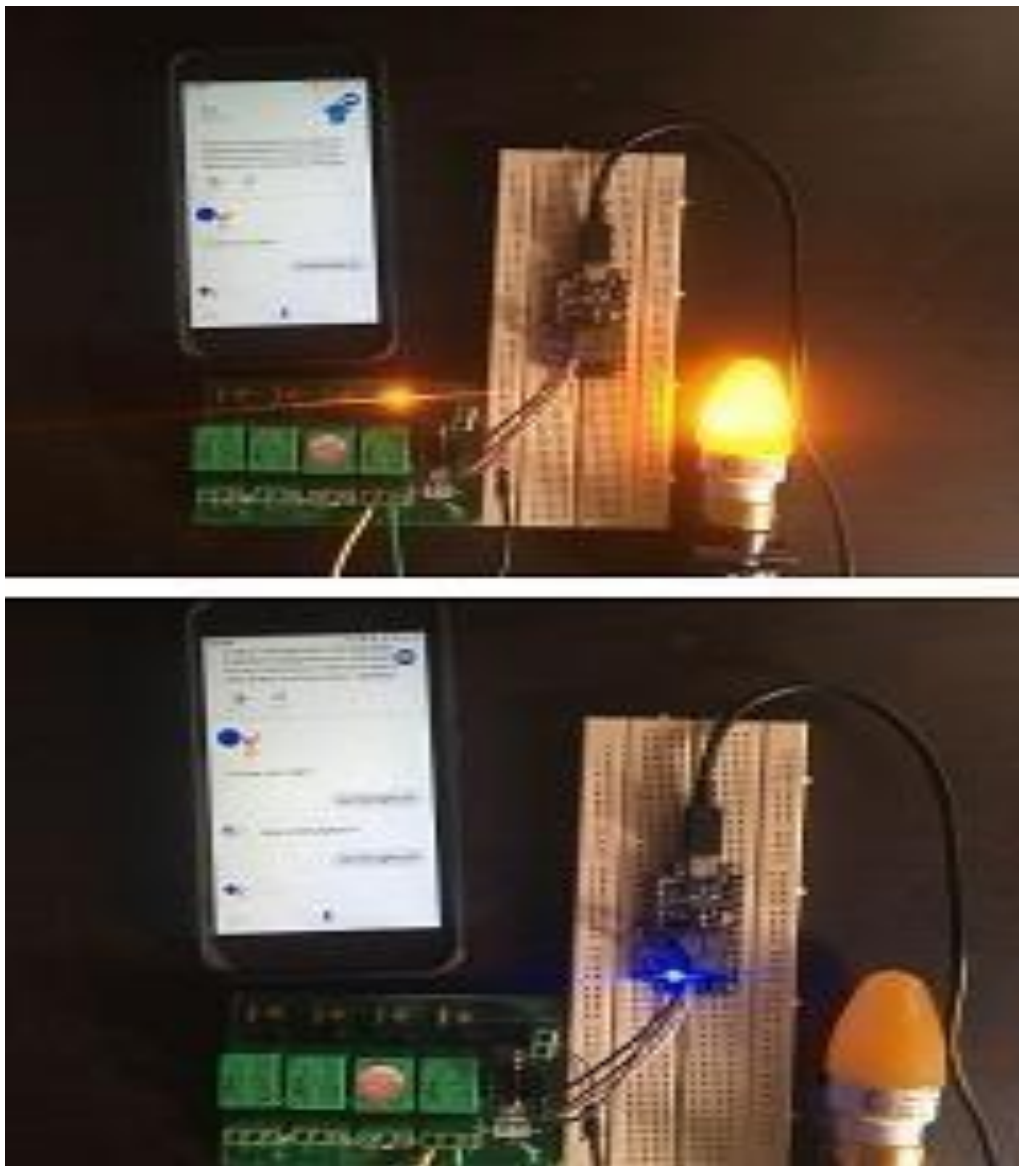
trigger i.e. the Google Assistant command. The action taken by it is simply sending a message to the Blynk app to either turn ON or OFF the concerned connected device. Finally, the microcontroller is programmed with the actions it needs to do once it receives the signal from the Blynk application. Before that, the Blynk and the microcontroller should communicate and the communication is done via the internet and since the microcontroller, NodeMCU comes with inbuilt Wi-Fi module, it is programmed to connect to the desired network once plugged in. 'C' language is used to program the microcontroller and is programmed in the Arduino IDE [9].



CHAPTER 4

4.1.RESULT

The result was positive and the system responded well. The diagram below shows the complete prototype implementation of the proposed system.



CHAPTER 5

5.1.CODE:

Download latest Blynk library here:

<https://github.com/blynkkk/blynk-library/releases/latest>

Blynk is a platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. You can easily build graphic interfaces for all your projects by simply dragging and dropping widgets.

Downloads, docs, tutorials: <http://www.blynk.cc>

Sketch generator: <http://examples.blynk.cc>

Blynk community: <http://community.blynk.cc>

Follow us: <http://www.fb.com/blynkapp>

http://twitter.com/blynk_app

Blynk library is licensed under MIT license

This example code is in public domain.

/* Comment this out to disable prints and save space */

#define BLYNK_PRINT Serial

#include <ESP8266WiFi.h>

#include <BlynkSimpleEsp8266.h>

// You should get Auth Token in the Blynk App.

// Go to the Project Settings (nut icon).

char auth[] = "IOUs89UhVaJ3ynVq_MFmLElb2ybnVsiV";//OUR OWN AUTH KEY HERE

// Your WiFi credentials.

// Set password to "" for open networks.

char ssid[] = "dhiraj"; //OWN SSID

char pass[] = "12345678"; //OWN PASSWORD

void setup()

{

// Debug console

Serial.begin(9600);

Blynk.begin(auth, ssid, pass);

}

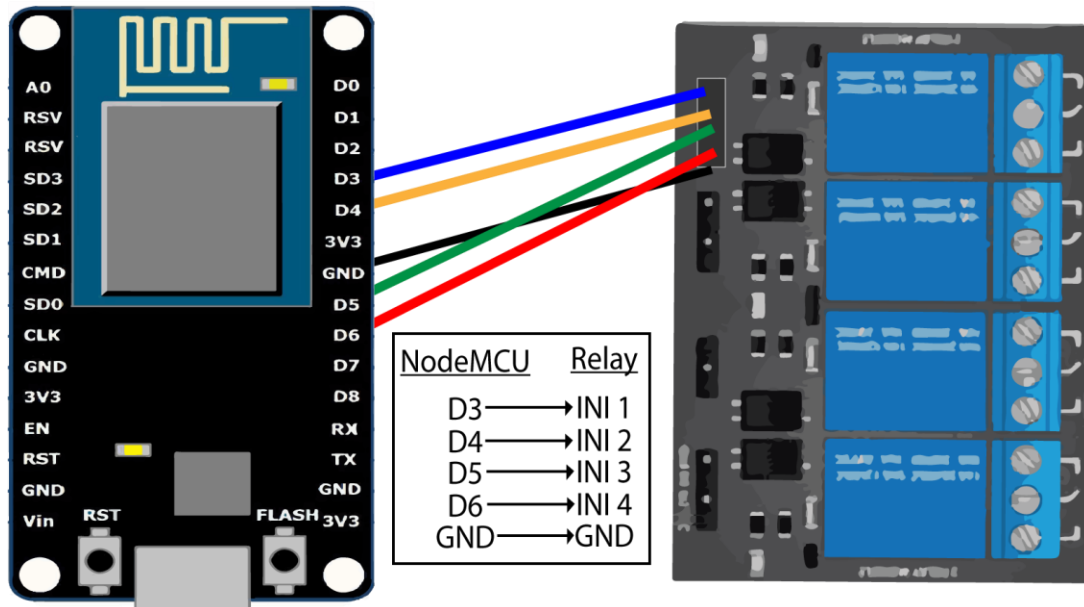
void loop()

{

Blynk.run();}

CHAPTER 6

6.1.Circuit Diagram:



CHAPTER 7

7.1. CONCLUSION AND FUTURE SCOPE

- The aim of this paper was to propose a cost effective voice controlled (Google Assistant) home automation controlling general appliances found in one's home. The approach discussed in the paper was successful as GACHA's (Google Assistant Controlled Home Automation) design was successfully implemented. 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 future scope for GACHA can be huge. There are many factors to improve on to make GACHA more powerful, intelligent, scalable, and to become better overall for home automation. For example, controlling the speed of the fan, more number of devices can be integrated, like a coffee machine, air conditioner etc. To make the system respond more faster own private Blynk server can be made. Well, no system is ever perfect. It always has a scope for improvement. One just needs to put on a thinking cap and try and make the system more better

7.2. References and Bibliography

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