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Voice Controlled Home Automation

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ABSTRACT

The work is mainly concentrated on the implementation of Voice Controlled Home Automation. It is all about the development of home appliances based on the voice command using Android. The system is used to support elderly and disabled people at home. Google application is used as voice recognition and process the voice input from the smart phone. The voice activated home automation is implemented using NodeMCU, relays, pcb connectors, diodes and power supply. The voice input is captured by the android and the NodeMCU receives the signal to control the light, fan, bulb etc.

Keywords: Home Automation, NodeMCU (ESP12f), IFTTT (If This Than That) Application, Blynk Application, Internet of Things (IOT), Google Assistant, Voice Control, Smartphone.

I. INTRODUCTION

In today's world, automatic systems are preferred more than the manual systems. As the concept of automation is gaining popularity as it helps in reducing the human efforts and errors, thus increasing the efficiency. There are many types of Home Automation Systems like Bluetooth Controlled, Internet Controlled, RF Controlled, Remote Controlled (IR Remote) etc.

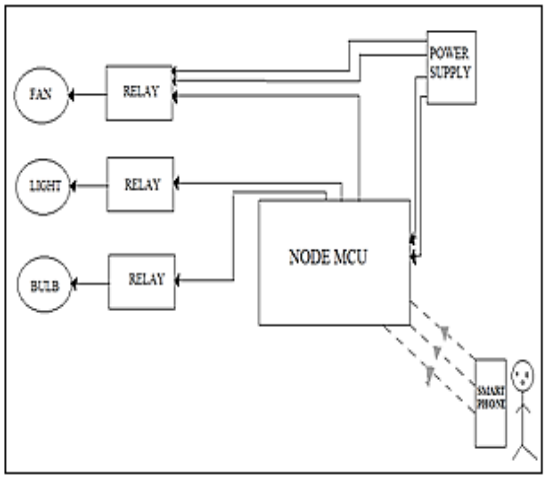


Fig.1 Block Diagram

II. DESCRIPTION

We have several parts in this home automation to explain. We can look at them one by one. Firstly, we take

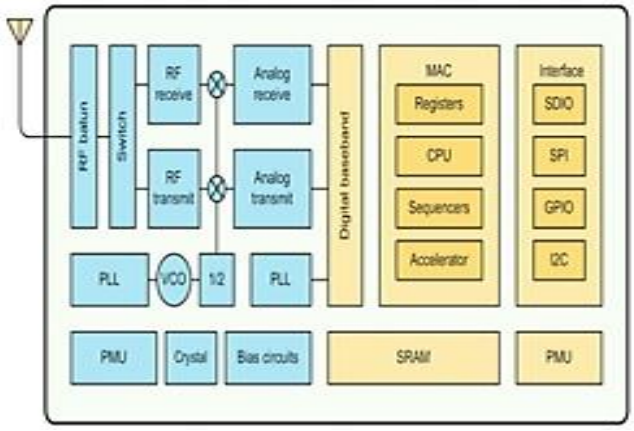
A. NODEMCU:

NodeMCU is an open source IOT platform. It includes firmware which runs on the **ESP8266** Wi-Fi SOC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. **NodeMCU pinout** is having labels D0 to D8 and RX-TX but when programming it using Arduino IDE, we observe that its labels are not matching with IO connections. Let's see actual connections of NodeMCU with ESP8266 i.e. ESP-12f

B. ESP12F MODULE:

ESP-12F WIFI module is developed by Ai-thinker Team. core processor ESP8266 in smaller sizes of the module encapsulates Tensilica L106 integrates industry-leading ultra-low power 32-bit MCU micro, with the 16-bit short mode, Clock speed support 80

MHz, 160 MHz, supports the RTOS, integrated Wi-Fi MAC/BB/RF/PA/LNA, on-board antenna. The module supports standard IEEE802.11 b/g/n agreement, complete TCP/IP protocol stack. Users can use the add modules to an existing device networking, or building a separate network controller. ESP8266 is high integration wireless SOCs, designed for space and power constrained mobile platform designers. It provides unsurpassed ability to embed Wi-Fi capabilities within other systems, or to function as a standalone application, with the lowest cost, and minimal space requirement. ESP8266EX offers a complete and self-contained Wi-Fi networking solution; it can be used to host the application or to offload Wi-Fi networking functions from another application processor. When ESP8266EX hosts the application, it boots up directly from an external flash. In has integrated cache to improve the performance of the system in such applications.



Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any micro controller-based design with simple connectivity (SPI/SDIO or I2C/UART interface). ESP8266EX is among the most integrated WIFI chip in the industry; it integrates the antenna switches, RF balun, power amplifier, low noise receive amplifier, filters, power management modules, it requires minimal external circuitry, and the entire solution, including front-end module, is designed to occupy minimal PCB area.

ESP8266EX also integrates an enhanced version of Tensilica's L106 Diamond series 32-bit processor, with on-chip SRAM, besides the Wi-Fi functionalities. ESP8266EX is often integrated with external sensors and other application specific devices through its GPIOs; codes for such applications are provided in examples in the SDK.

C.PINDESCRIPTIONS

There are altogether 18 pin counts, the definitions of which are described in Table 2 below.

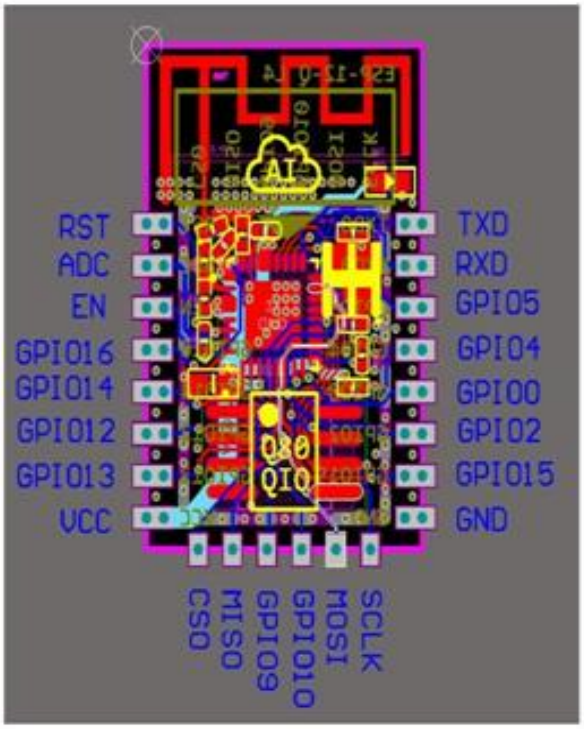


Fig.2 Pin Design

D. RELAY BOARD

A relay is an electromagnetic switch. It is activated when a small current of some microampere is applied to it. Normally a relay is used in a circuit as a type of switch, an automatic switch. There are different types of relays and they operate at different voltages. When a circuit is built the voltage that will trigger it has to be considered. In this system the relay circuit is used to turn the appliances ON/OFF. The high/low signal is supplied from the NodeMCU microcontroller.

When a low voltage is given to the relay of an appliance it is turned off and when a high voltage is given it is turned on. The relay circuit to drive four appliances in the Home automation system is shown below in figuree. The number of appliances can be modified according to the user's requirements.

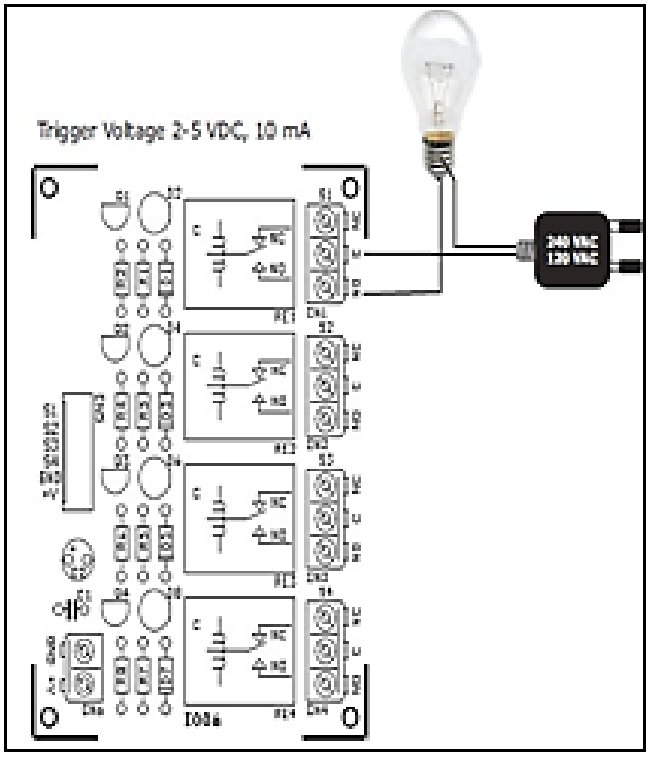


Fig. 3 Relay Board Wiring Diagram

E.ULN 2803 IC :

ULN 2803 IC [6] is used as a relay driver. It is a High voltage, high current Transistor Array IC used especially with Microcontrollers where we need to drive high power loads. This IC consists of eight NPN Darlington connected transistors with common Clamp diodes for switching the loads connected to the output. This IC is widely used to drive high loads such Lamps, relays, motors etc. Most of the Chips operates with low level signals such as TTL, CMOS, PMOS, NMOS which operates at the range of (0-5) V and are incapable to drive high power inductive loads. However, this chip takes low level input signals (TTL) and uses that to switch/turn off the higher voltage loads that are connected to output side.

The ULN2803 IC consists of eight NPN Darlington pair which provides the proper current amplification required 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.

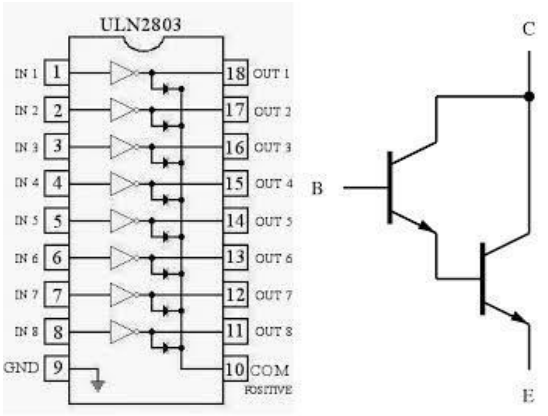


Fig.4 (a). ULN 2803, (b). Darlington Pair

III. SOFTWARE

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

A. BLYNK APPLICATION:

Blynk [2] 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.

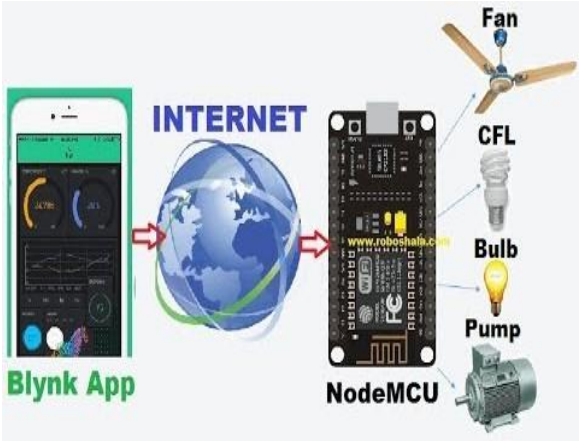


Fig. 5 Functioning of the Blynk Application

B. 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.

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 form:

http://188.166.206.43/AuthToken/pin/CorrespondingDigitalPinNo

Then in the method we select 'PUT' and the content type is 'Application/JSON' 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 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.6 IFTTT Application

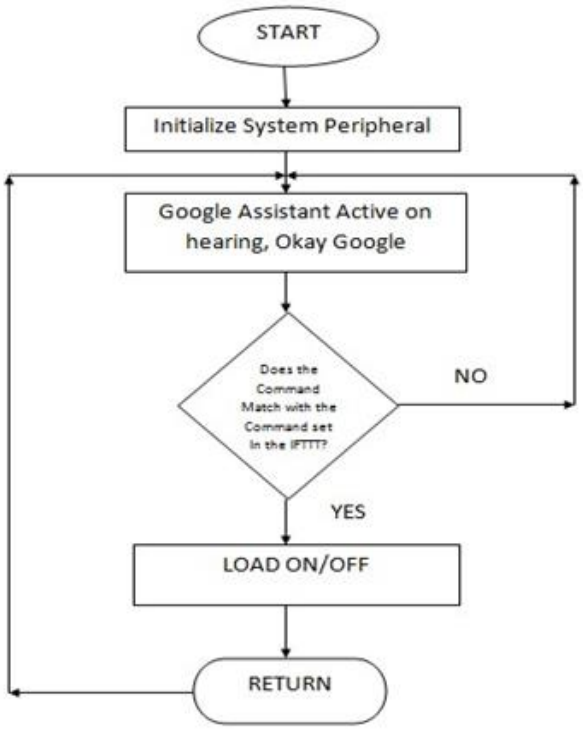


Fig.7 Flowchart

IV. RESULT & CONCLUSION

The result was positive and the system responded well.

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, a greater number of devices can be integrated, like a coffee machine, air conditioner etc. To make the system respond more 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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