

# Home Automation using Google Assistant

## Aavishkar'18

Shashi Kumar Fagna (B17141) \*, Vipul Sharma (B17069)<sup>†</sup>, Manpreet Singh (B17091) <sup>‡</sup>,  
Toshendra Rustagi (B17147) <sup>§</sup>, Neeraj Sharma (B17050) <sup>¶</sup>  
(\* B17141 , <sup>†</sup> B17069 , <sup>‡</sup> B17091 , <sup>§</sup> B17147 , <sup>¶</sup> B17050) @students.iitmandi.ac.in

**Abstract**—In this project, we are making a product used for Home Automation using Google Assistant. Generally, we see that while installing Google Home cost a lot of money but we have reduce the cost making it accessible to everyone. The Google Assistant recognizes the speech of a person and converts it into a phrase. The phrase is then processed by Raspberry Pi and corresponding output signals are given at GPIO pins.

### I. INTRODUCTION

The project is made keeping in mind the following aspects:-

- Simplicity of Interaction
- Innovating new yet cost effective method

The following points give us the motivation for making this prototype:-

Item Required
Raspberry Pi 3
Sound Card
Relay Board
Mic, Speaker
Motor and Motor Driver
Jumper Wire

1) *Cost effectiveness*: The prototype we have made would cost nearly 5000, which also includes the automation of home or office plus the electronic components used. If we go in the market and ask for Google Home/Amazon Echo Dot these would cost around 6000 or more and with room automation the cost would go much higher around 75000 as the appliances, such as bulb, fan, ac etc., they install are compatible with their the product only. On the other hand, what we install is compatible with all kind of appliances.

2) *Making life easy*: Through the effort, we have devoted to this product prototype; we have tried to make the life of everyone easy and self-sustainable. Suppose a situation where the person is not healthy and is not able to move around, so through Google assistant he/she can know what is going around the world just by saying Hey Google, Whats happening around the globe ,also he/she can operate the different the electronics devices in the house without going close to the switch board. The erstwhile example we have chosen for the situation where a person is unhealthy but this is not all, we can make the life of everyone easy as said earlier. By installing this product in homes and offices we

can save a lot of energy as someone forgets to switch OFF the lights in room after leaving the room so just by saying Hey Google, Trigger room lights off he/she can switch the lights OFF without coming close to switch board. Think how efficient it will make the life of people letting them have their assistant around with them.

3) *Using Google Assistant*: Why Google Assistant? As we all know for finding some information we Google it. And with the help Google Assistant API we are making the product far more superior than others. The interface it has is very good and works for almost all kind of accents and for different languages. Also the API is free and files related to provide signals to appliances operation are available for modification purposes.

4) *Home security*: Google assistant can recognize the voice of a person because of this feature it is very useful in home security. Through Google assistant you can lock/unlock the door of your house. Also the security cameras installed in the house can be controlled using Google Assistant and can live stream it on your mobile phone sitting somewhere else.

5) *Making Homes Environment Friendly*: As the product prototype can control appliances in the home so we can control them from any place in the home. Suppose someone is sitting in one room and some appliance is ON in other room so he/she just need to ping Google Assistant and have to say the predefined commands. Our product will automatically switch that appliance OFF, thus saving the electricity and the money in electricity bills.

### II. DEVICE AND ITEM USED

1) **Raspberry Pi 3 Model B**: Raspberry Pi 3 model B is third generation of Raspberry Pi CPU board, developed by the raspberry pi foundation. Pi 3 model B is based on Broadcom BCM2387 chipset with 1.2 GHz, 64 - bit Quad-Core ARM Cortex-A53. It has 1GB LPDDR2 memory with 512 KB L2 cache memory. It boots from a Micro SD card with an operating system. A Micro USB socket is provided for power input of 5V, 2.5 A. It is provided with 10/100 BaseT Ethernet socket, HDMI(rev 1.3 and 1.4), 3.5mm Audio Output jack, 4 USB 2.0 connector, a MicroSD card slot. It has built in Wifi and Bluetooth features. The main difference between a CPU and Raspberry pi is the GPIO (General Purpose Input

Output) pins. 40 GPIO pins were available in this model including "5V, 3.3V and Ground" pins. [4]



Fig. 1: Raspberry Pi 3

2) **Relay Board:** Relay is an electromagnetic mechanical switch. This relay module is 5V input 4-channel board specifically made for microcontrollers. It can switch upto 250 V 10 A AC or 30 V 10 A DC. [5]



Fig. 2: Relay Board

#### Working of Relay board

This module consist 3 types of input pins:

- Vcc: +5V supply
- GND: Ground
- IN1-4: Relay controlling switch input pins

This module consist 3 types of output pins

- COM (Common):

It is a common terminal which remain in contact with one of the other two pins.

- NC (Normally Closed):

It is the terminal which is in the contact with the COM terminal when no input signal is given.

- NO (Normally Open):

It is the terminal which is out of contact until signal does not

comes from the IN pins.

When a input signal is given to the relay board the input will create a magnetic field and the switch will move from NC to NO because of this magnetic field.

3) **Sound Card:** Sound card is an interface between sound and signal. Sound card converts sound to an electrical signal which computer can read. There are many kinds of sound cards and we are using USB sound card.

4) **Motor Driver:** L298N motor drive is used to DC drive motor in clockwise or counter clockwise direction. It can control 2 motors and 5 volt DC supply is provided to power the L298N IC. There are 2 pins for each motor to rotate in clockwise and counter clockwise direction. Enable pins can be used to control the motor speed.

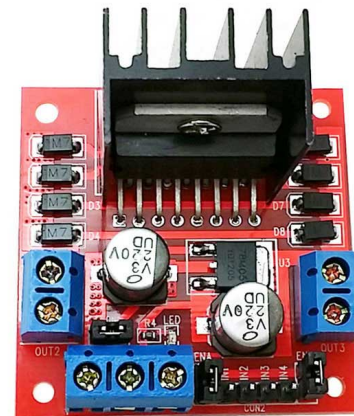


Fig. 3: Motor Driver

### III. WORKING

What happens actually inside the Raspberry Pi is that it is triggered with the word "Hey Google" after which it actually starts listening and starts converting speech to text. We are provided with this text (string called "phrase") and we can operate on this string to perform actions.

The above code determines if the phrase contains trigger words like "open the door", "lock the door", "shut down" or other servo commands, otherwise it checks if any of the words in phrase match with var string array which is used to trigger specific GPIOs on the Raspberry Pi, and if this also does not happen, the phrase is sent to Google, which gives a reply depending upon the phrase.

var = ('room lights', 'kitchen lights', 'bedroom lights')

#Add whatever names you want. This is case is insensitive

gpio = (12,13,24) #GPIOs for 'var'. Add other GPIOs that you want.[6]

#### 1) Room Lights

Connect positive of 5-volt DC supply to Vcc pin of relay and negative of DC supply to GND pin. Connect GPIO 12 pin from raspberry pi to IN1 pin on relay using female-female wire. Insert the relay circuit in 220-volt supply. Using input from GPIO 12 pin, we can turn on/off circuit.

## 2) Door Open

Provide DC power supply to L298N motor drive. Connect DC motor to output of motor driver. Connect GPIO pin 21 and GPOI pin 13 to motor drive input IN1 and IN2 and ground from pi to motor driver. We can now operate DC motor in both clockwise and counter clockwise direction.

## 3) Listening and Speaking indicator LEDS

Connect GPIO pin 5 and GPOI pin 6 to red and green LED. On saying Hey Google red LED will turn on and would turn off when listening is finished. When Google assistant responds, green LED will turn on and would turn off when speaking is finished.

## 4) Stop button for music and radio

Push button is connected to Raspberry Pi pin 23. When playing music, listening to music or playing radio, if we want to stop, press stop button is used to stop listening to radio or music.

## IV. CIRCUIT DIAGRAM

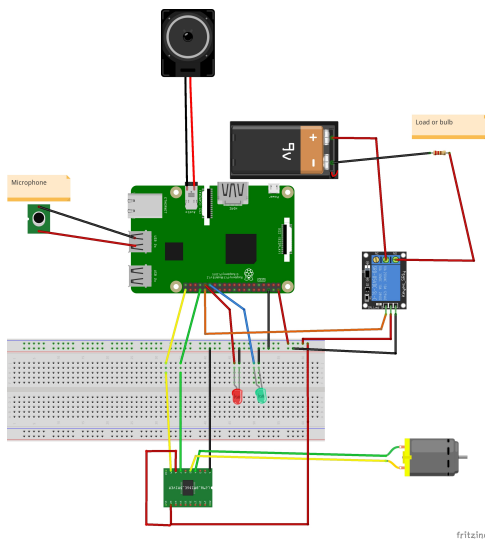


Fig. 4: Circuit Diagram of Home Automation System

## V. FEATURES AND COMMANDS

### A. Lights Control

From lot many functions of home automation, the elementary function is to operate the room lights. Using Relay and raspberry pi, room lights can be turned on and off using Google assistant simple commands. Just say "Hey Google" or "OK Google" and assistant will respond with beep, indicator light will turn on to listen the command and then say "Trigger room light on/off" to turn room lights on/off. Google assistant will say Turning on/off room light and room lights will be triggered.

### B. Door Lock Control

Door lock is operated using simple mechanism of DC motor on lock. Say "Hey Google" or "OK Google" and wait for beep and indicator light to turn on. Then say command "Trigger open the door" to open the door lock or "Trigger lock the door" to lock the door. Motor rotates clockwise or counter clockwise according to the command given and lock or unlock the door.

### C. Other Home Operations

Lot many functions can be added to home automation using Google assistant to make our life easy in future. Fan operation is also an important feature along with lights control which can be implemented in our project. Along with fan operation, we can also implement other home appliances like washing machine and do tasks like drawing the curtains, opening the door etc. just by adding a command line in raspberry pi, assigning pin on it and using relay. Just say "Hey Google" before saying any command. Any electrical or electronic device can be operated using this setup in our home.

### D. Google Assistant Features

Integrating Google assistant with home automation has advantages over using it on our phone that we can use it anywhere inside our home. This reduces our dependence on our phone. Home automation using Google assistant has advantages over other virtual assistants. We can also use Google based features as described below:

- **Playing Music/Songs**

To play music/song, say "Hey Google", wait for beep and indicator light to turn and say "Stream" before your favourite song name and listen to song by using voice commands. Example "Stream Castle of Glass by Linkin Park" and assistant will respond by saying "Getting YouTube link" and you can listen to music. To stop the song/music say "Hey Google, Stop the song" or use push button to stop listening.

- **News and Weather**

News and Weather report can be played using Google assistant by saying "Hey Google, tell me about weather/news" and we can hear latest report of weather or news in our area. You can tell Google assistant to stop when you want to stop hearing news or push the stop button.

- **Personal assistant**

Google Assistant is a personal assistant which helps person in his daily activities like setting of alarm, reminders, meetings, managing shopping list etc. We can be at any place inside our home and use it anywhere inside home. This helps person manage his/her work more efficiently as he/she can be less dependent on smart phones. We can also add personal information to the Assistant.

- **Other features**

Person can also use Google assistant to ask any general thing like date and time, use for fun activities like making a joke and educational purpose example history, mathematics, geography etc. Google assistant just requires an internet connection and we can make our life lot easier by using this.

## VI. PSEUDO CODE

```
function Action(phrase)
{
    if 'shut down' in phrase
        say 'Shutting down Raspberry Pi'
        sleep(10)
        system(shutdown)

    if 'lock the door' in phrase
        say 'Locking the door'
        OutputHigh(LockGPIO)
        sleep(2)
        OutputLow(LockGPIO)

    if 'open the door' in phrase
        say 'Opening the door'
        OutputHigh(OpenGPIO)
        sleep(2)
        OutputLow(OpenGPIO)

    else
        for every name in var
            if name in phrase
                pinout=gpio[num]
                if 'on' in phrase
                    OutputHigh(pinoutGPIO)
                    say "Turning On " + name
                else if 'off' in phrase
                    OutputLow(pinoutGPIO)
                    say "Turning Off " + name
            }
        }
}
```

This is the code used to add custom function to Google Assistant.

## VII. RESULT

The Google Assistant works properly and responds correctly to the given input voices commands. The voice command starting with the "Hey Google, Trigger Voice Command" are correctly recognized by the Google Assistant and voice to text operation is performed correctly. The Task related to the specific command is performed in the desired way. The Prototype is working properly.

## VIII. ACKNOWLEDGEMENT

The team would like to thank Dr. Hitesh Shrimali, for guiding us for the project. The team members are also thankful to Mr. Lakshay Arora for helping us wherever required. Finally, this project would not have been successfully created without the support of Robotronics Club, IIT Mandi.

## IX. CONCLUSION

### A. Advantages of Product

- 1) It can be used in Medical and Military Area:
- 2) Cost:

Item Used	Cost
Raspberry Pi 3	Rs 3500
Sound Card	Rs200
Relay Board	Rs 250
Mic, Speaker	Rs 500
Motor	Rs 500

The Total Cost of our Project is Rs4950 which is less than Google product (Rs 4500 + Accessories worth atleast Rs 5000) present in market.

### B. Future Implementation of this Product

- 1) *Display*: We can add display to improve user interface.
- 2) *Multiple Assistant*: We can add more than one virtual assistant in a single device.
- 3) *Portable*: It can be made portable using internal battery and GSM Sim Module.

## REFERENCES

- [1] • IMG Motor Driver  
<http://www.dx.com/p/l298n-dual-h-bridge-stepper-motor-driver-module-w-heat-dissipation-for-arduino-red-white-408436#.WwQnK0xuJPY>
- [2] • IMG Raspberry Pi  
<https://shop.pimoroni.com/products/raspberry-pi-3-b-plus>
- [3] • IMG Relay Board  
<https://shop.pimoroni.com/products/raspberry-pi-3-b-plus>
- [4] Raspberry Pi 3  
<http://docs-europe.electrocomponents.com/webdocs/14ba/0900766b814ba5fd.pdf>
- [5] Relay Board  
<https://en.wikipedia.org/wiki/Relay>
- [6] Connect the DC motor and make it work with raspberry pi using Python  
<http://www.instructables.com/id/Raspberry-PI-L298N-Dual-H-Bridge-DC-Motor/>
- [7] <https://diyhacking.com/best-voice-recognition-software-for-raspberry-pi>
- [8] Link for the API used to control most of the funtions-  
<https://github.com/shivasiddharth/GassistPi>
- [9] Google Developer Console  
<https://developers.google.com/assistant/sdk/guides/library/python/embed/config-dev-project-and-account>
- [10] Circuit made by FritZing.