

## Implementation of Home Automation using Google Assistant

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### Abstract

World's demand for energy had grown 85% between 2010 and 2018 and the demand of electricity will grow at very high rate. The use of electricity will grow continuously but the wastage of electricity can be minimized by turning off our appliances at home or office that are not in use. This paper presents a proposal for home automation using voice communication over Google Assistant. The cost of entire system is very less as compared to other system of home automation. It costs around One thousand four hundred rupees (INR) which is approximately equals to 25\$(USD). The system is basically works on Internet-of-Things (IOT) and revolves around a hardware component NodeMCU (ESP-8266) which is used to connect with Internet. Other major part of system is software component which is used to communicate between microcontroller and application over means of communication as Internet(Wi-Fi). Thus it is achieved by utilizing the open source API of Google Assistant developed by Google Inc.

**Keywords:** Arduino IDE, Blynk App, Google Assistant, NodeMCU(ESP-8266), IFTTT App (If That Than That).

### 1. INTRODUCTION

Home automation is building automation for a home, called a smart home or smart house. A home automation system will control lighting, climate, entertainment systems, ventilation and appliances. Home Automation is also named as domestics or smart home. Wi-Fi is often used for remote monitoring control. The implementation of the system deals with the use of internet to control home-appliances. The purpose of this device is to reduce the effort put by user to control a device manually by using Google Assistant SDK provided by Google. The user gives real-voice commands to control appliances through their smartphones. The main concept behind the developing this system is that internet connectivity increased at a tremendous rate due to development of 4G-LTE Technology and use of smartphone also increases due to which it is easy to control device through any part of the world. But, now it will exist in range of Wi-Fi-network coverage is present. This supports a wide-range of home automation devices like power management and security components. Home, it is the place where one fancies or desires to be after a long tiring day. People come home exhausted after a long hard working 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 homelier. Modern systems generally consist 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.

## II. SYSTEM DESIGN AND IMPLEMENTATION

The system design consists of two main components-

- 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, all components are connected with help of jumper cables and electric wires.
- ii. The Software- The Blynk app, the IFTTT app, Arduino IDE and the Google Assistant constitute the software of the design and these applications would be integrated in the Android device. The Control

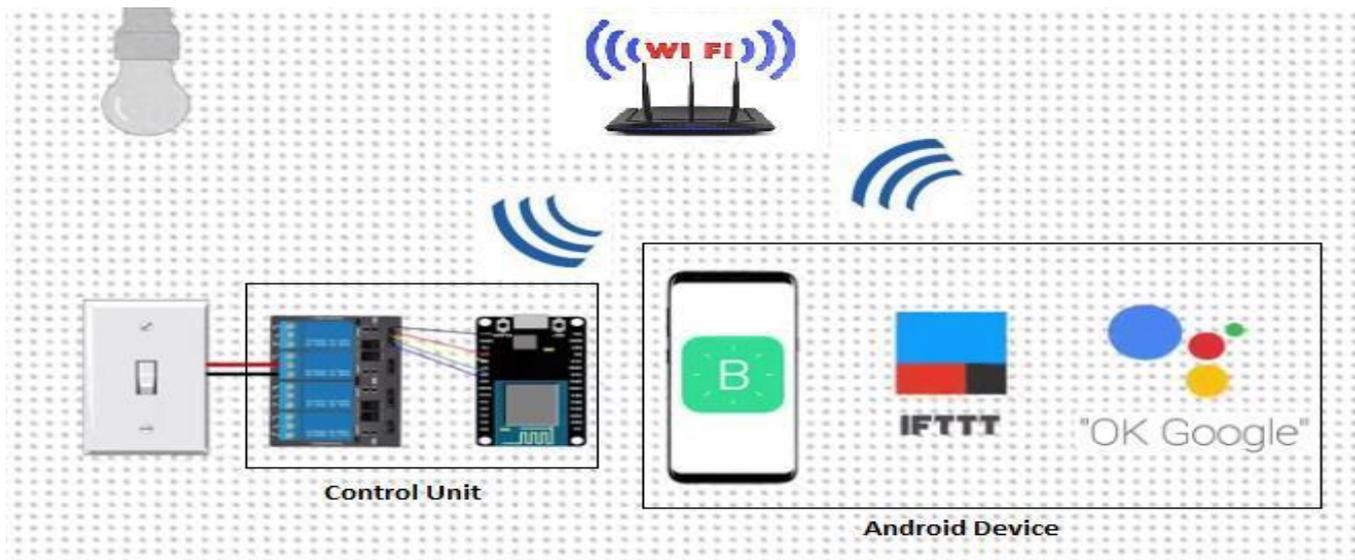
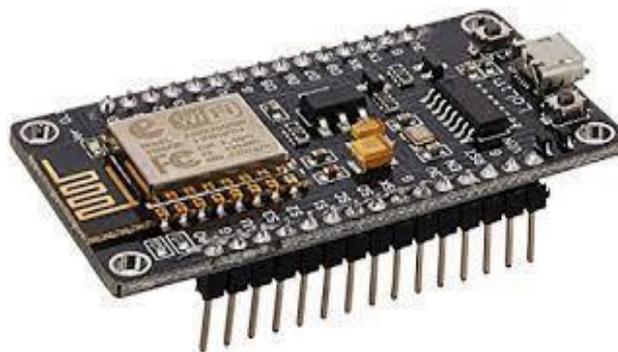


Fig 1. Basic System Architecture of Home Automation System

## III. Hardware Components: -

### 3.1 ESP8266

The ESP8266 is a low cost Wi-Fi chip with full TCP/IP stack and microcontroller unit. This small module allows microcontroller to connect to a Wi-Fi network and make simple TCP/IP connection using Hayes style commands, The ESP8266 with 1MiB of built in flash, allowing for single chip device capable of connecting to Wi-Fi. Fig 3.4 shows the ESP8266 module structure.



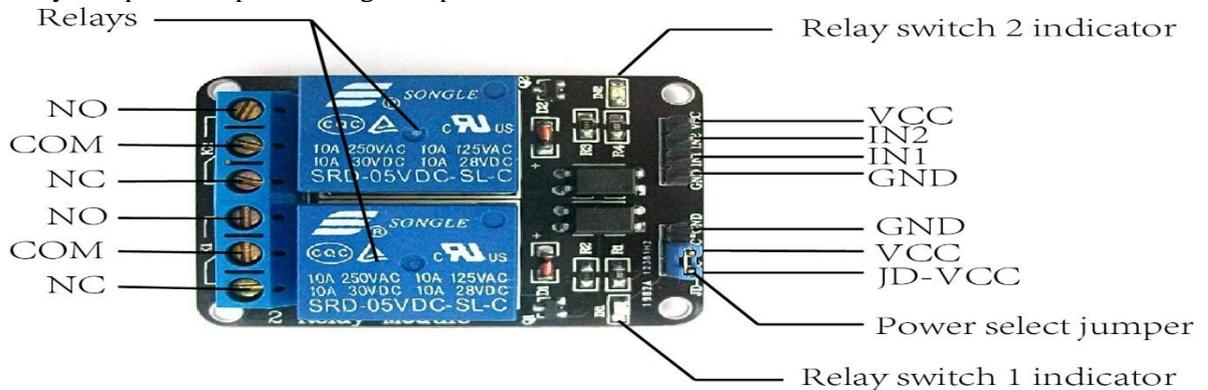


D0(GPIO16) can only be used as gpio read/write, no interrupt supported, no pwm/i2c/iw supported.

**Fig 2. Pin diagram explanation of NodeMCU 8266**

**3.2 Relay Board**

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 were used extensively in telephone exchange and early computers to perform logical operation.



**Fig 3. Relay Board**

**3.3 Breadboard Module Module**

A breadboard is a construction base for prototyping of electronics. Originally it was literally a bread board, a polished piece of wood used for slicing bread. In the 1970s the solderless breadboard (plug board, a terminal array board) became available and nowadays the term "breadboard" is commonly used to refer to these. Because the solderless breadboard does not require soldering, it is reusable. This makes it easy to use for creating temporary prototypes and experimenting with circuit design. It is the one common used component for electronics and electrical laboratories.

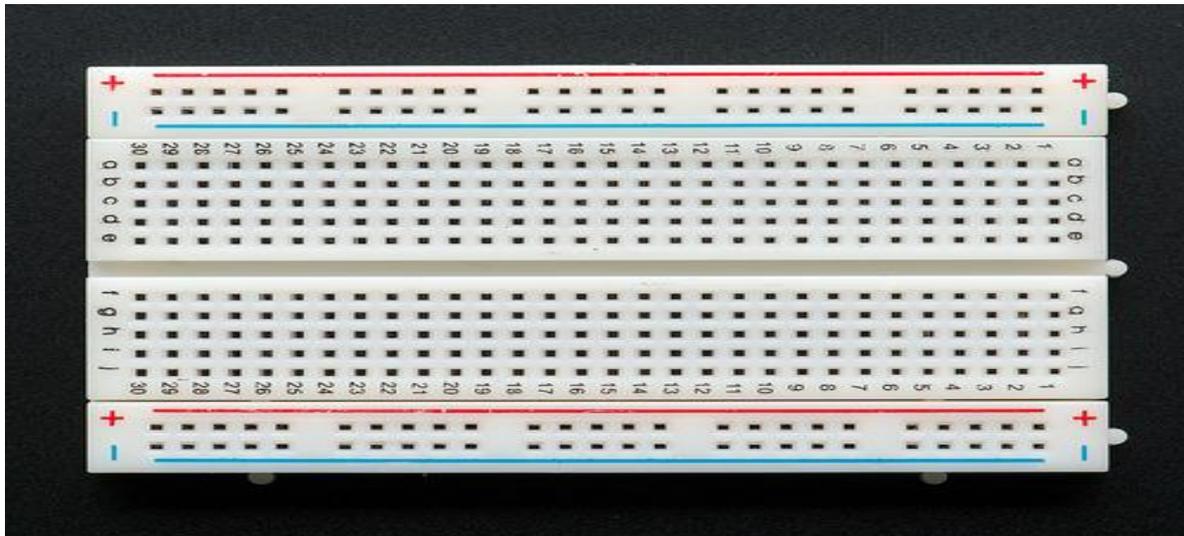


Fig 4. Bread Board Module

### 3.4 Bread-board Power Supply Module

This is a 3.3V/5V MB102 Breadboard Power Supply Module which provides a dual 5 V and 3.3 V power rails and has a multi-purpose female USB socket. The 3.3V/5V MB102 Breadboard Power Supply Module securely fits in a standard 400 or 800 tie points breadboard it also features reverse polarity protection, the module can take 6.5V to 12V input and can produce 3.3V and +5V. The module can also output 5V on USB connector or input through USB connector. It's a must-have product for experimenters those have to test/prototype electronic circuits on the breadboard.



Fig 5. Bread Board Power Supply Module

## 4. Software Components

### 4.1 Arduino IDE

The Arduino integrated development environment is a cross-platform application for different operating systems that is written in the programming language Java, C or C++. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards. The source code for the IDE is released under the General Public License GNU, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software company from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub *main ()* into an executable cyclic executive program with the GNU toolchain also included with the IDE distribution. The Arduino IDE employs the program *argued* to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

```

ESP8266_Standalone | Arduino 1.8.5
File Edit Sketch Tools Help
ESP8266_Standalone $
#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[] = "2e087b25a814476d94df819ea5f30989";

// Your WiFi credentials.
// Set password to "" for open networks.
char ssid[] = "Blhostel";
char pass[] = "aedpi3829n";

void setup()
{
  // Debug console
  Serial.begin(9600);
  // Begin Check WIFI connection
  Serial.println();
  Serial.print("Wifi connecting to ");
  Serial.println( ssid );
  
```

Fig.6 Code-snippets of Arduino IDE

#### 4.2 Blynk IOT Platform

Blynk is a Platform with iOS and Android apps to control Arduino, Raspberry Pi and the likes over the Internet. It's a digital dashboard where you can build a graphic interface for your project by simply dragging and dropping widgets. By this platform we have connected android with other components.

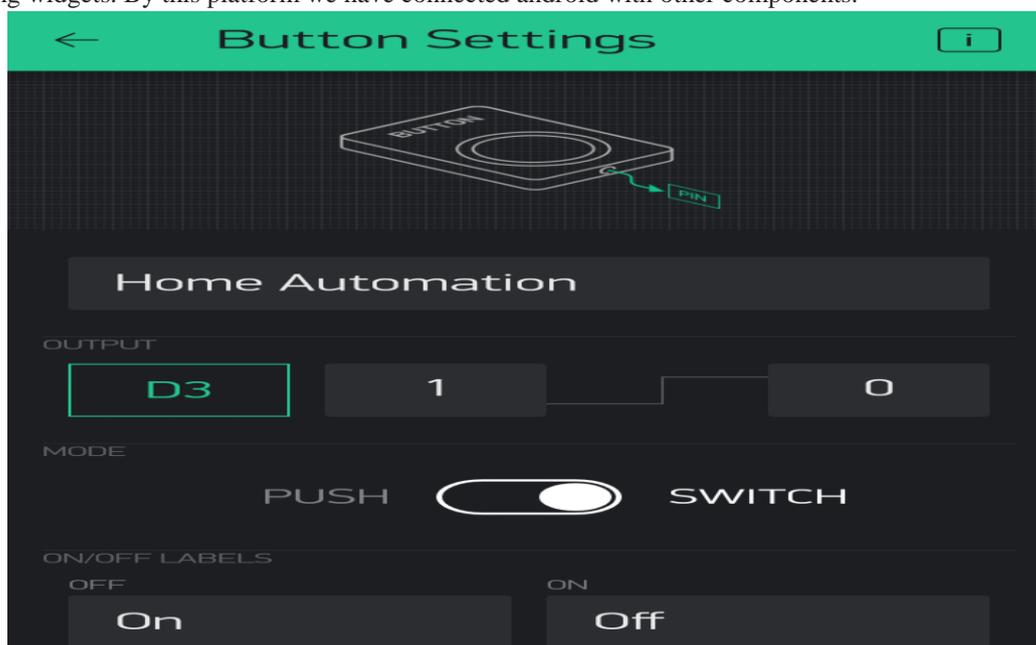


Fig 7. Snippet of Blynk IOT Platform

#### 4.3 IFTTT APPLICATION

IFTTT 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 favorite 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 Goggle Assistant can also be typed in as desired.

#### 4.4 Google Assistant

Google Assistant is an artificial intelligent powered virtual assistant developed by Google that is primarily available on mobile and smart home devices. Unlike the company's previous virtual assistant, Google Now Google Assistant can engage in two-way conversations. Users primarily interact with Google Assistant through natural voice, though keyboard input is also supported. In the same nature and manner as Google Now, the Assistant is able to search the Internet, schedule events and alarms, adjust hardware settings on the user's device, and show information from the user's Google account. Google has also announced that the Assistant will be able to identify objects and gather visual information through the device's camera, and support purchasing products and sending money, as well as identifying songs.

### 5. Result

The result was positive and the system responded well. The photographs below show the complete prototype implementation of the proposed system. On giving the voice command in mobile phone on google assistant as "Turn On the lights" the light bulb glows and for reversal action instruction on phone given as "Turn off the lights!" and light bulb turned off automatically.



Fig 8. Light turned ON and hardware set-up

### 5. Conclusion and Future Work

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 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 better.

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