

Artificial Intelligence Based Home Automation System

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Abstract: The objective of this work is to use Google Assistant for the home automation system through voice control. Using Smartphone, it is possible to control almost all the home appliances. Usual voice commands are given to the Google Assistant app and the given commands are decoded and then sent to the microcontroller with the help of the IFTTT App (If This Then That) and the Blynk app.

Keywords: Home Automation System, ESP8266 (NodeMCU), IFTTT (If This Then That), Blynk App.

I. INTRODUCTION

Home is a place where everyone gets sheltered peacefully. After heavy and busy work, it is a place where people will take rest. Some people are even tired of finding it difficult to move once they are placed on their sofa or bed. The Home Automation system provides such people with enormous relief, a small device would help switch their lights on and off, automatically, open and close the doors with the Smartphone. Besides, it is also possible to control all other appliances such as air conditioner, television, fan, water pump via voice control. The room Temperature can also be monitored by using this system, which helps us to control the temperature of the air conditioner [1]. The advance of this technique is based on number of persons inside the room the ac temperature can be varied automatically. The need for a low cost and smart assistant for all kinds of people is therefore beginning to develop. In future it can also be implemented with gesture based method. That is based on the movement of hand the fan or light can be on and off. The work suggests such a low-cost system. The main components are Google Assistant App, IFTTT App, Blynk App, and the NodeMCU microcontroller. To give the Google Assistant commands, normal voice is used [2]. All these components are connected through internet via Wi-Fi network, which brought this system under the IoT [3] system.

II. LITERATURE SURVEY

Home Automation's existing system is very costly and not user friendly. They also need proper maintenance and the system will take more time to install.

1. In 2003, Potamitis, Georgila, Fakotakis, and Kokkinoss proposed the use of voice that interacts with home appliances to accomplish a specific task on rather than the user. This approach is particularly inclined by directing appliances via voice for people with disabilities to perform day-to-day operations at home.
2. In 2006, S.M. AnamulHaque, and S.M. Kamruzzaman, Ashraful Islam developed a system called "A System for Smart-Home Control of Appliances Based on Time and Speech Interaction," which uses personal computers to control appliances at home. Visual basic 6.0 is used for programming and for speech recognition Microsoft voice Engine tools are used. Using a timer or voice control, appliances can be controlled.
3. Jawarkar, Ladhake, Ahmed, and Thakare developed a remote home monitoring system with the use of voice commands using android phone. The control system receives the voice command in the form of SMS text and the decision making will be based on the SMS.

4. Prof. Era Johri Dept. Of Information and Technology K.J. Somaiya College of Engineering VIDYAVIHAR, MUMBAI in the year 2001 have developed the project called "Remote Controlled Home Automation".

III. PROJECT SYSTEM SETUP AND IMPLEMENTATION

The system setup can be categorized as follows:

1. The hardware system-It acts as a control unit which can be used to switch ON / OFF the appliances in the home.The hardware system and the router can be connected.
2. The Software System-Blynk App, IFTTT App and the Google Assistant App constitute the design of software system and these applications can be controlled by using the Android device.

The control unit consists of the ESP8266 (NodeMCU) and the board of 4 Channel Relay. Using ULN 2803 IC, the relay board controls the relays. On a Smartphone, Blynk App communicates with the NodeMCU and sends the signal through the internet. The digital output pins of NodeMCU and Relay board pins are connected. Finally, each channel of Relay is connected to each device used for controlling.

IV. HARDWARE AND SOFTWARE DESCRIPTION

A. ESP8266 (NodeMCU)

NodeMCU known as a Node MicroController Unit is one of the Hardware development environments and also a open source softwares. ESP8266 contains all the key elements present in the modern computer such as Operating system, Wi-Fi,CPU, RAM etc. The NodeMCU development board is shown in figure 1.



Figure-1: Development Board NodeMCU (ESP8266)

B. RELAY BOARD

A relay board is normally used as an ON / OFF switch or automatic switch type. There are various types of relays that operate at different voltages. The voltage required to trigger must be analyzed when a circuit is built. The relay circuit is used in the system to turn ON and OFF home appliances. The microcontroller NodeMCU supplies the high and low signal. When the relay is supplied with a low voltage, it turns off the connected appliance and when the relay is supplied with a high voltage, it turns on the connected appliance. The 4 channel relay circuit used in the home automation system to drive four devices is shown in Figure 2 below. The number of devices can be changed depending on the need of the user. The wiring diagram of relay board is shown in Figure 2.

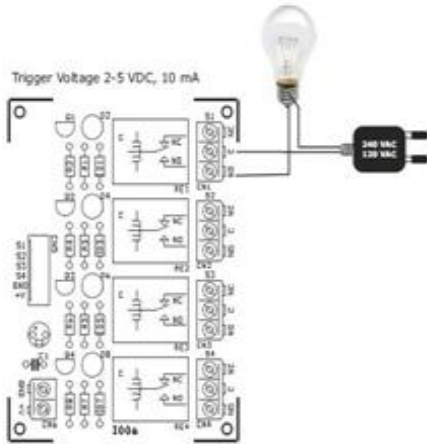


Figure -2: Wiring diagram of the relay board

C. BLYNK APPLICATION

Blynk application is an important platform that is incorporated with the iOS and other automaton apps in order to adjust the Arduino, Raspberry Pi and therefore the advantages over the web keep on increasing [4]. Blynk App is used as a platform for controlling various controllers like Arduino, Raspberry Pi, NodeMCU and also other internet modules with iOS and Android applications. Blynk application is mainly designed for IoT based applications. It can control hardware, display sensed data, store data, view the stored data, and perform many other operations [5]. Primary setup is required for Blynk Application; set it up according to project requirements. First create a project, and then select the microcontroller that was used in the project. After that the toggle buttons are created for each relay which is associated with the microcontroller's digital pins used. Once done, Blynk application sends a token of authentication for the particular project to the registered email Id. The authentication token is noted down [6]. When coding NodeMCU and setting up IFTTT server, the auth-token must be used. The Functioning of Blynk application is shown in Figure 3.

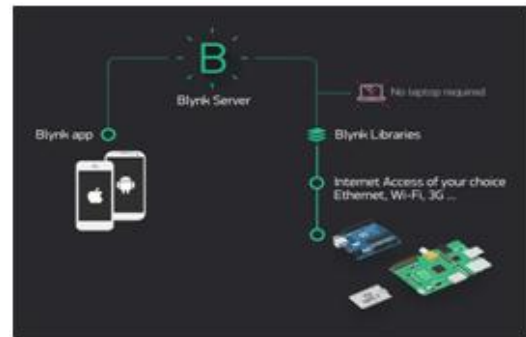


Figure-3: Functioning of Blynk application

D. IFTTT APPLICATION

IFTTT is derived from the conditional programming statement "if this then that." IFTTT is used for both a website application and a mobile application. The idea is to use IFTTT App to make everything automated from favourite applications and from websites to application accessories and also smart devices. The IFTTT provides a common software platform which connects various applications, services and devices to provide one or more automations involving those applications, services and devices. The IFTTT app is used to build a bridge between Google Assistant and Blynk app. First we have to log in into account before entering the IFTTT application, then the applet should be created, click "This" option from the menu, select the Google Assistant which is used in this project and type down the commands that the Google Assistant should respond to. It should control the appliances according to the user's command. Google Assistant's response command can also be typed. To set up the application's "That" after configuring the trigger. Click the "That" button and select the webhooks option and click the link. Webhooks will help the users to send commands to server of Blynk App. Then enter the Blynk App server's IP address in the URL, now enter the Auth- token from Blynk App and then enter the pin number of the microcontroller to which the device is connected. Then click GET option and choose 'PUT' in the method option and select the content type as Application / JSON[8] and write ["0"] to turn ON & ["1"] to turn OFF. Now, the Trigger actions are created. The actions are simply done by sending a command to either switch ON/OFF the connected device. Once, the signal from the Blynk App is received, the microcontroller is coded with the operations as commands which it needs to be performed. Blynk App and the microcontroller are interfaced and the communication should be made through the desired network once it is plugged in. The C language is used for programming the microcontroller using Arduino IDE. The flowchart of the process is shown in Figure 4.

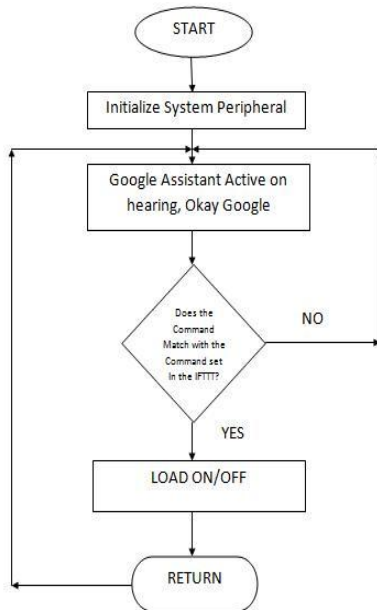


Figure- 4: Flowchart of the process

V. PROPOSED SYSTEM

The home automation system was controlled in Google Assistant using Smartphone by the Wi-Fi network in the Blynk android application and voice control. By using the command in the Blynk application, the Home automation system can be easily on and off [8]. Using Wi-Fi Internet technologies, the home automation system can perform different tasks. Home appliances can be controlled from anywhere in the world using Blynk application. The NodeMCU is connected to a relay based on an optocoupler and programmed with the application code of Blynk. It's really a very simple knowledge and there's no need for programming. Once the interface has been completed, the microcontroller is connected to the internet connection and made online mode [9]. Check it in the application for Blynk. Google assistant opens the phrases in the configuration followed by 'Ok Google' on the smart phone. If the user says 'Turn ON Light,' the answer will be 'Ok, Turning ON Light' and NodeMCU's Light connected to D0 pin will turn on. All the devices are operated connected to D0 pin will turn on. All the devices are operated and controlled similarly [10]. When a voice message or typed message is given in Google assistant app automatically the fan or light will turn on or off according to the instruction. The screenshot taken from Google assistant is shown in Figure 5.



Figure-5: Google Assistant application screenshot

VI. RESULT

The outcome of Home Automation system was positive and also cost efficient. The system responds well to the order given in the Google assistant. The response of the system was fast. The prototype setup of Home Automation system was shown in the Figure-6.

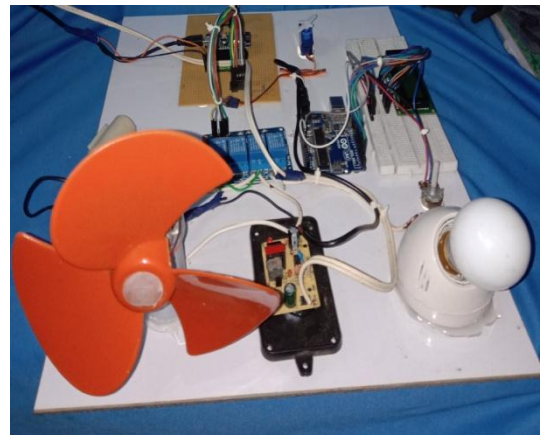


Figure-6: Home Automation prototype setup

VII. CONCLUSION

The main objective of this project was to propose a cost-efficient voice-controlled home automation system for controlling all the home appliances Google Assistant Controlled Home Automation system and the control of home appliances using Blynk application was successfully implemented. The system is user-friendly for elder people who find it difficult to reach the switch for the ON/OFF devices. The future scope for this project of automation will be high. There are also many features that can be added to make this system smarter and more powerful. It is possible to use the private Blynk server to make the process faster.

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