

HOME AUTOMATION SYSTEM USING GOOGLE ASSISTANT

MUDASIR M, NEHA V, NIHAAL THATHIR K, PAVAN YADAV M, POLLARPU
SREERAMULU, SMITHA PATIL

B.Tech. Student, Department of Computer Science and Engineering, Presidency University, Bangalore,
India

B.Tech. Student, Department of Computer Science and Engineering, Presidency University, Bangalore,
India

B.Tech. Student, Department of Computer Science and Engineering, Presidency University, Bangalore,
India

B.Tech. Student, Department of Computer Science and Engineering, Presidency University, Bangalore,
India

B.Tech. Student, Department of Computer Science and Engineering, Presidency University, Bangalore,
India

Assistant Professor, Department of Computer Science and Engineering, Presidency University, Bangalore,
India

Abstract: Nowadays Technology keeps on upgrading. The idea behind Google assistant-controlled Home automation is to control home devices with voice. On the market there are many devices available to do that, but making our own is awesome. In this project, the Google assistant requires voice commands. Adafruit account which is a cloud based free IoT web server used to create virtual switches, is linking to IFTTT website abbreviated as “If This Than That” which is used to create if else conditional statements. The voice commands for Google assistant have been added through IFTTT website. In this home automation, as the user gives commands to the Google assistant, Home appliances like Bulb, Fan and Motor etc., can be controlled accordingly. The commands given through the Google assistant are decoded and then sent to the microcontroller, the microcontroller in turn control the relays connected to it. The device connected to the respective relay can be turned ON or OFF as per the users request to the Google Assistant. The microcontroller used is NodeMCU (ESP8266) and the communication between the microcontroller and the application is established via Wi-Fi (Internet).

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

1. INTRODUCTION

As the computer science engineering students of Presidency University this project gives us a chance to practice all the knowledge and skills which we already gain along the academic session in solving problems through a project in order to be an efficient and a good engineer.

“Home automation” refers to the automatic and electronic control of household features, activities, and appliances. The utilities and features of our home can be easily controlled via Internet. There are three main elements of a home automation system: sensors, controllers, and actuators. Having day to day developing technology is a proud moment to the whole world. The foremost aim of the technology is to increase the efficiency and to decrease the effort. In this trending world, Internet of Things is being given extreme importance. In that, Automation, leads to have less effort and much efficiency. By using IoT, we are successful in controlling the appliances in various areas, in which one of them is to control the home automation by using Node Microcontroller. We can also use other boards like raspberry pi, beagle bone etc., In the present- day technology, the whole work is done through communication so the effective way of communication can be done through voice. Even though the technology is developing in our day to day

life, there is no help coming into existence for the people who are physically not good on the basis of technology. As the speech enabled, home automation system deploys the use of voice to control the devices. It mainly targets the physically disabled and elderly persons. The home automation will not work if the speech recognition is poor. The speech given by the user will be given as input to the Microphone. Microphone recognizes the speech given by the person and sends it to the recognizing module. It searches for the nearest word even if there are any disturbances in it. If the command (ON/OFF) is given, the action is done. Similarly, the line following robot functions with respect to the speech commands given to it. The line following robot moves forward and backward with the help of sensors and a motor driver board. Home is the place where one desires to be rest 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 favourite 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 cosier and rather, feel more homely. Human assistants like housekeepers were a way for millionaires to keep up their homes in the past. Even now when technology is handy enough only the well to do people of the society is blessed with their new smart home devices, as these devices costs are a bit high. However, not everyone is wealthy enough to be able to afford a human assistant, or some smart home kit. Hence, the need for finding an inexpensive and smart assistant for normal families keeps growing.

2. LITERATURE REVIEW

Manish Prakash Gupta (2018) have proposed “Home automation using voice via Google assistant. The spoken commands from google assistant sends message to micro-controller this micro-controller pass the message to relay which will switch On and Off the appliances.

Aayush Agarwal, Anshul Sharma, Asim Saket Samad and S Babeetha (2018) “UJALA- Home Automation System Using Google Assistant” 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. 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.

Md Sarwar Kamal in (2017)“Efficient low cost supervisory system for Internet of Things enabled smart home.” This paper proposes an efficient low cost supervisory system for smart home automation that can be managed using IoT. The proposed system is based on Apriority algorithm and will help to monitor and control all the home appliances and electronic devices through a supervisory system in a most efficient and reliable manner. Both the consumers and the suppliers will get the opportunity to manage the power distribution by monitoring the electricity consumption.

Nikhil Singh, Shambhu Shankar Bharti, Rupal Singh, Dushyant Kumar Singh (2014)“Remotely controlled home automation system”, *Advances in Engineering and Technology Research (ICAETR)* This paper describes an investigation into the potential for remote controlled operation of home automation systems. It considers problems with their implementation, discusses possible solutions through various network technologies and indicates how to optimize the use of such systems. The home is an eternal, heterogeneous, distributed computing environment (Greaves, 2002) which certainly requires a careful study before developing any suitable Home Automation System (HAS) that will accomplish its requirements. Nevertheless, the latest attempts at introducing Home Automation Systems in actual homes for all kinds of users are starting to be successful thanks to the continuous standardization process that is lowering the prices and making devices more useful and easier to use for the end user. Even so several important issues are always to be handled strictly before developing and installing a Home Automation System; factors like security, reliability, usefulness, robustness and price are critical to determine if the final product will accomplish the expected requirements.

Sean Dieter Tebje Kelly, Nagender Kumar Suryadevara, Subhas Chandra Mukhopadhyay (2013)“Towards the Implementation of IoT for Environmental Condition Monitoring in Homes” In this paper, we have reported an effective implementation for Internet of Things used for monitoring regular domestic conditions by means of low cost ubiquitous sensing system. The description about the integrated network architecture and the interconnecting mechanisms for the reliable measurement of parameters by smart sensors and transmission of data via internet is being presented. The longitudinal learning system was able to provide a self-control mechanism for better operation of the devices in monitoring stage. The framework of the monitoring system is based on a combination of pervasive distributed sensing units, information system for data aggregation, and reasoning and context awareness. Results are encouraging as the reliability of sensing information transmission through the proposed integrated network architecture is 97%. The prototype was tested to generate real-time graphical information rather than a test bed scenario.

Jawarkar, Ahmed, Ladhake, and Thakare (2008)“Micro-controller based Remote Monitoring using Mobile through Spoken Commands” 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.

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.

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). It proposes hardware and software design considerations which enable the user to access the process variables on the DCS, remotely and effectively rent designations.

Prof. Era Johri in (2001) have successfully completed the project on “Remote Controlled Home Automation”.

3. PROPOSED SYSTEM

- The proposed system eliminates the complication of wiring in case of wired automation. Considerable amount of power supply is also possible.
- Operating range is more than the Bluetooth.
- The existing system does not allow remote monitoring and controlling of appliances. But where as in the proposed system the system using the Wi-Fi based home automation system it allows to monitor and control the appliances.
- The home automation of the existing system in 1990's, the people in every home has electronic devices which are controlled manually but in our proposed system we are controlling all electronic appliances through remotely.
- The IOT application have become this popular in this 21st century is due to dominant use of the internet, evolution of smart phone technology and raised standard of mobile communication.



Fig-1: User Interface Diagram

4. METHODOLOGY

The system design is broken down into two main categories,

- 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,
- The Software- The Blynk app, the IFTTT app and the Google Assistant constitute the software of the design and these applications would be integrated in the Android device.

The Control Unit comprises of the microcontroller- NodeMCU and the 4/8 Channel Relay board. Relay board uses Node MCU(ESP 8266) to control the relays. The Blynk app on an Android device communicates with the microcontroller and sends the desired signal via the internet. Figure 1 below shows the basic system design architecture.

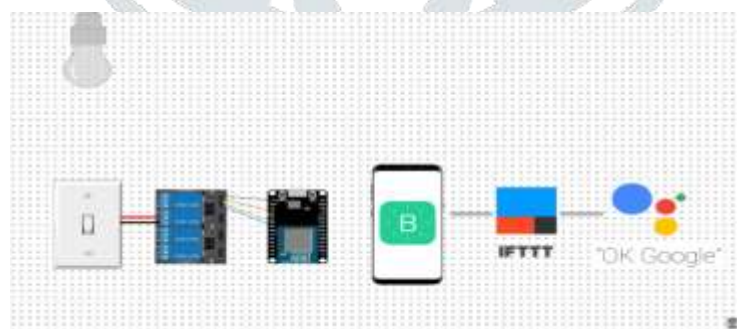


Fig -2: Basic System Architecture

The hardware also called the Control Unit comprises of the NodeMCU microcontroller and the Relay board. NodeMCU's digital output pins are connected to the Relay pins of the Relay board. Finally, each Relay is connected to an appliance. In the fig- 1 above the second relay is connected to a bulb.

NODEMCU ESP8266:- The NodeMcu is an open-source firmware and development kit that helps you to prototype your IOT product with few Lua script lines. The Development Kit based on ESP8266, integrated GPIO, PWM, IIC, 1- Wire and ADC all in one board. Board is a fast leading edge low-cost WiFi technology.

A [development](https://github.com/nodemcu/nodemcu-devkit) [HYPERLINK "https://github.com/nodemcu/nodemcu-devkit"](https://github.com/nodemcu/nodemcu-devkit) [_](https://github.com/nodemcu/nodemcu-devkit) [HYPERLINK "https://github.com/nodemcu/nodemcu-devkit"](https://github.com/nodemcu/nodemcu-devkit) [kit](https://github.com/nodemcu/nodemcu-devkit) [HYPERLINK "https://github.com/nodemcu/nodemcu-devkit"](https://github.com/nodemcu/nodemcu-devkit) [_](https://github.com/nodemcu/nodemcu-devkit) [HYPERLINK "https://github.com/nodemcu/nodemcu-devkit"](https://github.com/nodemcu/nodemcu-devkit) [board](https://github.com/nodemcu/nodemcu-devkit) that incorporates the ESP8266 chip on a standard circuit board. The board has a built-in USB port that is already wired up with the chip, a hardware reset button, Wi-Fi antenna, LED lights, and standard-sized GPIO (General Purpose Input Output) pins that can plug into a bread board. Figure 2 below shows the NodeMCU development board.



Fig -3: NodeMCU (ESP8266) Development Board

4-Channel Relay:- A 4-Channel Relay interface board allows us to control various appliances, and other equipment's with large current. It can be controlled directly by Micro-controller (Arduino, Node MCU, Raspberry Pi, 8051, AVR, PIC, DSP, ARM, ARM, MSP430, TTL logic).



Fig -4: 4 Channel Relay

Buzzer:- This is a Small PCB Mountable 3V Active Electromagnetic Buzzer. It is great to add Audio Alert to your electronic designs. It operates on 3V supply, uses a coil element to generate an audible tone.



Fig-5: Buzzer

Jumper Wires:- Jumper wires are used for making connections between items on your breadboard and your Arduino's header pins. Use them to wire up all circuits.



Fig-6: Jumper wires

SOFTWARE

The software of the system proposed consists of mainly the Blynk Application and the IFTTT application

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

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

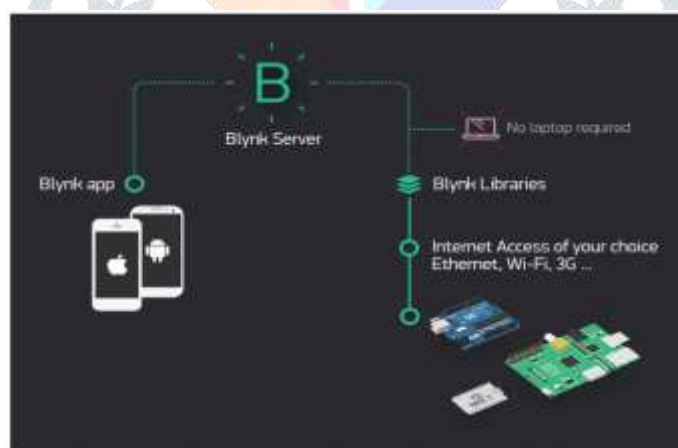


Fig -7: Functioning of the Blynk Application

IFTTT:- If This Then That, also known as IFTTT, is a free web-based service to create chains of simple conditional statements, called applets. An applet is triggered by changes that occur within other web services such as Gmail, Facebook, Telegram, Instagram, or Pinterest. For example, an applet may send an e-mail message if the user tweets using a hashtag, or copy a photo on Facebook to a user's archive if someone tags a user in a photo. IFTTT is an initialism for "If This Then That. In addition to the web-based application, the service runs on iOS and Android. IFTTT users created about 20 million recipes each day. All of the functionalities of the Do suite of apps have since been integrated into a redesigned IFTTT app.

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

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

http://188.166.206.43/AuthToken/pin/CorrespondingDigit_alPinNo

Then in the method we select ‘PUT’ and the content type is ‘Application/JSON’ and in the body we write [“0”] to turn ON and [“1”] to turn OFF. This creates the action for the trigger i.e. the Google Assistant command. The action taken by it is simply sending a message to the Blynk app to either turn ON or OFF the concerned connected device.

Finally, the microcontroller is programmed with the actions it needs to do once it receives the signal from the Blynk application. Before that, the Blynk and the microcontroller should communicate and the communication is done via the internet and since the microcontroller, NodeMCU comes with inbuilt Wi-Fi module, it is programmed to connect to the desired network once plugged in. ‘C’ language is used to program the microcontroller and is programmed in the Arduino IDE.

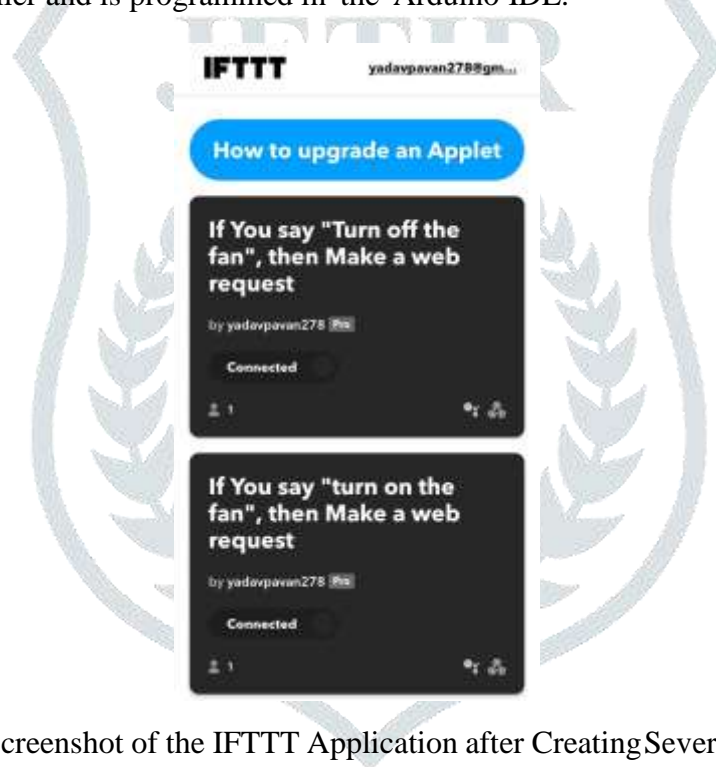


Fig -8: Screenshot of the IFTTT Application after Creating Several Applets

GOOGLE ASSISTANCE:- The Google Assistant is an Artificial Intelligence based Virtual assistant software which allows its users to control all the apps in their device. It allows the users to control and command most of the apps in their devices using voice commands. This provides more convenience to the people as they only have to command the google assistant thorough voice command. Fig 4.5 shows Google assistant. Google Assistant is an artificial intelligence-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. Assistant initially debuted in May 2016 as part of Google's messaging app Allo, and its voice activated speaker Google Home. After a period of exclusivity on the Pixel and Pixel XL smartphones, it began to be deployed on other Android devices in February 2017, including third-party smartphones and Android Wear (now Wear OS), and was released as a standalone app on the iOS operating system in May 2017. Alongside the announcement of a software development kit in April 2017, the Assistant has been, and is being, further extended to support a large variety of devices, including cars and third-party smart home appliances. The functionality of the Assistant can also be enhanced by third-party developers. 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.

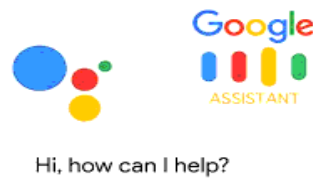


Fig-9: Google Assistant

FLOWCHART

• RESULT ANALYSIS

The output for Google assistant controlled Home automation is shown below. Fig.10.2 shows the complete prototype implementation of the proposed system.



Fig-10.1: Light and Fan turned Off



Fig-10.2: Light and Fan turned On

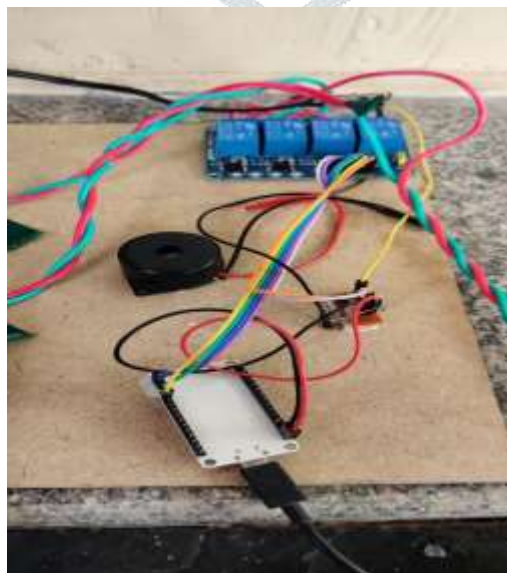


Fig-10.3: Connections of Google Assistant- controlled Home Automation

NOTE: 5V/1A Output, Mobile Chargers USB Cable were used to power the NodeMCU and the Relay Board

CONCLUSION AND FUTURE WORKS

5.1 CONCLUSION

In this project, voice commands are given to the Google assistant. The voice commands for Google assistant have been added through IFTTT website and the Blynk account is also linked to it. In this home automation, user has given commands to the Google assistant. Home appliances like Bulb, Fan and Motor etc., are controlled according to the given commands. The commands given through the Google assistant are decoded and then sent to the microcontroller and it controls the relays. The device connected to the respective relay turned ON or OFF as per the users request to the Google Assistant. The microcontroller used is NodeMCU (ESP8266) and the communication between the microcontroller and the application is established via Wi-Fi (Internet). There has been tremendous growth in the home automation sector, and many reputed companies utilizing their opportunity to work with IFTTT to deliver an elegant way to connect families to their homes. Consumers are looking to secure their home environment in today's unpredictable world, and the new Home automation service gives them the peace of mind that they need to protect their family's well-being. This project is about wireless home automation using Android mobile helps us to implement such a fantastic system in our home at a very reasonable price using cost-effective devices. Thus, it overcomes many problems like costs, inflexibility, security etc. In addition, will provide greater advantages like it decrease our energy costs, it improves home security. In addition, it is very convenient to use and will improve the comfort of our home. The project has proposed the idea of smart homes that can support a lot of home automation systems. Node microcontrollers have been used to connect the sensors circuit to the home.

Also, in home and building automation systems, the use of wireless technologies gives several advantages which cannot be achieved by using a wired network.

- Reduced installation costs.
- Easy deployment, installation, and coverage.
- System scalability and easy extension.
- Aesthetical benefits.
- Integration of mobile devices. For all these reasons, wireless technology is not only an attractive choice in renovation and refurbishment, but also for new installations.

5.2 FUTURE WORK

Future scope for the home automation systems involves making homes even smarter. More energy can be conserved by ensuring occupation of the house before turning on devices and turning off lights if not necessary. The system can be integrated closely with home security solutions to allow greater control and safety for home owners. The next step would be to extend this system to automate a large scale environment, such as offices and factories. Home Automation offers a global standard for interoperable products. Standardization enables smart homes that can control appliances, lighting, environment, energy management and security as well as the expandability to connect with other networks. Well, no system is ever perfect. It always has a scope for improvement. One just needs to put on a thinking cap and try and make the system more better.

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