A Project Report

On

VOICE OPERATED HOME AUTOMATION USING IOT

By

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Submitted to Department of Electronics and Communication Engineering

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In

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CERTIFICATE

This is to certify that the work embodied in this project report entitled **"VOICE OPERATED HOME AUTOMATION USING IOT (GOOGLE ASSISTANT)"** has been satisfactorily completed by **Hari Om Rajbhar, Nishita Gautam, Rohit Singh.** It is a bonafide piece of work, carried out under our supervision and guidance in the Department of **Electronics and Communication Engineering, Axis Institute of Technology & Management, Kanpur (U.P.)**. For partial fulfillment of the **Bachelor of Technology in Electronics and Communication** during the academic year 2018-2019.

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DECLARATION

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief. It contain no material previously published or written by another person or material which to a substantial extent has been accepted for the award of any another degree of university or other institution of higher learning except where due acknowledgement has been made in the test.

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Abstract

World's demand for electricity had grown 85% between 2010 and 2017 this increase is more than today's total use of electricity in India, USA, Japan, Australia combined. We can't decrease the electricity growth rate but we can lessen the amount of electricity wasted each year by turning off our home appliances when not in use. This project presents a design and prototype of Home Automation system that will use ESP8266 Wi-Fi module as a network provider in connecting with other appliances. The proposed system has two main components. The first main part is Arduino, which controls and manages input of Wi-Fi module. The other main component is Wi-Fi module through Wi-Fi module a web server can be added to the module which will help in controlling of devices over Internet. One server can manage many hardware interface modules as long as it exists on Wi-Fi network coverage. It supports a wide range of home automation devices like power management components, and security components. We want to make this automation system centralized and artificially intelligent. Further we will connect the specific home to our database and it can be accessed from anywhere through a specific IP address or website. Also, an app would be developed which will allow the user to control their devices using the Google Assistant.

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CHAPTER – 1

Introduction

1.1 Overview

Home automation is also named as domestics or Smart home. It involves the control and automation of lighting, heating, ventilation, air conditioning and security, as well as home appliances. Wi-Fi is often used for remote monitoring and control. Home devices, when remotely monitored and controlled via Internet is a part of Internet of things. Modern systems generally consists of switches and sensors connected to a central hub called a gateway from which the system is controlled with a user interface that is interacted either with a mobile phone software, tablet, computers or a web interface ,often but not always via internet cloud services. World's demand for electricity had grown 85% between 2010 and 2017.

This increase is more than today's total use of electricity in India, USA, Japan, Australia combined. We can't decrease the electricity gross electricity wasted each year by turning off our home appliances when not in use. World's demand for electricity had grown 85% between 2010 and 2017 this increase is more than today's total use of electricity in India, USA, Japan, Australia combined. We can't decrease the electricity growth rate but we can lessen the amount of electricity wasted each year by turning off our home appliances when not in use. Unlike most of available home automation system in the market the proposed system is scalable that one server can manage many hardware interface modules as long as it exists on Wi-Fi network coverage. System supports a wide range of home automation devices like power management components, and security components.

1.2 Block Diagram of Voice Operated Home Automation using IOT

This figure 1.1 shows the block diagram of the project Voice Operated Home Automation using IOT.

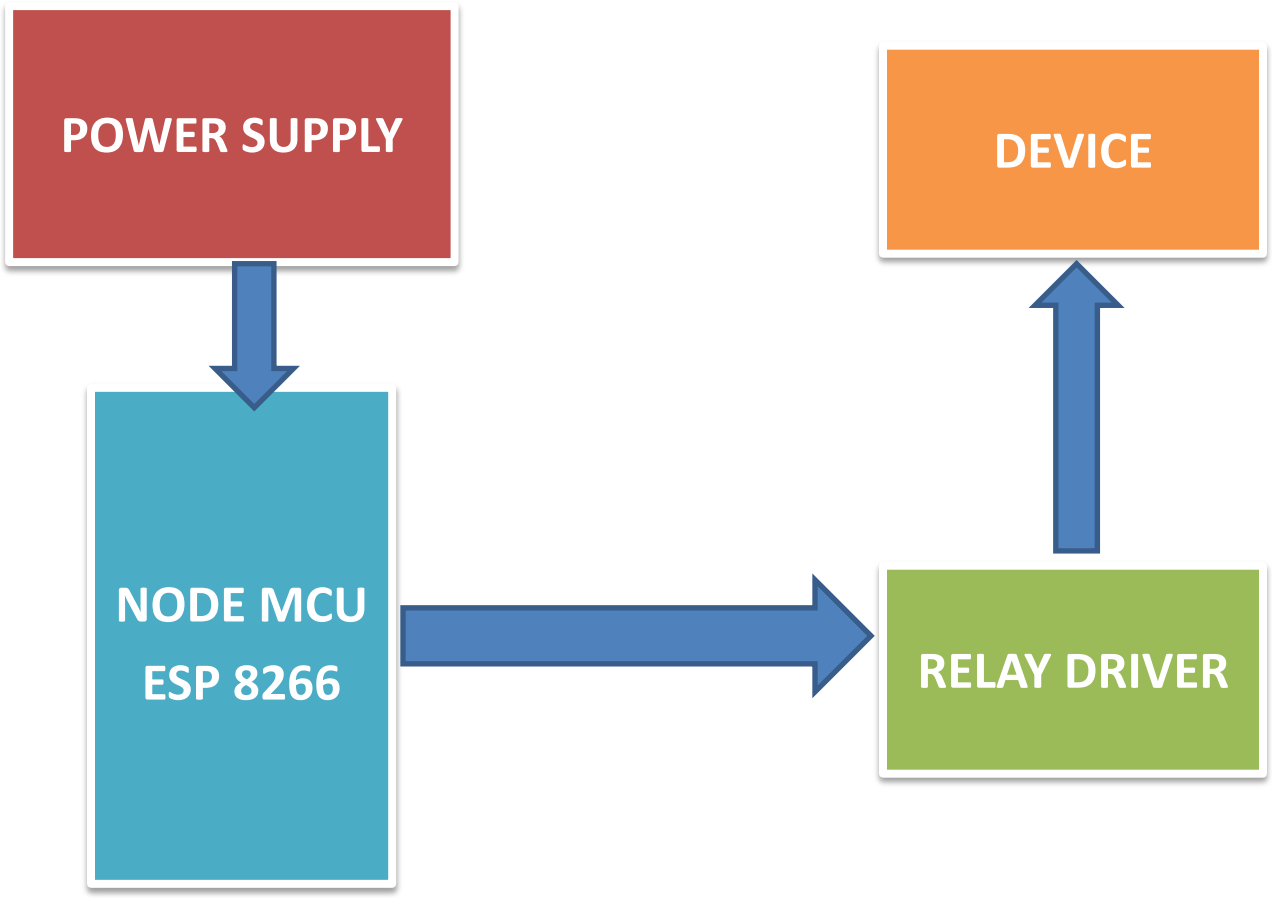


Fig. 1.1 – Block Diagram of Voice Operated Home Automation using IOT

1.3 Block Diagram Description

The operation of the Voice Operated Home Automation using IOT is described by the following process:

1.3.1 NodeMCU (ESP8266 Module)

Introduction

NodeMCU is an open source LUA based firmware developed for ESP8266 Wi-Fi chip. By exploring functionality with ESP8266 chip, NodeMCU firmware comes with ESP8266 Development board/kit i.e. NodeMCU Development board.

NodeMCU Development Kit/board consist of ESP8266 wifi enabled chip. The **ESP8266** is a low-cost Wi-Fi chip developed by Espressif Systems with TCP/IP protocol.

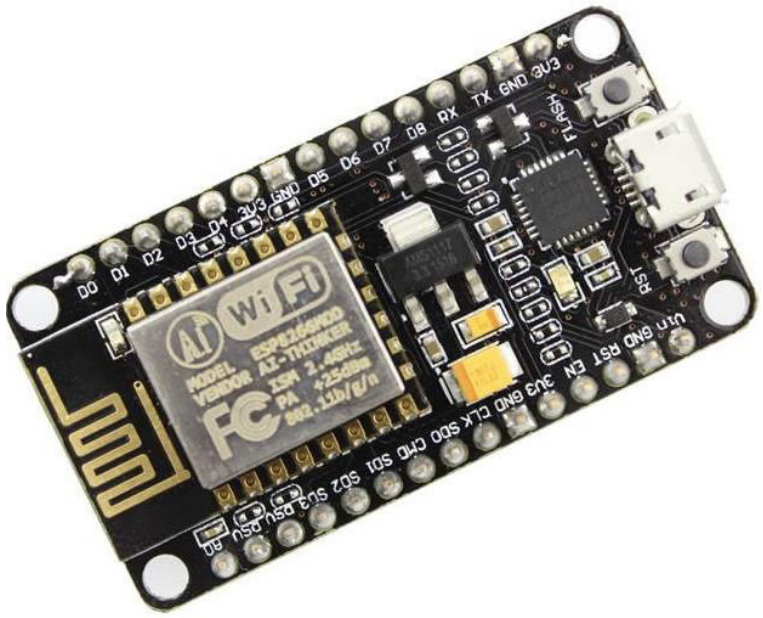


Fig. 1.2 – ESP8266 Module

Pin Diagram:-

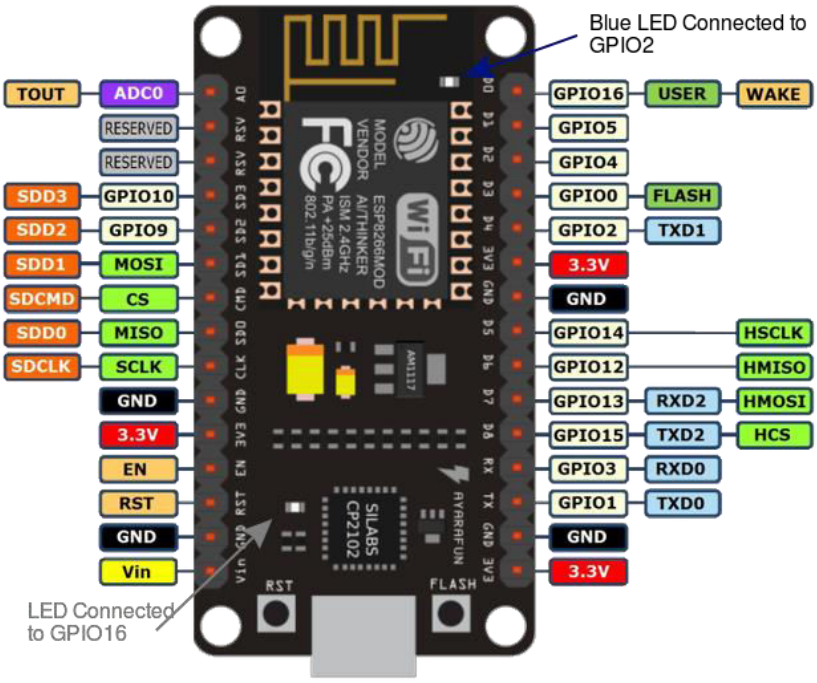


Fig. 1.3 – Pin Diagram of ESP8266 Module

Features of ESP8266 WIFI Module:-

- **Processor:** L106 32-bit reduced instruction set computer processor core based on Tensilica Xtensa Diamond Standard 106 micro running at 80 MHZ.
- 64 KB of instruction RAM, 96 KB of data RAM
- External QSPI flash: 512 KB to 4MB
- WPA/WPA2 authentication, or open networks
- 16 General purpose input/output pins
- Serial Peripheral Interface Bus
- Inter- Integrated circuit
- Inter-IC sound interface with sharing pins with general purpose input output pins
- 10 bits Analog to digital converter

Specification of ESP 8266 WIFI Module:-

- Wi-Fi Direct (P2P), soft-AP
- Integrated TCP/IP protocol stack
- Integrated TR switch, balun, LNA, power amplifier and matching network
- Integrated PLLs, regulators, DCXO and power management units
- 19.5dBm output power in 802.11b mode
- Power down leakage current of <10uA
- 1MB Flash Memory
- Integrated low power 32-bit CPU could be used as application processor
- Standby power consumption of < 1.0mW (DTIM3)

1.3.2 Power Supply

In the power supply section, we use one step down transformer to step down the voltage from 220 volt AC to 9 volt DC since the operating voltage for the ULN2003 IC relay driver is 9v. Output of the transformer is further connected to the two diode circuit. Here two diode work as a full wave rectifier circuit. Output of the full wave rectifier is now filtered by the capacitor.

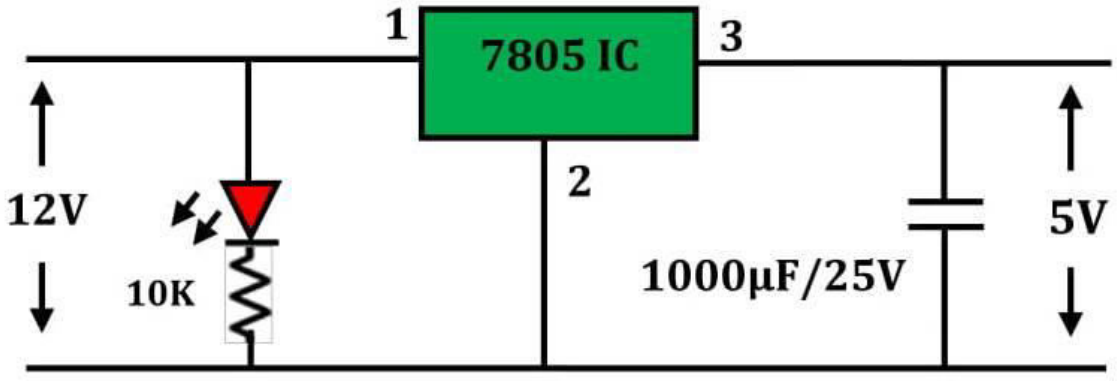


Fig. 1.4 – Power Supply Circuit

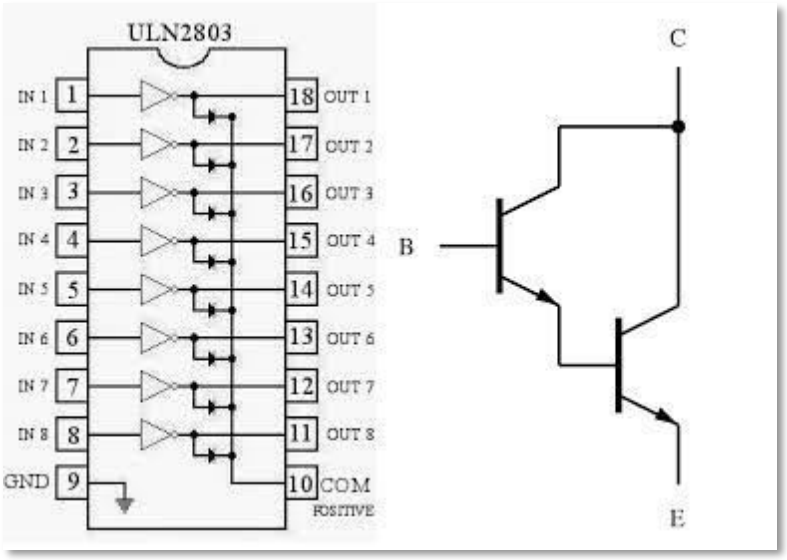
1.3.3 ULN2003 IC Relay Driver

ULN 2003 IC is used as a relay driver. It is a High voltage, high current Transistor Array IC used especially with Microcontrollers where we need to drive high power loads. This IC consists of eight NPN Darlington connected transistors with common Clamp diodes for switching the loads

connected to the output. This IC is widely used to drive high loads such Lamps, relays, motors etc.

Most of the Chips operates with low level signals such as TTL, CMOS, PMOS, N-MOS which operates at the range of (0-5) V and are incapable to drive high power inductive loads. However this chip takes low level input signals (TTL) and uses that to switch/turn off the higher voltage loads that are connected to the output side.

The ULN2003 IC consists of eight NPN Darlington pair which provides the proper current amplification required by the loads. A Darlington pair has two transistors that act as a single transistor providing high current gain. In this pair the current amplified by the first transistor is further amplified by the next transistor providing high current to the output terminal.



a. b.

Fig. 1.5 - a. ULN 2003; b. Darlington Pair

1.3.4 Voltage Regulator 7805 IC

Voltage sources in a circuit may have fluctuations resulting in not providing fixed voltage outputs. A voltage regulator IC maintains the output voltage at a constant value. 7805 IC, a member of 78xx series of fixed linear voltage regulators used to maintain such fluctuations, is a popular voltage regulator integrated circuit (IC). The xx in 78xx indicates the output voltage it provides. 7805 IC provides +5 volts regulated power supply with provisions to add a heat sink.

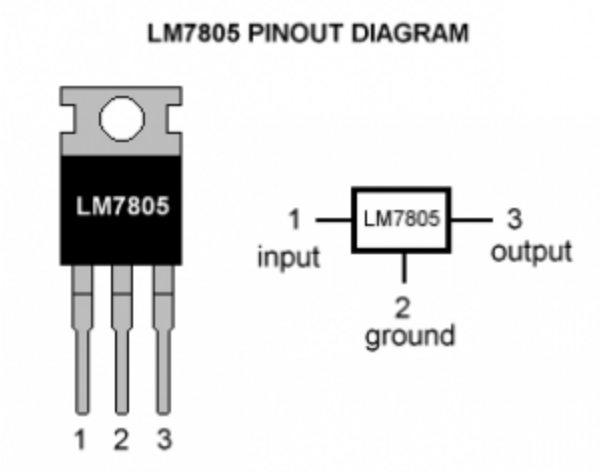


Fig. 1.6 – PINOUT Diagram of 7805 IC

7805 IC Rating:-

- Input voltage range 7V- 35V
- Current rating $I_{c=}$ 1A
- Output voltage range $V_{Max} = 5.2V$, $V_{Min} = 4.8V$

Pin Details of 7805 IC:-

Pin No.	Pin	Function	Description
1	INPUT	Input voltage (7V-35V)	In this pin of the IC positive unregulated voltage is given in regulation.
2	GROUND	Ground (0V)	In this pin where the ground is given. This pin is neutral for equally the input and output.
3	OUTPUT	Regulated output; 5V (4.8V-5.2V)	The output of the regulated 5V volt is taken out at this pin of the IC regulator.

1.3.5 Relay Switch

A relay is an electrically operated switch. Many relay use an electromagnet to, mechanically operates a switch, but other operating principles are also used, such as solid state relay. Relay are used where it is necessary to control a circuit by a separate low power signal, or where several circuits must be controlled by one signal. Relay is used extensively in telephone exchange and early computers to perform logical operation.

A type of relay that can handle the high power required to directly control an electronic motor or other loads is called a contactor. Solid state relay controls power circuit with no moving parts, instead using a semiconductor device to perform switching. Relay calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power system these functions are performed by digital instruments still called "Protective Relay".

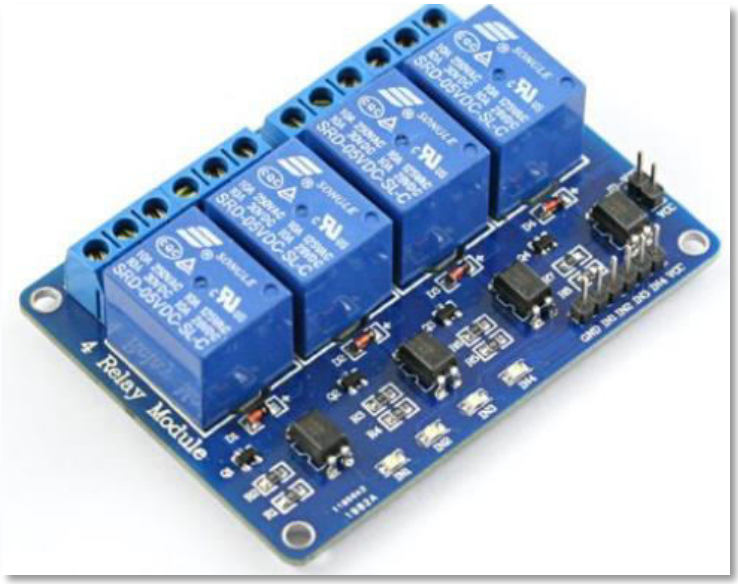


Fig. 1.7 – Relay Switch Board

This is relay board with 4 SPDT Relays controlled from USB port of your computer. The main purpose of this USB relay module is to help you building projects regarding robotics and home automation (domestic). You may control different electrical devices like home lights, DC motors, pneumatic cylinders, lasers and so on.

In this project work, relay is used for connecting the home appliances to a microcontroller i.e. NodeMCU ESP8266 Module is shown below.

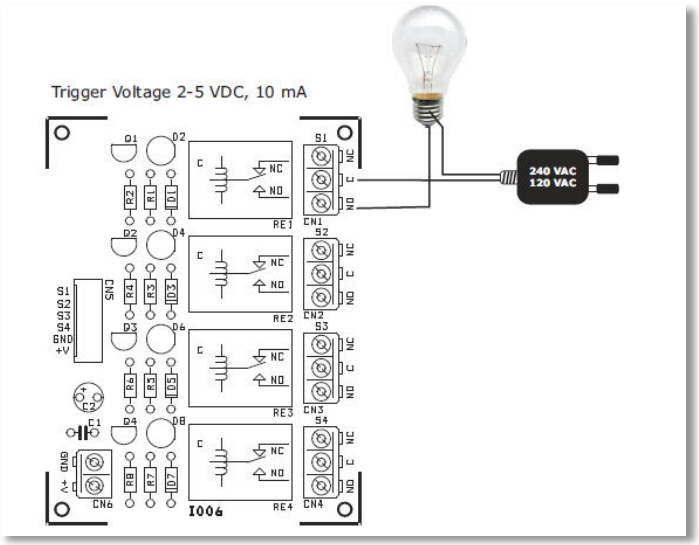


Fig. 1.8 – Relay Board Wiring Diagram

Advantages:-

- High quality
- Low cost
- No extra power supply
- Software with many functions
- Control electrical devices according weekday/date/time
- Create timers or pulses with our software

Applications:-

- Home automation
- Robotics
- Alarms
- Timers
- Open doors and windows via PC
- Aquariums applications

CHAPTER – 2

Theory

The project is based on Microcontroller (NodeMCU ESP8266 Wifi Module). The principle of this project is basically to use the technology to develop a home automation system that gives the user complete control over all voice controllable aspects of his or her home. An Embedded System is one that has computer hardware with software embedded in it as one of its important components. Its software embeds in ROM (Read Only Memory). It does not need secondary memories as in computer hardware.

Basic components of Embedded Systems are:

It has Hardware i.e. Processor, Timers, I/O Devices, Memories, Ports, etc.

It has main Application Software i.e. which may perform concurrently the series of tasks or multiple tasks.

It has Real Time Operating System which defines the way the system work which supervise the application software. It sets the rules during the execution of the application program. A small scale embedded system may not need a RTOS.

2.1 Hardware classifications of Embedded System

2.1.1 Based on performance and functional requirements of system

An embedded system is classified into four categories based on performance and functional requirements of systems as follows:

- Standalone embedded systems
- Real time embedded systems
- Networked embedded systems
- Mobile embedded systems

2.1.1.1 Standalone embedded system

This system don't require host system like a computer system, it works by itself. It takes the input from the input ports either analog or digital and processes, computes and transfers the data and gives the resulting data through the connected device-which controls, drives or displays the associated devices. For examples standalone embedded systems are mp3 players, digital cameras, video game consoles, microwave ovens and temperature measurement systems.

2.1.1.2 Real time embedded systems

A system called real time embedded system, which gives a required output in a particular time. These types of embedded systems follow the time deadlines for completion of a task. Real time embedded systems are classified into two types such as soft real time embedded system and hard real time embedded systems based on the time preciseness.

2.1.1.3 Networked embedded system

Networked embedded systems are related to a network to access the resources. The connected network can be LAN, WAN or the internet. The connection can be any wired or wireless. This kind of embedded system is the fastest growing technological area in embedded system applications. The embedded web server is a type of system wherein all embedded devices are connected to a web server and accessed and controlled by a web browser. For example the LAN networked embedded system is a home security system wherein all sensors are connected and run on the protected protocol TCP/IP.

2.1.1.4 Mobile Embedded Systems

Mobile embedded systems are highly preferable in portable embedded devices like cell phones, mobiles, digital cameras, wireless mp3 players and personal digital assistants, etc. The basic limitation of these devices is the other resources and limitation of memory.

2.1.2 Based on performance of microcontroller

An embedded system is classified into three categories based on performance of microcontroller as follows:

- Small scale embedded system
- Medium scale embedded system
- Sophisticated Embedded Systems

2.1.2.1 Small Scale Embedded Systems

These types of embedded systems are designed with a single 8-bit or 16-bit microcontroller. They have tiny scaled hardware, software complexities and involve board-level design. They

may even be battery operated. When embedded software is developing for this tiny scaled hardware, an editor, an assembler or cross assembler, specific to the microcontroller or processor used, are the main programming tools. Usually, 'C programming language' is used for developing these systems. 'C' program compilation is done into the assembly, and executable codes are then appropriately located in the system memory. The software has to fit within the memory existing and keep in view the need to limit power dissipation when system is running continuously.

2.1.2.2 Medium Scale Embedded Systems

These systems are usually designed with a single or few 16-bit or 32-bit microcontrollers or Digital Signal Processor (DSPs) or Reduced Instruction Set Computers (RISCs) being used. These system have both hardware and software complexities. For complex software design of medium scale embedded system, there are the following programming tools: RTOS, Source code engineering tool, Simulator, Debugger and Integrated Development Environment (IDE). Software tools also give the clarifications to the hardware complexities. An assembler is of slight use as a programming tool. These systems may also utilize the readily available Application-Specific Standard Product (ASSPs) and IPs for the various functions. For example, for the bus interfacing, encrypting, deciphering, discrete cosine transformation and inverse transformation, TCP/IP protocol is stacking and network connecting functions.

2.1.2.3 Sophisticated Embedded Systems

Sophisticated embedded systems have massive hardware and software complexities and may require ASIPs, IPs and PLAs scalable or configurable processors and programmable logic arrays. They are used for cutting edge applications that require hardware and software co-design and integration in the final system. They are constrained by the processing speeds available in their hardware units. Certain software functions such as encryption and deciphering algorithms, discrete cosine transformation and inverse transformation algorithms, TCP/IP protocol stacking and network driver functions are implemented in the hardware to obtain additional speeds by saving time. Some of the functions of the hardware resources in the system are also implemented

by the software. Development tools for these systems may not be readily available at a reasonable cost or may not be available at all.

Programming Language for Embedded System

Language basically used for embedded system:-

1) Assembly Language

2) Embedded C

Software used for compiling these languages:-

1) Arduino IDE

For designing a circuit a compiler is needed like:-

1) Dip Trace

CHAPTER – 3

Circuit Details

Every electronic project has a circuit diagram. The Circuit Diagram of the project Voice Operated Home Automation using IOT is given in the Fig. 3.2.

3.1 Circuit Description

Circuit defines a project. It is the most important part which characterizes a project. The working of whole project depends upon the circuit, components, and the circuit layout of the project. The circuit of the Voice Operated Home Automation using IOT can be divided into sub-parts:

3.1.1 Power Supply

A Direct Current (DC) supply is needed by most circuits as a constant reference voltage. Also, some components would be damaged by the negative half cycles of an Alternate Current (AC) supply. A DC supply, stays at a fixed, regular, voltage all of the time, like the voltage from a battery.

3.1.2 Embedded System

The fundamental embedded system used in this project is a NodeMCU. The NodeMCU (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.

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

- 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.
- 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.

3.1.3 Relay Module

A relay module is combination of 4 relays which works as a switching device. The relay is the device that opens or closes the contacts to cause the operation of the other electric control. It detects the intolerable or undesirable condition with an assigned area and gives the commands to the circuit breaker to disconnect the affected area. Thus protects the system from damage. It works on the principle of an electromagnetic attraction. When the circuit of the relay senses the fault current, it energizes the electromagnetic field which produces the temporary magnetic field.

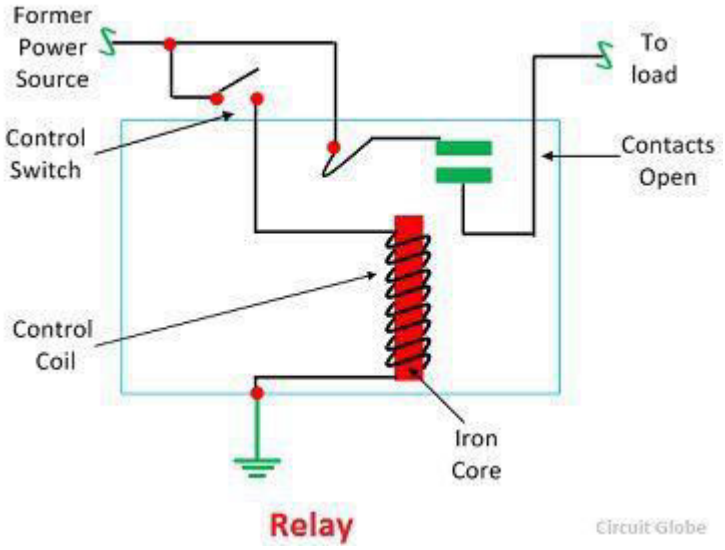


Fig. 3.1 – Working of Relay

This magnetic field moves the relay armature for opening or closing the connections. The small power relay has only one contact, and the high power relay has two contacts for opening the switch.

The inner section of the relay is shown in the figure below. It has an iron core which is wound by a control coil. The power supply is given to the coil through the contacts of the load and the control switch. The current flows through the coil and produces the magnetic field around it.

Due to this magnetic field, the upper arm of the magnet attracts the lower arm. Hence close the circuit, which makes the current flow through the load. If the contact is already closed, then it moves oppositely and hence opens the contacts.

3.2 Circuit Diagram

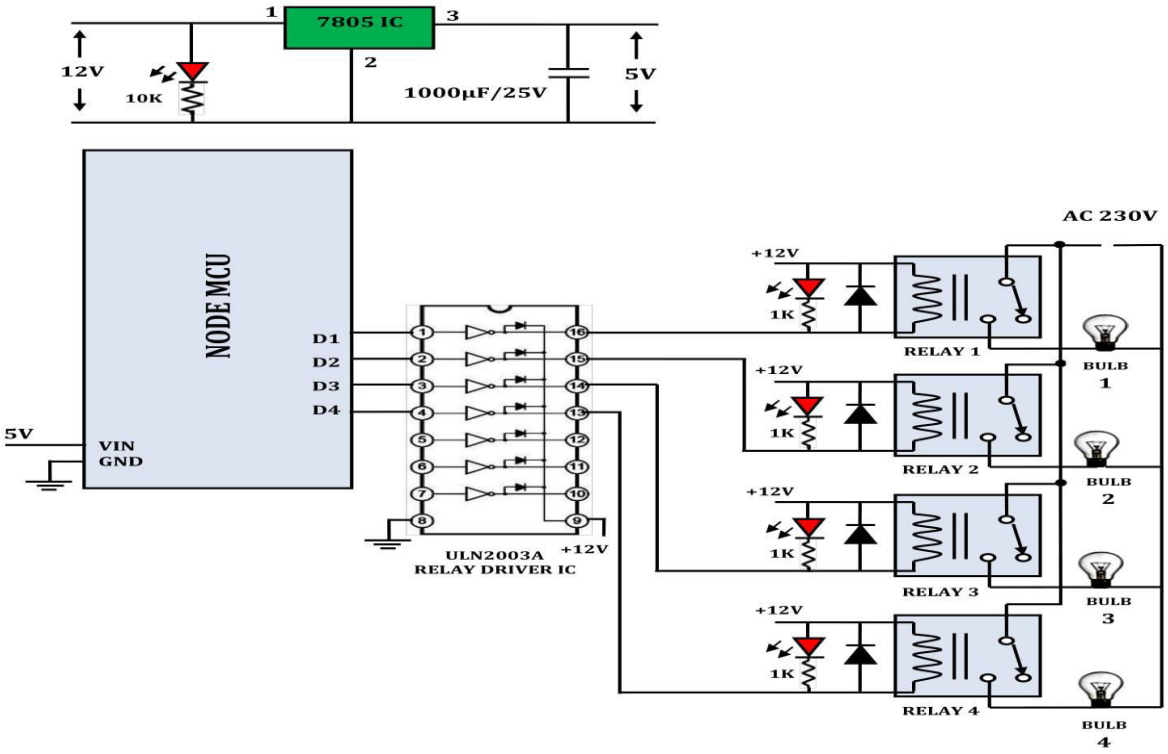


Fig. 3.2 – Circuit Diagram of Voice Operated Home Automation using IOT

3.3 Circuit Components

Table 3.1 Circuit Components

S. No.	Components	Component Details	Reference Designation	Quantity
1.	NodeMCU	Wi-Fi Module	ESP8266	1
2.	Capacitor	1000 microF	C	1
3.	Resistors	10 k , 1 k	R	5
4.	Diodes	4007	D	4
5.	LEDs	12v	LED	5
6.	Voltage regulator	5v	7805 IC	1
7.	Relays	12v	Relay	4
8.	Connectors			4
9.	ULN2003 IC	5v	Relay Driver	1
10.	DC Socket	12V		1

CHAPTER – 4

How the Project Works?

A project works with the combination of hardware and software. This project also works with the combination of hardware and software. The software part of this project is explained below which contains the following:

- Blynk Application
- IFTTT
- Google Assistant

4.1 Blynk Application

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.

Fig. 4.1 – Blynk App

4.1.1 How Blynk Works

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.

There are three major components in the plateform:

- **Blynk App –** allows to you create amazing interfaces for your projects using various widgets we provide.

- **Blynk Server –** responsible for all the communications between the smartphone and hardware. You can use our Blynk Cloud or run your private Blynk server locally. 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 – enable communication with the server and process all the incoming and outcoming commands.

Now imagine: every time you press a Button in the Blynk app, the message travels to the Blynk Cloud, where it magically finds its way to your hardware. It works the same in the opposite direction and everything happens in a bynk of an eye.

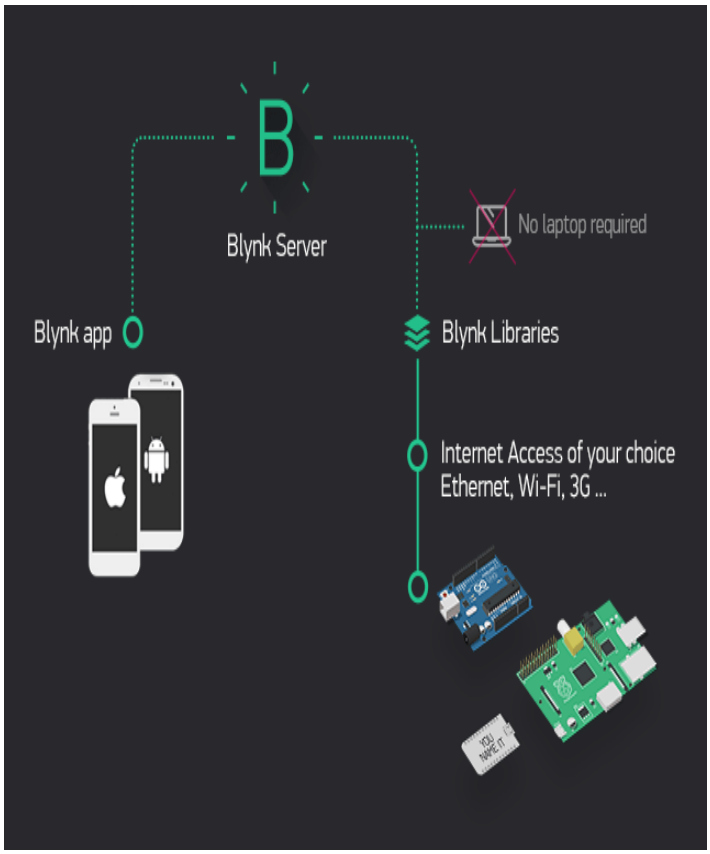


Fig. 4.2 – Blynk App

Features:

- Similar API & UI for all supported hardware & devices
- Connection to the cloud using:
- Wi-Fi
- Bluetooth and BLE

- Ethernet
- USB (Serial)
- GSM
- Set of easy-to-use Widgets
- Direct pin manipulation with no code writing
- Easy to integrate and add few functionality using virtual pins
- History data monitoring via Super Chart Widget
- Device-to-Device communication using Bridge Widget
- Sending emails, tweets, push notification, etc.

4.1.2 What do I need to Blynk?

At this point you might be thinking: **"Ok, I want it. What do I need to get started?" –** Just a couple of things, really:

1. Hardware – An Arduino, Raspberry Pi, or a similar development kit.

Blynk works over the Internet: This means that the hardware you choose should be able to connect to the Internet. Some of the boards like Arduino Uno will need an Ethernet or Wi-Fi Shield to communicate while others are already Internet enabled like ESP8266, Raspberry Pi with Wi-Fi dongle, Particle Photon or SparkFun Blynk Board. But even if you don't have a shield, you can connect it over USB to your laptop or desktop (it's a bit more complicated for newbies, but we got you covered). What's cool is that the list of hardware that works with Blynk is huge and will keep on growing.

2. A Smartphone – The Blynk App is a well-designed interface builder. It works on both iOS and Android.

4.1.3 Downloads

Blynk app can be downloaded from:

- Google Play Store for the Android

Fig. 4.3 – Google Play Store

- Apple Store for the iOS.

Fig. 4.4 – Apple Store

4.1.4 Getting Started with Blynk App

Let's get started with the Blynk App. We will switch on the devices connected to our NodeMCU (ESP8266 Wi-Fi Module) using the Blynk App on our smartphone. A device is connected as shown below:

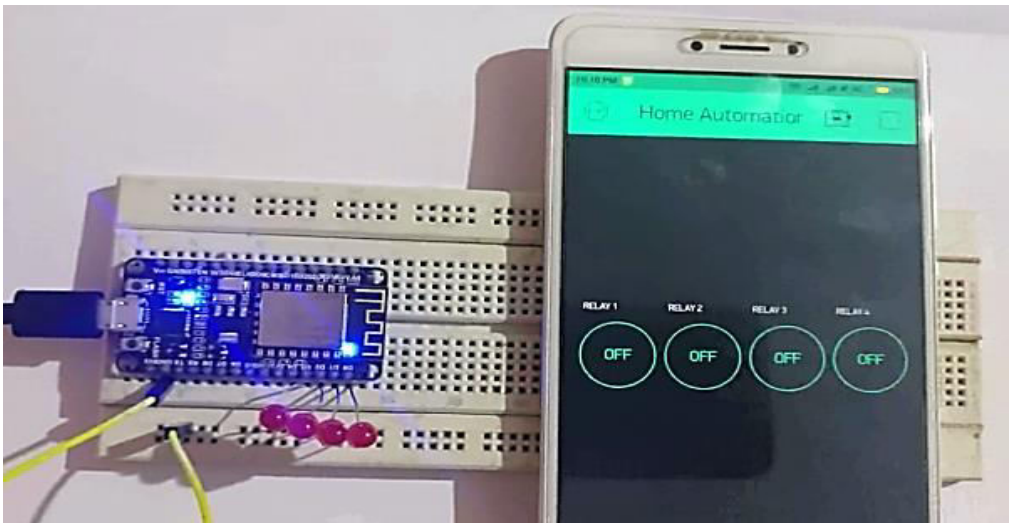


Fig. 4.5 – Device connected with Blynk App

Getting Started with the Blynk Account

1. Create a Blynk Account

After you download the Blynk App, you'll need to create a New Blynk account. This account is separate from the accounts used for the Blynk Forums, in case you already have one.

We recommend using a **real** email address because it will simplify things later.

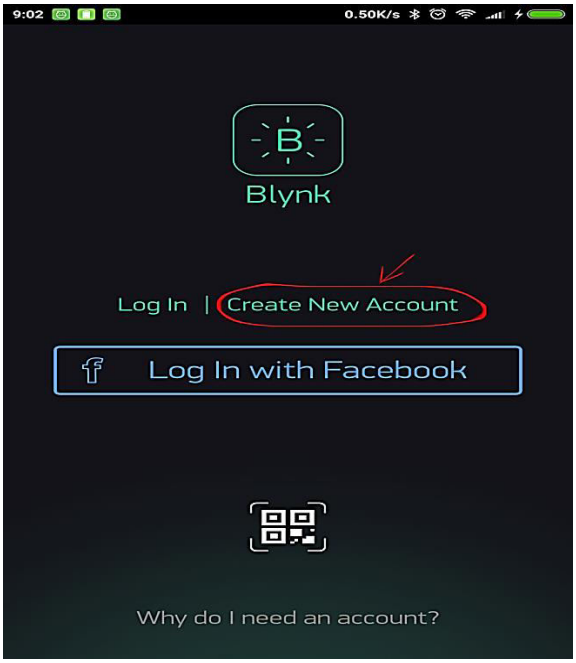


Fig. 4.6 – Create a Blynk Account

Why do I need to create an account?

An account is needed to save your projects and have access to them from multiple devices from anywhere. It's also a security measure.

You can always set up your own Private Blynk Server and have full control.

2. Create a New Project

After you've successfully logged into our account, start by creating a new project.

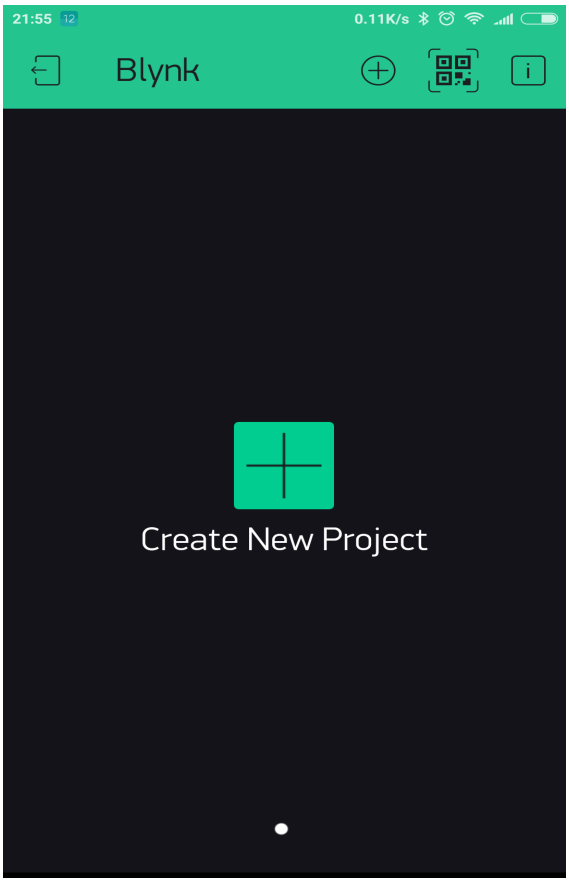


Fig. 4.7 – Create New Project

3. Choose the Hardware

Select the hardware model you will use.

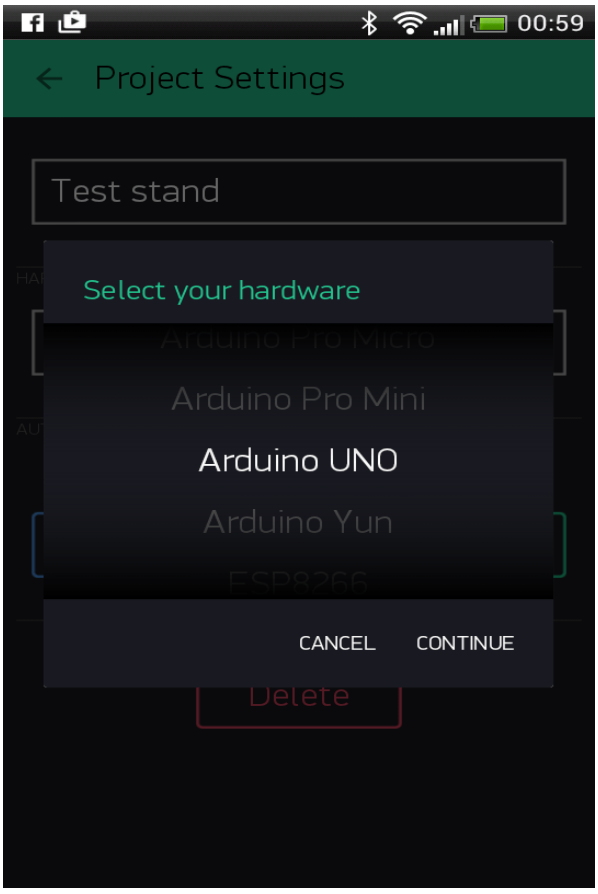


Fig. 4.8 – Hardware chosen for the project

4. Auth Token

Auth Token is a unique identifier which is needed to connect your hardware to your smartphone. Every new project you create will have its own Auth Token. You'll get Auth Token automatically on your email after project creation. You can also copy it manually. Click on devices section and selected required device:

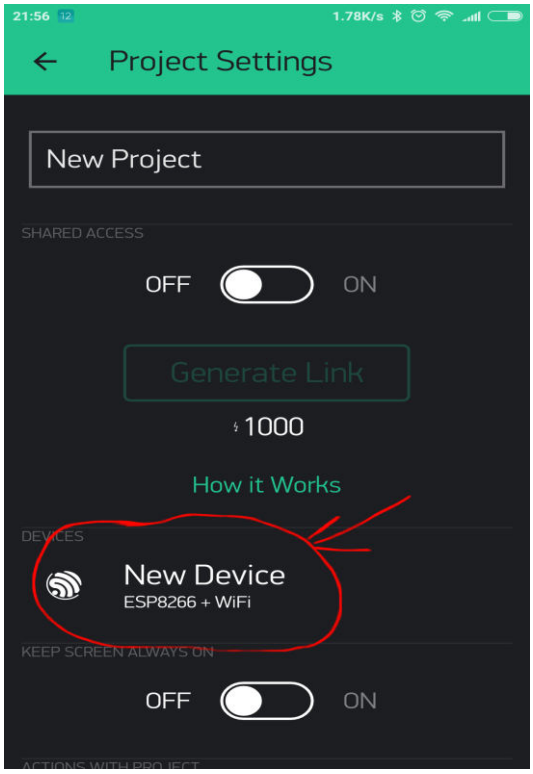


Fig. 4.9 – Auth Token

And you'll see token:

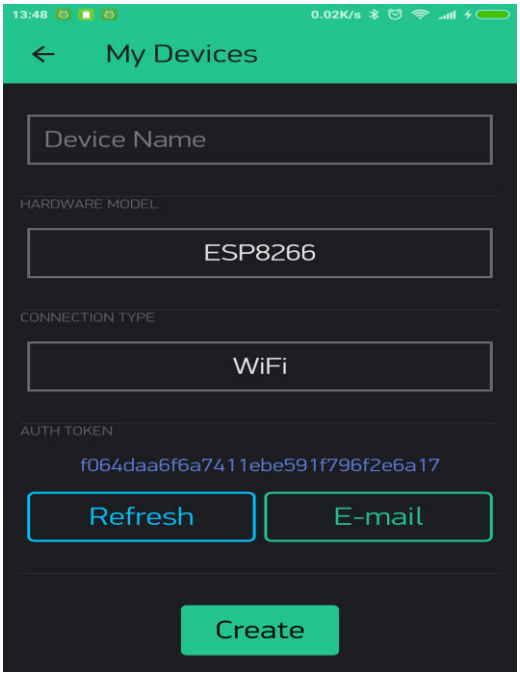


Fig. 4.10 – Getting Auth Token

Note: Don't share your Auth Token with anyone, unless you want someone to have access to your hardware.

It's very convenient to send it over e-mail. Press the e-mail button and the token will be sent to the e-mail address you used for registration. You can also tap on the Token line and it will be copied to the clipboard. Now press the "Create" button.

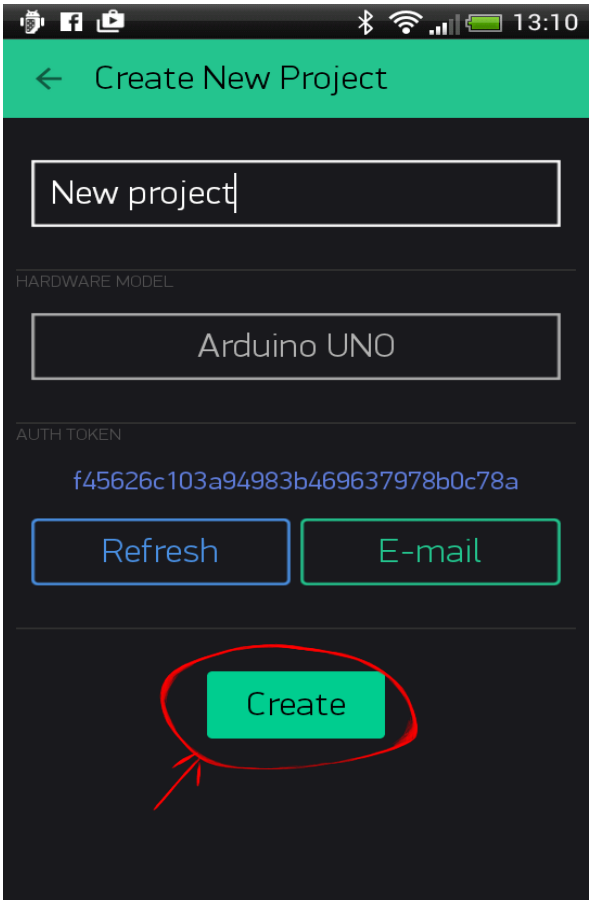


Fig. 4.11 – Create Project

5. Add a Widget

Your project canvas is empty, let's add a button to control our LED.

Tap anywhere on the canvas to open the widget box. All the available widgets are located here. Now pick a button from widget box.

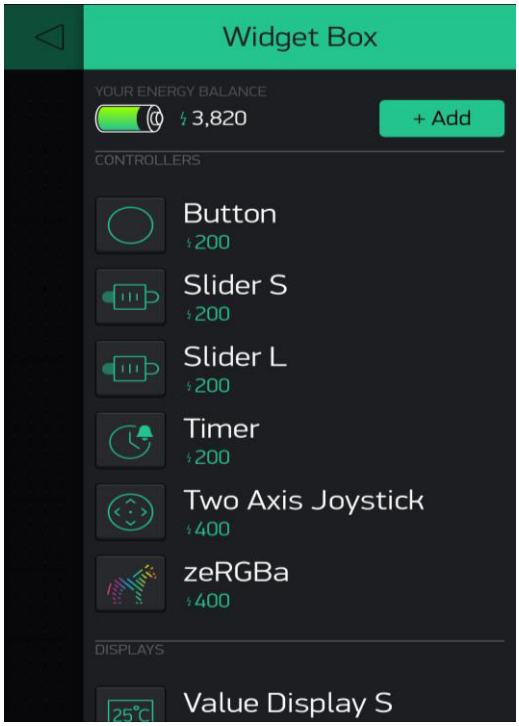


Fig. 4.12 – Widget Box

Drag-n-Drop - Tap and hold the Widget to drag it to the new position.

Widget Settings - Each Widget has its own settings. Tap on the widget to get to them.

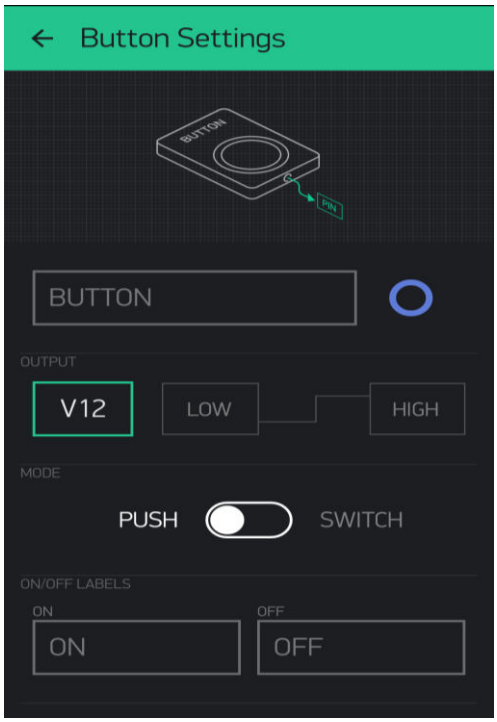


Fig. 4.13 – Widget Settings

The most important parameter to set is **PIN**. The list of pins reflects physical pins defined by your hardware. If your LED is connected to Digital Pin 8 - then select **D8** (**D** - stands for **D**igital).

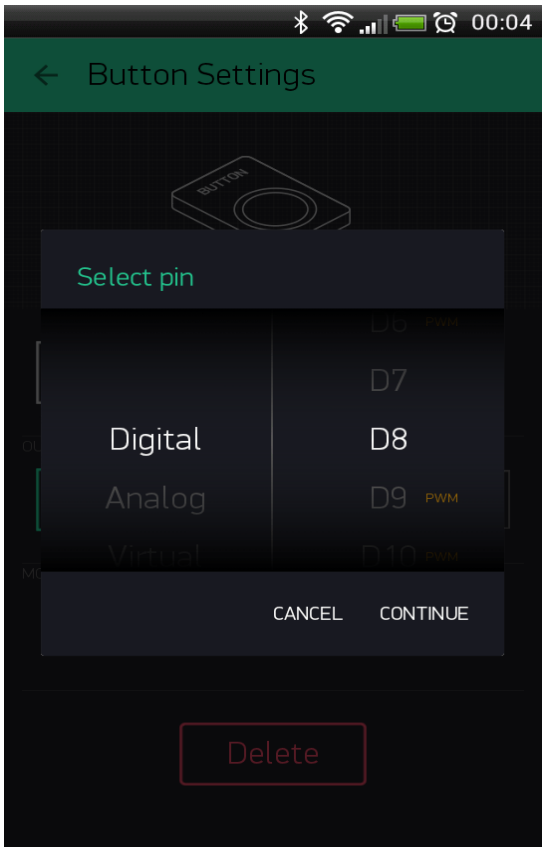


Fig. 4.14 – PIN Selection

6. Run the Project

When you are done with the Settings - press the **PLAY** button. This will switch you from EDIT mode to PLAY mode where you can interact with the hardware. While in PLAY mode, you won't be able to drag or set up new widgets, press **STOP** and get back to EDIT mode.

You will get a message saying "Arduino UNO is offline". We'll deal with that in the next section.

4.2 IFTTT

IFTTT helps you connect all of your different apps and devices. When you sign up for a free account, you can turn on Applets that help your apps and devices work together to do specific things they couldn't do otherwise. For example, you can back up your Instagram photos to Dropbox, have your lights turn on when you enter your home, or automatically remind a Slack channel about a meeting. There are millions of Applets to explore.

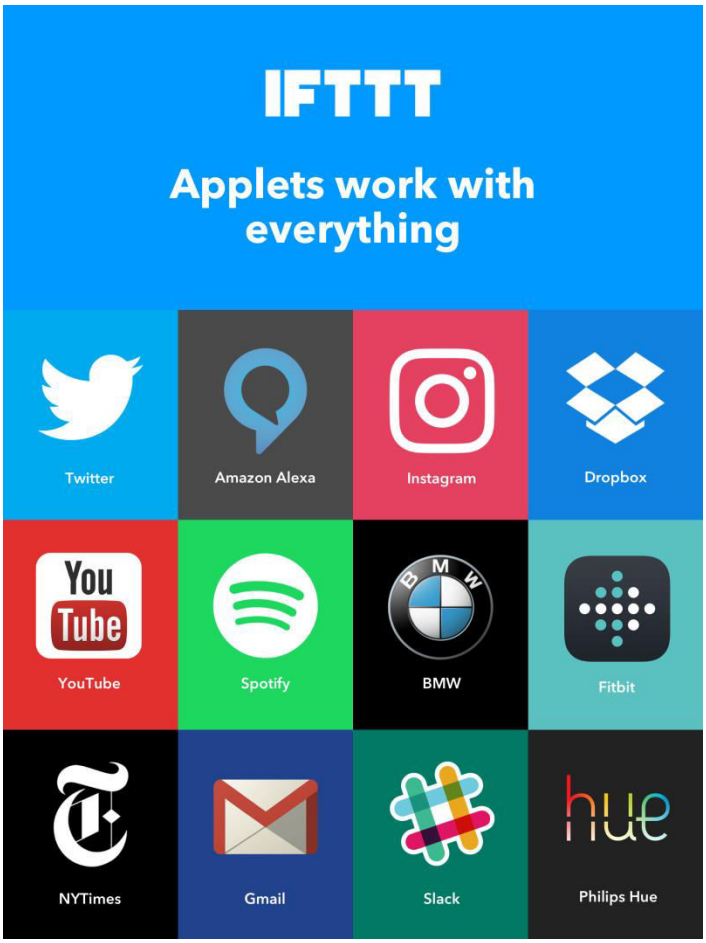


Fig. 4.15 - IFTTT

4.2.1 What is IFTTT?

IFTTT is both a website and a mobile app. The free service launched in 2010 with the following slogan: "Put the Internet to work for you". It's changed a lot in recent years, however. Currently, with IFTTT, you can connect all your "services" together so that tasks are automatically

completed. There are numerous ways you can connect all your services - and the resulting combinations are called "Applets".

Applets essentially automate your daily workflow, whether it's managing smart home devices or apps and websites. So, for instance, if you own the Philips Hue smart lighting system, you could use IFTTT to automatically turn on a light every time you're tagged in a Facebook photo. In another example, you could use IFTTT to automatically email readers when they comment on your WordPress blog.

4.2.2 What does IFTTT stand for?

It pronounces like "gift" but without the "g". The acronym stands for If This, Then That.

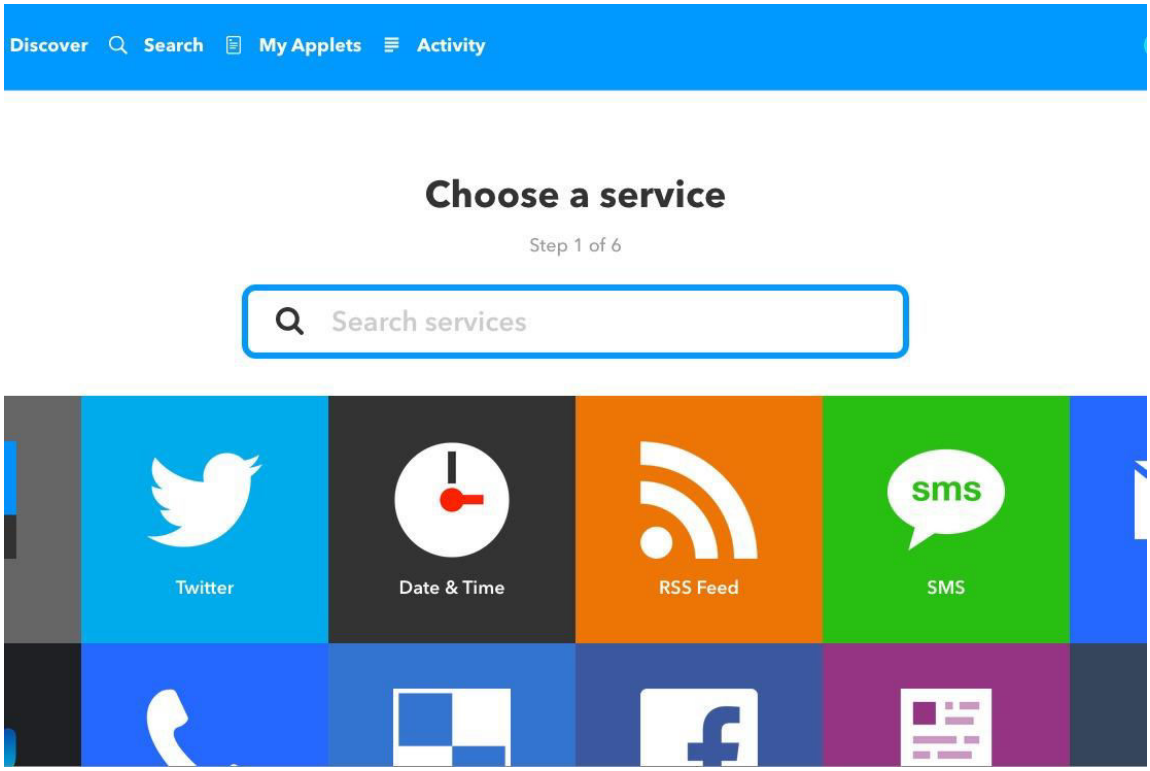


Fig. 4.16 – IFTTT Desktop View

4.2.3 How it Works?

1. Create a free account.

2. Browse the IFTTT website or app to find an Applet that interests you.

3. Click into the Applet and turn it on.

4. Connect the services that are involved in the Applet — this is only so we can use them to run Applets on your behalf.

5. IFTTT provides a layer between different services to only allow them to do what you specifically tell them to do.

6. Find more Applets, and repeat.

4.2.4 What are Applets?

Applets are specific things that can happen when you connect services. For instance, you could use an Applet to sync Amazon Alexa to-dos with your Google Calendar, or you could use one that lets you create events in your iPhone Calendar via Google Assistant. There are tonnes of Applets to choose from; IFTTT says there are 11 million users running more than a billion Applets a month.

4.2.5 How to setup an Applet?

1. Login to IFTTT's website.

2. Go to your username and click services.

3. You may see some auto-generated Applets based on your account information, such as your time zone and email address.

4. Search for an Applet or a service you'd like to find a relevant Applet for, such as Google Assistant.

5. Select one you want to use. For instance, there's an Applet that lets you get started with your relevant Applet.

6. Click the "Turn on" button to turn on the Applet.

7. IFTTT will ask for permission to access both your Google Assistant and Webhooks. Click OK and then authorize access to each service.

8. Once done, you'll be brought back to the turned-on Applet on IFTTT.

9. To view your Applets, select My Applets from the top of your IFTTT dashboard.

4.2.6 How to create an Applet?

1. Login to IFTTT's website.
2. Go to your username and click New Applet.
3. Select the **+**This in the "If This Then That" logo toward the center-top of the page. This will allow you to look for the "trigger" that will tell your Applet when to run.
4. You can then search for and select a service. In this example, we'll use Twitter. You'll need to connect to it and authorize access to your account.
5. You'll then see a choice of triggers. Pick one. In this example, we'll use "New tweet from search". Maybe there's a tech conference happening and you want to collect all the tweets used with that conference's hashtag (like, #CES2018).
6. Now, you need to select the +That in the "If This Then That" logo toward the center-top of the page. This is where you'll specify what you want to happen next.
7. Choose an action service. For instance, you can select the weekly email digest option. This will bundle up all those hashtagged tweets.
8. Review your Applet and click Finish when done.
9. It'll now be live. To view your Applet, select My Applets from the top of your IFTTT dashboard.
10. If you want to change it or reconfigure it, click the gear icon on the Applet's card, adjust the "ingredients", and click save.

4.2.7 What are IFTTT widgets?

Widgets are shortcuts that allow you to run certain Applets with the touch of a button on your iOS or Android device. In order to use them, you need to have the IFTTT app on your phone. After you turn on a widget Applet, you can add it as a icon in your Today screen on iOS, or your home screen on iOS or Android. Step-by-step instructions on how do that are available from IFTTT's Help center.

- **The Camera widget:** Connects your phone's camera to IFTTT and allows you to run Applets when you take photos. When you take a picture through the widget, the Applet will let you send it to a social site, back up to the cloud, or share with team members.
- **The Note widget:** Allows you to write quick notes and run Applets that send them to email, your calendar, Twitter, etc. It's a simple way to add content to a notebook, to-do list, calendar, or even a Spotify playlist.
- **The Button widget:** Connects to other services with Applets and acts as a remote conttrol. You can use it to toggle your lights, log your location, or trigger a phone call.

4.2.8 Managing your widgets in the IFTTT app for iOS and Android

- Tap **Applets**
- Then tap **Settings** in the top left
- Select **widgets**

Tip for iPhones with 3D Touch:

Firmly press the IFTTT app on your home screen for quick access to your widgets, Discover, Search, My Applets and Activity.

Adding new widgets on Android devices

Users on Android Oreo or above (8.0+)

- Users on this version can add widgets within the app.
- Go to the widget applet details screen and press the "Add home screen widget" button to prompt instructions.
- Note that this instruction is handled by the Launcher app, not IFTTT. So it might vary in different Launcher apps.
- You can still use the instructions below to add a widget manually on the home screen as well.

Users on other versions of Android

- Because the Launcher app can be different for different devices, these steps will only work for a subset of them. All of the "stock" Android devices follow this pattern.

- Go to the device home screen.
- Long press any empty space on home screen, this should prompt the widget menu to appear.
- On the widget menu, find IFTTT.
- Long press either “IFTTT Small” or “IFTTT Large”, and drag it to any empty space on home screen to add the widget.

4.3 Google Assistant

4.3.1 What is Google Assistant?

Assistant is Google's voice assistant. At launch, it was an extension of Google Now - designed to be personal - while expanding on Google's existing "OK Google" voice controls. Originally, Google Now smartly pulled out relevant information for you: it knew where you worked, your meetings and travel plans, the sports teams you liked, and what interested you so that it could present you with personal information that mattered.

Google has long killed Google Now, but Assistant very much lives in the same space, fusing these personalised elements with a wide-range of voice control. Google Assistant supports both text or voice entry and is happy to follow the conversation whichever entry method you're using.

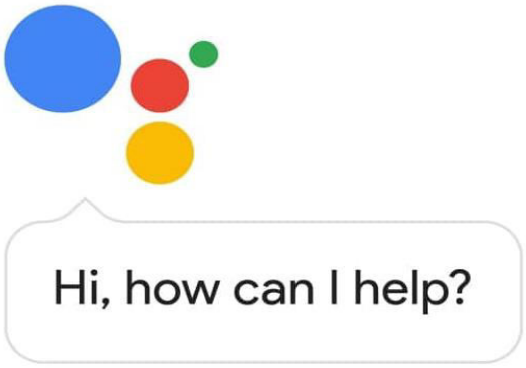


Fig. 4.17 – Google Assistant

4.3.2 What can Google Assistant do?

The "OK Google" or "Hey, Google" side covers voice commands, voice searching, and voice-activated device control, letting you do things like send messages, check appointments and so on

on your Android device, just like Apple's Siri on an iPhone or iPad, but reaching far beyond that, with a bot-centric AI experience, designed to give you conversational interactions.

Google Assistant will:

- control your devices and your smart home
- access information from your calendars and other personal information
- find information online, from restaurant bookings to directions, weather and news
- control your music
- play content on your Chromecast or other compatible devices
- run timers and reminders
- make appointments and send messages
- open apps on your phone
- read your notifications to you
- Real-time spoken translations

Continued Conversation means you don't have to say "Hey Google" for follow-up requests. Instead, once you've started talking to Google, it listens for a response without needing a trigger phrase all the time. Google can also recognise voice profiles for different people, so it knows who is talking to it and can tailor the responses accordingly - something that other systems are also beginning to offer.

You can also ask for multiple things at the same time. This, Google said, is rather difficult. In linguistics, it is called coordination reduction. Mastering requests like this is probably what will power Google Assistant ahead of rivals.

Because Google Assistant knows you and understands context, it can react in an informed or smart way. That's important as Assistant spreads its wings, because it gives voice control a lot more power and moves it on from only reacting to specific phrases or commands. In the future, Google even says that Assistant will be able to call and book appointments for you. It's designed to be more than just reactive.

Other cool features include the ability to check in to your flight (starting first with domestic flights with United Airlines), as well as the ability to book a room with partners like Choice Hotels, Accor Hotels, InterContinental Hotels Group, Price line, Expedia, Mirai, and Travel

click. Google is also adding adding support for Google Keep, Any.do, Bring, and To do list, so you can check your notes and lists with Google Assistant.

We especially like the new Interpreter Mode, which began rolling out in early 2019 to Google Home devices and Smart Displays. With it, you can ask Google Assistant to help you conduct a conversation in dozens of languages. Just say “Hey Google, be my Spanish interpreter” to start Interpreter Mode and get real time spoken and (on Smart Displays) written translation to aid the conversation.

Google Assistant in Google Home devices forms the foundation of smart home control. It's compatible with a wide range of devices, so you can control heating, lights, and a lots more with your voice.

4.3.3 Which devices offer Google Assistant?

Google Assistant launched on the Google Pixel smartphones and Google Home, before expanding to just about all modern Android devices. It's available on Wear OS devices, Android TV and Nvidia Shield, plus Android Auto.

Google Assistant is native to Google Home smart speakers, but it's also widely available on other smart speakers from third-party manufacturers; devices like Philips Hue can be controlled by Google Assistant and not just through Google Home, but wherever you happen to interact with Assistant. Assistant is truly everywhere at this point, walking a path that's very similar to Amazon's Alexa.

4.3.4 What is Google Assistant Connect?

Google recently launched a preview of Google Assistant Connect.

This is a platform that device manufacturers can use to bring the Google Assistant into devices more easily and cheaply. For consumers, that means you should see different types of smart devices coming soon. For example, Google said a partner could create an e-ink display that projects the weather or your calendar, while using Assistant Connect to deliver content from your linked smart speaker.

Google Assistant will handle the so-called "higher-order computing" -- knowing what’s on the calendar, checking for updates, etc.

4.3.5 Google Assistant on phones

Google expanding its Google Assistant service in 2017 so that it would be available on more mobile devices. That saw the roll-out of Assistant to most Android phones, with all recent launches offering the AI system. Even devices that offer another AI system, like Samsung's Bixby, also offer Google Assistant. Essentially, if your phone has Android, your phone has Google Assistant, so the user base for Google Assistant is huge.

One cool new feature is the ability to - after opting-in through your settings - have Assistant respond to you even when your Android phone is locked. You can also opt in to see answers to personal queries. This is feature is coming to all Android devices in early 2019.

Google Assistant is also available on the iPhone, although there are some restrictions. So, Google Assistant is no longer the preserve of Pixel phones; it's something that all Android users and even iOS users can enjoy.

4.3.6 How do I know if my phone has Google Assistant?

To check if your phone has Google Assistant, say "OK Google" or press-and-hold the home button. That's the starting point for Assistant, after which you can type or speak and have Assistant respond. Usually, during the set-up of an Android, you'll be prompted to configure Assistant.

4.3.7 Google Home devices

Google Home is the company's direct competitor to the Amazon Echo. Google Home is essentially a Chromecast-enabled speaker that serves as a voice-controlled assistant. It's the first port of call for Google Assistant in the home and likely to be the first device that people think of. There's an expanding ecosystem, however, with three other devices currently available, including a new Google Home Hub with a display.

You can ask it to do anything you'd ask Assistant to do on Android phones, but moving into the home really put that emphasis on other services and functions, like smart home control, compatibility with Chromecast to send movies to your TV, and a whole lot more. Google Home is a growing ecosystem of devices.

4.3.8 Smart home devices and appliances

As we've mentioned, a lot of connected devices are now compatible with Google Assistant, from little lightbulbs to massive fridges and everything else between. Assistant works with over 1,600 home automation brands and more than 10,000 devices. And, at CES 2019, Google announced new smart home device would arrive from Whirlpool connected appliances, GE's smart microwave, and August security products.

There's a full list of Google Assistant partners here, but here's a rundown of some of the important compatible devices:

- Canary
- Hive
- Honeywell
- iRobot
- LG appliances
- Logitech
- Nest
- Netatmo
- Osram
- Philips Hue
- Ring
- Samsung SmartThings
- Tado
- TP-Link
- WeMo
- Whirlpool

These devices can be controlled by Google Assistant, meaning you can turn lights and switches on and off. You can change the heating or get an alert that your cleaning is done or a washing cycle is finished. Google Assistant is also compatible with IFTTT, so custom recipes can be created. As we've said before, you also don't need to be talking to Google Home; you can use Assistant on your phone to interact. It really is powerful.

4.3.9 Google Assistant vs Amazon Alexa

This is always the big question: Which is better - Assistant or Amazon Alexa?

Both these platforms go head-to-head, offering similar devices as well as similar functions. The ambitions are generally the same, to be a cross-device personal assistant. Google has an obvious advantage when it comes to Android: it knows who you are, what you search for, your friends, browsing habits, the content of your calendar and where you go, all thanks to the sort of data living in Android.

Alexa, on the other hand, knows what you buy on Amazon.

But that Android advantage extends further. It's baked into the OS of many phones (not iPhone users), so you have Google Assistant with you all the time. Amazon Alexa has the smartphone app, but it's not as integrated into phones.

Google Assistant feels at home on a phone, with access to more functions around the phone - like launching apps. Google has hotword support on phones, too, while Alexa hotword support on phones is limited to some HTC and Huawei devices and Amazon's own Fire tablets.

When it comes to support, Alexa feels like it has more partnerships and hardware.

But, Google is smarter in dealing with basic functions: Alexa needs to know which light to turn on and off, specifically, while Google will just let you turn everything on or off without needing a group setting up or devices to be named.

Google is also better a routing out information, often giving you better search results. On a phone, naturally, finding address and navigation is a core skill. Alexa will find addresses and report on traffic, but that's not quite the same as getting access to real navigation and maps.

Again, the smartphone advantage gives Google an edge here.

But when it comes to home tasks, like playing music or working with those compatible devices, the experience is very close - and some degree of personal preference will come into it. Amazon has the edge with devices (there's greater variety in Echo and the system in one step ahead, with Google currently playing catch-up), and talking to Alexa feels nicer than talking to Google. It's a more comfortable expression.

CHAPTER – 5

Source Code

The programming done to fulfill the purpose of this project, the following line of codes is embedded into the microcontroller. Embedded C is the programming language used.

Source code of NodeMCU ESP8266 interfacing with Arduino IDE:-

```
#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[] = "24f8aafd279d40bdbf5bd949f2f834bb";
// Your WiFi credentials.
// Set password to "" for open networks.
char ssid[] = "Rajnandani";
char pass[] = "123456789";
void setup()
{
  // Debug console
  Serial.begin(9600);
  Blynk.begin(auth, ssid, pass);
}
void loop()
{
  Blynk.run();
}
```

CHAPTER – 6

Flowchart

Flowchart of a project describes the sequence and the flow of the operations carried out in the project. In this project of Voice Operated Home Automation using IOT the operation starts with the command message from a Google Assistant enabled handset which is given by user, this message is generally a predefined command known to the user.

The flowchart of the project Voice Operated Home Automation using IOT is given in Figure 6.1.

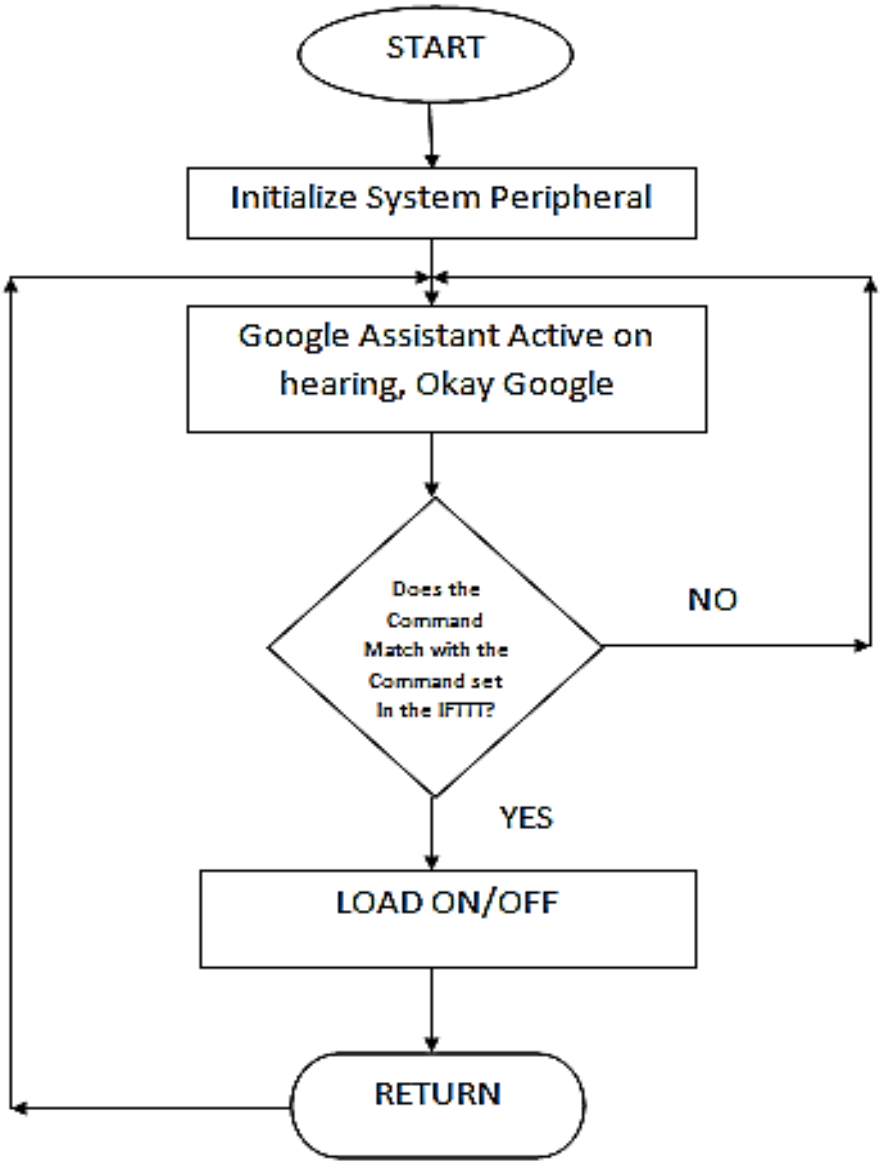


Fig. 6.1 – Flowchart of Voice Operated Home Automation using IOT

In this project of Voice Operated Home Automation using IOT the operation starts with the command message from a Google Assistant enabled handset which is given by user and afterwards the sequence of operations are as follows:

a. The Home Automation is operating with NodeMCU ESP8266 controller and the command is given by the Google Assistant in a mobile phone using the IFTTT webhooks.

b. The NodeMCU ESP8266 has inbuilt Wi-Fi module and the devices connected with Home Automation.

c. The IFTTT webhooks and NodeMCU ESP8266 are connected with an authentication token generated by Blynk Android Application.

d. If the command set in IFTTT matches, the NodeMCU ESP8266 will transmit command using wifi to the electrical equipments connected with the relay and connectors upon the required condition.

e. If the command set in IFTTT does not match, the NodeMCU ESP8266 will not transmit any command to the electrical equipments.

f. After the electrical equipment is ON, it will get OFF when the set command in IFTTT will match again with the same process.

CHAPTER – 7

Breadboard Implementation

7.1 What is Breadboard?

A breadboard is used to build and test circuit quickly before finalizing in a circuit design. The breadboard has many holes into which circuit components like ICs, resistors, diodes and leds can be inserted.

The name of the breadboard comes from the early days of electronics, when people would exactly drive screws into boards on which they cut board in order to place the components. A breadboard is made with a plastic material in a rectangular shape with a huge number of tiny holes. These holes let you simply place the electronic components to build an electronic circuit which is assembled with various components. The connections on the breadboard are not stable, so it is very simple to remove a component if you make a wrong connection. Breadboards are very great for beginners who are new to electronics. By using this, you can make different electronic projects.

7.2 Steps to Building a Project on Breadboard Circuit

Breadboard is used to design various electrical and electronics projects in less time without soldering. But in the field of electronics, there are many students or beginners are facing lot of problems because they cannot solder the components cleanly on the PCBs. The joint of one bad solder can cause the project damage. When the project doesn't work properly, they generally lose their confidence and stop to continue designing projects.

In module implementation we successfully implemented the complete project and a picture of breadboard of this project is shown in fig.7.1 followed. The entire circuit can be easily assembled on a general purpose P.C.B. board respectively. Layout of desire diagram and preparation is first and most important operation in any printed circuit board manufacturing process. First of all layout of component side is to be made in accordance with available components dimensions.

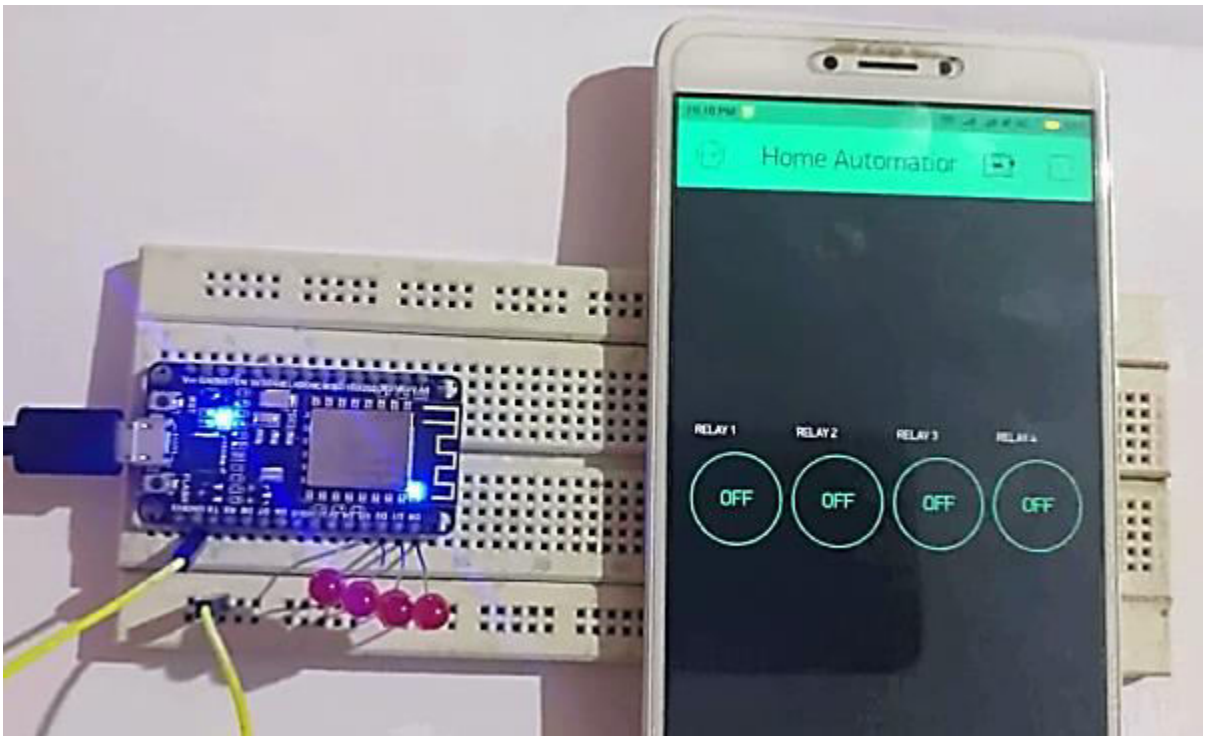


Fig. 7.1 – Circuit implementation on Breadboard

CHAPTER – 8

PCB Layout Details

A printed circuit board or PCB is used to mechanically support and electrically connect electronic components using conductive pathways, tracks or signal traces etched from copper sheets laminated onto a non-conductive substrate. The size of the PCB used in the project is 10cm x 10cm. Dip trace PCB software is used for designing the layout of any circuit. The circuit is then printed on the board which is further processed for etching and drilling etc.

8.1 Dip Trace Software

DipTrace is an EDA/CAD software for creating schematic diagrams and printed circuit boards. DipTrace has 4 modules:

- Schematic capture editor
- PCB layout editor
- 3D-preview & export
- Component editor and Pattern editor

Basic Features:

- Simple user interface
- Multi-sheet and hierarchical schematics
- High-speed and differential signal routing
- Smart manual routing modes
- Wide import/export capabilities
- High-speed shape-based auto router
- Real-time 3D PCB preview
- Export of PCB to STEP 3D file format

8.2 PCB Layout

The PCB layout is a mirrored positive one –black on white, mirrored as viewed from the Silkscreen top (component) side. The PCB layout is printed 1:1 on paper by means of a laser printer or copier machine. The PCB layout of the project, Solder Side is given in figure 8.1

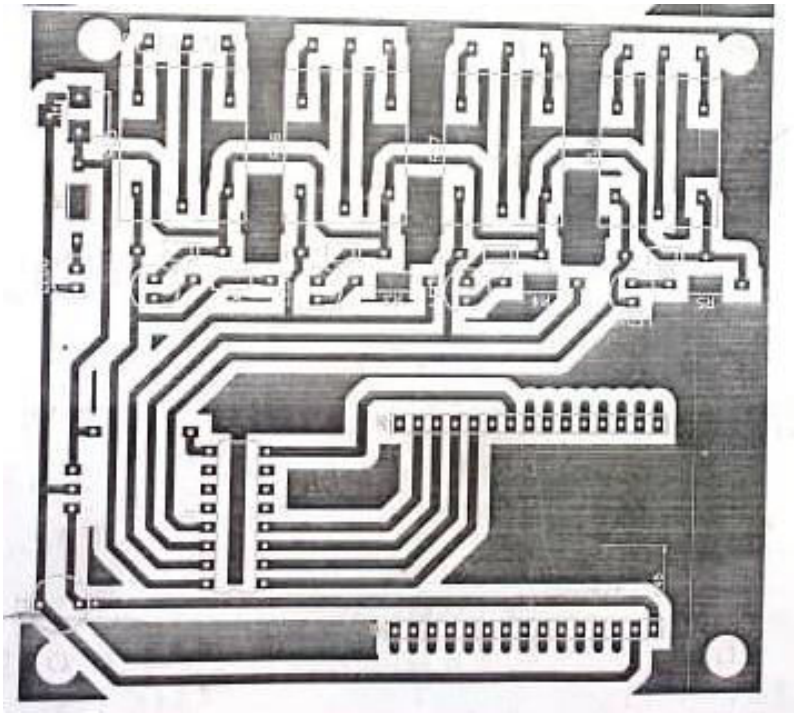


Fig. 8.1 – PCB Layout

CHAPTER – 9

Testing

The most and important phase in the project is Testing. There is a vast difference between the theoretical and practical aspects of the project. Once the project is made, it is repeatedly tested to determine its parameter such as operating voltage, current flowing in the project, and frequency of operation and specification of the components used. The practical values of the parameters are always less than the theoretical values decided to achieve during the designing phase of the project.

During testing it is checked whether the project is working or not, whether it is satisfying the given requirement or not, if it is not giving satisfactory results, the troubleshooting is performed. In troubleshooting, the fault inside the project is to be found out. The fault may be short-circuiting between two connection, loose connections, improper soldering, loose mounting of the ICs, improper placing of the resistors, contact of two or more wires with each other, wrong polarity of capacitors etc.

After the fault is detected, it is fixed and tested again. This process goes on until the satisfactory output is achieved. Once the satisfactory outcomes come, it is tested finally and the whole project is arranged in a proper manner on PCB.

In our project, Voice Operated Home Automation using NodeMCU, we come across several faults and mistakes committed by us during the designing the project. The first issue was related with the wrong polarity of capacitors. Another one was the improper power supply, but after proper testing, the mistake was corrected.

During testing the voltage at all the points was measured and correction was made to reach near the ideal value. The V.O.H.A. was tested with the triggering command and the working of LED was verified.

CHAPTER – 10

Result and Conclusion

At the end, the result can be taken out about the project of Voice Operated Home Automation, the following result and conclusion can be drawn about the project, Voice Operated Home Automation using NodeMCU:-

- The Voice Operated Home Automation system using NodeMCU is able to produce the required automation.
- This device can switch on or off by the user by voice from google assistance enabled handset.
- It possesses the basic features of the Home and Industry level Voice operated automation using NodeMCU.
- **S**ave man power.
- Efficient with lesser power.
- Time saving.
- Accurate.
- Precise.

From this study, a Voice Operated Home Automation system using NodeMCU that achieved the stated objectives had been developed.

- This system can be used to control our home appliances ass well
- Continuous monitoring system of appliances
- Reduces the wastage of electricity
- Can be operated from any place in the world
- Utilized for automation purpose

With the use of this technique, we can reduce electricity consumption. We will have great saving of the electricity.

CHAPTER – 11

Shortcomings and Limitations

Although the concept and design of the project seemed perfect, there were some problems faced while actual implementation.

The project was started by making power supply. That was easy but when the main circuit was implemented, there were many problems and issues related to it, like component selection, which component is better than other and its feature and cost wise etc. there were soldering related issue also which were resolved using continuity checks performed on the hardware.

- The shortcoming started from the power supply. There was the first trouble. After getting 9V from the transformer it was not converted to 5V and the circuit received 9V. As the solder was shorted an IC got burnt. So we replace the IC also the circuit part were completely damaged with the help of the solder we made the necessary path.
- After the burning code into the NodeMCU, it behaves vague at times. The NodeMCU required reset for proper performing.
- Apart from all the above limitation and shortcomings, the project, Voice Operated Home Automation system using NodeMCU is suitable for daily use with some minor modification.

CHAPTER – 12

Future Scope and Application

12.1 Future Scope

The goal of this project is to develop a home automation system that gives the user complete control over all remotely controllable aspects of his or her home.

The automation system will have the ability to be controlled from a central host PC, the Internet, and also remotely accessed via a Pocket PC with a Windows Mobile based application.

The System will also sense the Accidental Gas leakage, water level and will notify the user by SMS.

Day by day, the field of automation is blooming and these systems are having great impact on human beings. The project which is to be implemented is a home automation using Easy IOT Webserver and WIFI and has very good future development.

In the current system webserver is installed on a windows PC so the home appliances can be controlled using only by using the device on which webserver is installed. This can be further developed installing webserver on cloud.

Advantage of installing webserver on the cloud is that home can be controlled by using any device which has WIFI 802.1 and a web browser. By visiting the IP address of the cloud the control actions can be taken.

12.2 Applications

- Turning lights down/off at night
- Operating outside lights
- Turning lights or radio on / off when someone approaches the house, simulating occupancy
- Operating television, hot water heater, kettle, toaster etc. ready for your use.
- Optimizing use of low cost electricity.
- Working with intelligent electrical white goods e.g. washing machine, fridge, microwave etc.

CHAPTER – 13

Literature Survey

13.1 Review of Related Literature

When people think about home automation, most of them may imagine living in a smart home: One remote controller for every household appliance, cooking the rice automatically, starting air conditioner automatically, heating water for bath automatically and shading the window automatically during night. To some extent home automation equals to smart home. They both bring out smart living condition and make our life more convenient and fast. Early home automation began with labor-saving machines. Self-contained electric or gas powered home appliance became viable in the 1900s with the introduction of electric power distribution led to the introduction of washing machine (1904), water heater (1889), refrigerator, sewing machines, dishwashers and clothes dryers. As per our survey currently there exists system neither at cheaper rates nor easy to handle. Various systems are hard to install, difficult to use and maintain. Current systems are generally proprietary, closed and not very user friendly Based on Arduino or GSM or low cost home security system and home automation system.

13.2 Review of Foreign Study

In their paper, Tan, Lee and Soh (2002) proposed the development of an Internet-based system to allow monitoring of important process variables from a distributed control system (DCS). This paper proposes hardware and software design considerations which enable the user to access the process variables on the DCS, remotely and effectively rent designations.

Potamitis, Georgila, Fakotakis, and Kokkinoss, G. (2003) suggested the use of speech to interact remotely with the home appliances to perform a particular action on behalf of the user. The approach is inclined for people with disability to perform real-life operations at home by directing appliances through speech. Voice separation strategy is selected to take appropriate decision by speech recognition.

In the year 2006, S. M. AnamulHaque, S. M. Kamruzzaman and Md. Ashraful Islam proposed a system entitled “A System for Smart-Home Control of Appliances Based on Time and Speech Interaction” that controls the home appliances using the personal computer. This system is developed by using the Visual Basic 6.0 as programming language and Microsoft voice engine

tools for speech recognition purpose. Appliances can be either controlled by timer or by voice command.

Ciubotaru-Petrescu, Chiciudean, Cioarga, and Stanescu (2006) present a design and implementation of SMS based control for monitoring systems. The paper has three modules involving sensing unit for monitoring the complex applications. A processing unit, that is microcontroller and a communication module that uses GPRS modem or cell phone via serial port RS-232. The SMS is used for status reporting such as power failure.

Jawarkar, Ahmed, Ladhake, and Thakare (2008) propose remote monitoring through mobile phone involving the use of spoken commands. The spoken commands are generated and sent in the form of text SMS to the control system and then the microcontroller on the basis of SMS takes a decision of a particular task.

Prof. Era Johri Department of Information and Technology K.J.Somaiya College of Engineering VIDYAVIHAR, MUMBAI in (2001) have successfully completed the project on “Remote Controlled Home Automation”.

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5. **Webhooks:** https://webhooks.pbworks.com/w/page/13385124/FrontPage
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ANNEXURE-1

Project Cost

S. No.	Component	Component Details	References designation	Quantity	Price (Rs.)
1.	NodeMCU + Base	Wi-Fi Module	ESP8266	1	280+5
2.	Relay driver + Base	5V	ULN2003A	1+1	15+3
3.	DC Socket	12V	3 pin	1	10
4.	Capacitor	Electrolytic 1000 microf, 25V	C	1	5
5.	Resistor	10K, 1K	R	5	5
6.	Diode	4007	D	4	4
7.	Led	12v dc	L	5	5
8.	PCB	Copper Coated PCB		1	50
9.	Voltage Regulator	5V	7805 IC	1	5
10.	Relay Switch	12V	Relay	4	60
11.	Connectors			4	20
				Total Cost	467/-