IoT based Smart Home Automation Using Google Assistant (Hindi Voice Command)

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Abstract: **Now a day's electricity is available to most of the population and it has been an important part of our day to day life. We use it for various purposes and we tend it misuse it as well. Here comes our project where it shows how smart home automation will be the next big thing as a part of our smart life. It is based on the idea that by the mere presence of humans they will be able to sense and turn on all the lights and fans of our houses and vice versa. Therefore, we will be able to use it more efficiently. Just like the way modern technology has brought us whereby the command of a person the device can do a job of either playing music or giving navigation, it will be able to turn on and off our lights and fans from our phones. This project aims to make this system more comfortable, reliable and easy to use so that it is accessible by all. Our simple effort will be able to minimize the misuse of electricity by using an android home automation system.**

Keywords: **Home Automation, NodeMcu, Google Assistant, Voice control smartphone, Internet of things.**

1. Introduction

The purpose of this device is to reduce the effort put in by the user to control a device manually. This system uses Google Assistant SDK provided by Google, to communicate with the Raspberry Pi and the users. The users give Hindi voice commands to the device to control the appliances in their home, change the temperature of the air conditioner if available, talk to the Google Assistant to get seamless information and news, and also use it to connect to the smart lights and smart TVs to use Chrome cast or any other smart tech. People come to their home fatigued after a long day of work. It can be of great help for those working-class people as any small device/technology that would help them switch their lights on or off, or play their favorite music, etc. over command by their voice from their Smartphone's would make their home more comfortable. Voice identification is a technique and is created to recognize, differentiate and authenticate the voice of an individual thus giving security [1]. Furthermore, everything would be altered according to their needs before they reach home. In previous years, people used to hire human assistants like housekeepers so they can help to some extent but not up to the mark. Now a day as technology is changing so is human life, as the expense for a house- helping is increasing, so people are moving towards

smart technology. Not only it will be cost-effective but will also come with a maintenance facility. The Google Assistant is software that allows its users to control all the apps in their device to be controlled directly through voice command.

2. ULN 2803IC

As a relay handler, ULN 2803 IC [5] is used. It is a high voltage, high current Transistor Array IC especially used with microcontrollers where high-power loads are needed. This IC consists of eight NPN Darlington connected transistors with typical Clamp diodes to adjust the output loads. This IC is widely used to drive high loads such as Lamps, relays, motors, etc. Most chips work with low-level signals like TTL, CMOS, PMOS and NMOS that operate within (0-5) V range and are unable to drive high-power inductive loads. This chip, however, takes low-level input signals (TTL) and uses this to turn off / off the higher voltage loads attached to the output side.

The ULN2803 IC is made up of eight Darlington NPN pairs which provide the appropriate current amplification provided 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 [5].
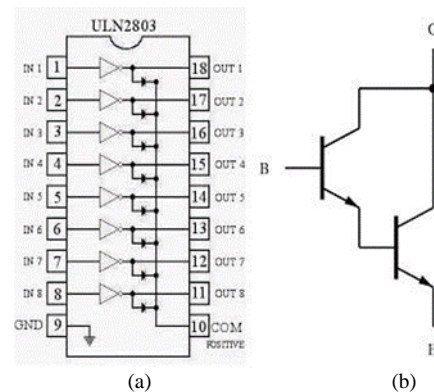

(a)   (b)
Fig. 1. a) ULN 2803   b) Darlingtonpair

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3. Node MCU (ESP8266)

The Node MCU [3] (Node Microcontroller Unit) is an open-source software and hardware development platform based on a very inexpensive system-on-a-chip named the ESP8266 framework. The ESP8266 is designed and produced by Express and comprises all the crucial elements.

Modern computer elements: CPU, RAM, networking (Wi-Fi), and even a simple SDK and operating system. SDK and Operating System. When purchased at bulk, the ESP8266 chip costs only USD 2 apiece. That makes this device design an excellent choice. The Node MCU aims to simplify ESP8266 development. It has two key components.

An open-source firmware ESP8266, which is built on top of the proprietary SDK of the chip manufacturer. The firmware provides a simple eLua (embedded Lua) programming environment, which is a very easy and quick scripting language with an existing developer community. For newcomers, the Lua scripting language is easy to learn. And the Android IDE can also be configured to turn on Node MCU.

A development kit board that incorporates the ESP8266 chips on a standard circuit board. The board has a built-in USB port that is already wired up with the chip; hardware reset button, Wi-Fi antenna, LED lights, and standard-sized GPIO (General Purpose Input Output) pins that can plug into a breadboard. Figure 2 below displays the board of growth for the Node MCU.

4. Relay board
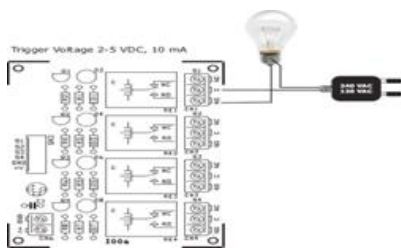

Fig. 2. NodeMCU (ESP8266) Board

Fig. 3. Relay board wiring diagram

A relay is an electromagnetic switch. It is triggered when added to it by a tiny current of some microampere. Normally a relay is used as a kind of switch in a circuit, an automatic switch. There are various types of relays, and they perform at different voltages. When a circuit is designed the voltage it will cause must be taken into consideration. The relay circuit is used in this system to switch the equipment ON / OFF. The high/low signal is delivered from microcontroller Node MCU. When a low voltage is applied to an appliance relay it is shut off and when a high voltage is applied it is switched on. Figure 3 below displays the relay circuit for operating four devices in the Home Automation Program. The number of appliances can be modified according to the user's requirements.

5. System design and implementation

The system design is broken down into two main categories,

The hardware: It can connect to the router. It might also turn on / off specific devices, such as lights and fans. It is called the 'Control Unit'.

The Software: The Blynk app, the IFTTT app, and the Google Assistant are the interface app and they would be built into the Android device.

The Control Unit consists of the MCU Microcontroller-Node and the Network Relay module 4/8. Uses the ULN 2803 IC to control the relays. The Blynk app on an Android device communicates with the microcontroller and sends the desired signal via the internet.

6. Blynk application

Blynk [2] is a Platform with IOS and Android apps to control Arduino, Raspberry Pi, Node MCU and several other boards over the Internet. Blynk was designed for the Internet of Things. It can remotely control the equipment, show the sensor data and store data, access it and do many other cool things. Blynk App configuration is required; we set it to the requirement. We start by creating a project and then choose the microcontroller that we are using. A relay is compatible with the microcontroller's physical pins. When this has been completed, Blynk sends an authentication token for this particular project to the registered email Id. This token should be noted and saved for its use while programming the Node MCU and setting up the IFTTT application.

7. IFTTT application

IFTTT [1] derives its name from the conditional statement on programming "if this is the case, then that is the case." IFTTT is a website and a mobile app launched in 2010 with the slogan ' Putting the Internet to use for you. 'The aim is to use IFTTT to automate everything from your favorite apps and websites to smart devices and accessories allowed by apps. What the company offers is a software platform that links various developers ' applications, devices and services to cause one or more automation involving certain apps, devices, and services. Here, the IFTTT application is used to bridge the gap between the Google Assistant commands and the Blynk app. Setting up the IFTTT program involves first signing in and then building an applet and then "This," i.e. the command., here we select Google Assistant and then we type in the commands to which the Google Assistant will respond and the appliance/relay associated with that command should be managed. The Goggle Assistant answer command can also be typed in as needed.

After configuring the trigger, i.e. "This" feature, we need to

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customize the "What". What should happen once the Google Assistant listens to the order we just configured? This is calculated by setting the User "Goal". We click "That" and then select webhooks [6] and click connects. Webhooks require us to send commands to server Blynk. Now, in the URL we type the IP address of the Blynk server followed by the Authentication token sent by the Blynk and then the PIN of the microcontroller to which the device to be controlled is connected. The URL should be in the following format:

http://188.166.206.43/AuthToken/pin/CorrespondingDigital PinNo

Then in the method we select 'PUT' and the content type is 'Application/JSON' [7] and in the body, we write ["1"] to turn ON and ["0"] to turn OFF. This creates the action for the trigger i.e. the Google Assistant command. The action taken by it is simply sending a message to the Blynk app to either turn ON or OFF the concerned connected device. Finally, the microcontroller is programmed with the behavior it must take once the signal is obtained from the Blynk application. Before that, the Blynk and the microcontroller should communicate and the communication is done via the internet and since the microcontroller, Node MCU comes with an inbuilt Wi-Fi module, it is programmed to connect to the desired network once plugged in. 'C' language is used to program the microcontroller and is programmed in the Arduino IDE [8].

8. Working model

The Google Assistant is introduced at release. You can start the conversation by saying "Hey Google" and a sound is prompted to recognize the same. If the raspberry pi monitor is available, the voice is translated to text and will also be shown on the screen. Here we use the keyword "bingo" to help the computer recognize the order to execute to achieve the desired output. For example, kitchen lights can be turned on by saying "Hey Google", followed by "Bingo Turn on Kitchen lights". The device gives voice feedback saying "turning on kitchen lights", and the light is turned on. The red LED acts as Kitchen

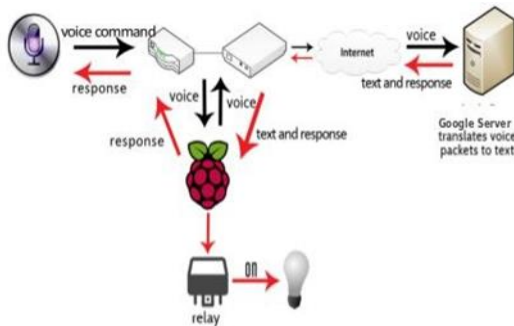*A complete guide to voice-controlled home automation using google [4].*

Fig. 4. Working model

The necessity of the USB microphone device can be understood from the fact that it helps the device to listen to the Hindi commands. Here the LINUX based raspberry Pi makes

certain scripts on startup easier. In this way, it helps the Google assistant at the time of boot. To acknowledge the running status of the Google assistant a sound is played. A hot word like "Hey Google" can be used to activate it and then the required command can be given based on functionality. The necessary output will be provided by processing the command in the cloud.
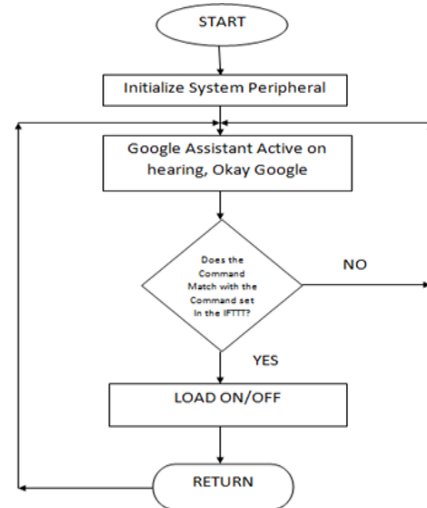
9. Flowchart

Fig. 5. Flowchart

Flow charts explain the step to step working of the Arduino based home automation system. It can be understood as follows.

1. First of all, the system is initialized by using the initialization algorithm as mentioned.
2. In the second step, the Google assistant gets activated on hearing word okay Google.
3. Then as given in the decision box of the flow chart the command is matched with the command in IFTTT.
4. Here if the command is not matched it returns the whole process to step 2.
5. Although at step 3 if the command matches on and off status are loaded. After that, the control is returned to step 2.

10. Result

The result was good and the program has reacted well. The diagram below shows the proposed system's full prototype implementation.

(a)

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(b)
Fig. 6. (a) Light turned OFF, (b) Light turned ON

11. Conclusion

This project includes multiple technologies and applications that can be used to provide control of the home. In this project, we are trying to show that wireless communication is also possible. The main intention was to show how electricity demand is increasing nowadays in this generation for making work comfortable. It showing monitoring, sensing and precaution regarding fire took place at home. How just by our voice we can be safe from this disaster.

12. Future scope

The camera module can be implemented on a system for security purpose attackers that can be hacked or catches. It provides better comfort and it's reliable. It's environment-friendly and we can also save electricity.

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