N.I.S.H.A.N. – NODE.MCU IMPLEMENTED SMART HOME AUTOMATION NEXUS

A Project Report submitted in partial fulfillment of the requirements for
the Degree of Bachelor of Technology
in
Electrical Engineering
Under
Maulana Abul Kalam Azad University of Technology

By

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Under the supervision of
Asst. Prof.
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ELECTRICAL ENGINEERING

Abacus Institute of Engineering & Management

Joint Venture of JIS Group & Techno India Group
MAY, 2023

ABACUS INSTITUTE OF ENGINEERING AND MANAGEMENT

CERTIFICATE OF RECOMMENDATION

This is to certify that the project entitled "N.I.S.H.A.N-NODE MCU IMPLEMENTED SMART HOME AUTOMATION NEXUS" has been submitted to the Department of Electrical Engineering, Abacus Institute of Engineering and Management for the partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Electrical Engineering by following students of final year B.Tech.

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(PRINCIPAL)

Declaration

We hereby declare that the project report entitled "N.I.S.H.A.N-NODEMCUIMPLEMENTED SMART HOME AUTOMATION NEXUS" being submitted by us towards the partial fulfillment of the requirement for the award of the degree of Bachelor of Technology in Electrical Engineering under the supervision of Mrs. Debadyuti Banerjee has not been submitted anywhere else.We will be solely responsible if any kind of plagiarism is found.

Date:

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Certificate of Approval

The project report titled **"N.I.S.H.A.N. – NODE.MCU IMPLEMENTED SMART HOME AUTOMATION NEXUS"** submitted by Sayan Dutta(Roll No-24001620052) is hereby approved and certified as a credible study in technological subjects performed in a way sufficient for its acceptance for partialfulfillment of the degree for which it is submitted.

It is to be understood that by this approval, the undersigned do not, necessarily endorse or approve any statement made, opinion expressed or, conclusions drawn therein, but approve the project only for the purpose for which it is submitted.

.....	.....	.....
Ms.DEBADYUTI BANERJEE	Ms.RESHMI CHANDRA	Prof. (Dr.)JINIA DATTA
(Project Guide)	(HOD OF EE Dept.)	(Principal)

ACKNOWLEDGEMENT

It is our privilege to express our sincerest regards to our project co-ordinator, **Mrs. Debadyuti Banerjee** for her valuable input, able guidance, encouragement, whole hearted cooperation and constructive critics, throughout the duration of the project.

We deeply express our sincere thanks to our Head of Department for encouraging and allowing us to present the project on the topic"N.I.S.H.A.N-NODE MCU IMPLEMENTED SMART HOME AUTOMATION" at our department premises for the partial fulfillment of the requirements leading to the award of B.Tech degree.

We take this opportunity to thank all our coordinators who have directly or indirectly helped our project. We pay our respects and love to our parents and other family members and friends for their love and encouragement throughout our career. Last but not the least we express our thanks to our friends for their cooperation and support.

ABSTRACT

The idea behind N.I.S.H.A.N. – NODE.MCU IMPLEMENTED SMART HOME AUTOMATION NEXUS is to control home devices with voice. In this project, the Google assistant requires voice commands. Ada-fruit account which is a cloud-based free IoT web server used to create virtual switches is linking to the 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 the 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, controls the relays connected to it. The device connected to the respective relay can be turned on or off as per the user's request to the Google Assistant. The microcontroller used is Node MCU (ESP8266) and the communication between the microcontroller and the application is established via Wi-Fi.

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CHAPTER-01.

1.1 INTRODUCTION

Home automation is also named as domestics or Smart home. It involves the control and automation of lighting, heating, ventilation, air conditioning, and security, as well as home appliances. Home Automation System is a system that uses computers or mobile devices to control basic home functions and features automatically through WIFI. The home automation system differs from other systems by allowing the users to operate the system from anywhere within this Wi-Fi range.

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 provided by Google. The users give voice commands to the device to control the appliances in their homes.

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. The 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. Home is the place where one fancies or desires to be 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 favorite music etc. on a go with their voice with the aid of their smartphones 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 bathwater adjusted to their suitable preferences, and they could relax right away and feel cozier and rather, feel more homely.

1.2 Basic Theory

What is Home Automation?

"Home automation" refers to the automatic and electronic control of household features, activity, and appliances. In simple terms, it means you can easily control the utilities and features of your home via the Internet to make life more convenient and secure, and even spend less on household bills. Read on to find answers to some of the most common questions about home automation technology, and get a few ideas for home automation solutions to incorporate in Your home.

How does home automation work?

Home automation is a network of hardware, communication, and electronic interfaces that work to integrate everyday devices with one another via the Internet. Each device has sensors and is connected through Wi-Fi, so you can manage them from your smartphone or tablet whether you're at home, or miles away. This allows you to turn on the lights, lock the front door, or even turn down the heat, no matter where you are.

There are three main elements of a home automation system: sensors, controllers, and actuators.

Sensors can monitor changes in daylight, temperature, or motion detection. Home automation systems can then adjust those settings (and more) to your preferences.

Controllers refer to the devices — personal computers, tablets or smartphones — used to send and receive messages about the status of automated features in your home.

Actuators may be light switches, motors, or motorized valves that control the actual mechanism, or function, of a home automation system. They are programmed to be activated by a remote command from a controller.

Features are available through home automation systems:-

Home automation systems offer a variety of services and functions. Some of the more common features available through these platforms include:

Fire and carbon monoxide monitoring

Remote lighting control

Thermostat control

Appliance control

Home automation security systems and cameras

Live video surveillance

Alarm systems

Real-time text and email alerts

Digital personal assistant integration

Keyless entry

Voice-activated control

Benefits of home automation systems:-

The purpose of a home automation system is to streamline how your home functions. Consider some of these benefits:

Remote access: Control your home from mobile devices, including your laptop, tablet, or smartphone.

Comfort: Use home automation to make your home a more comfortable, livable space. Preprogram your thermostat with your preferred settings so that your home is always at a comfortable temperature, set up smart speakers to play music when you get home from work, or adjust your lights to soften or brighten based on the time of day.

Convenience: Program devices to turn on automatically at certain times, or access their settings remotely from anywhere with an Internet connection. When you don’t have to remember to lock the door behind you or switch off the lights, you can turn your attention to more important things.

Increased safety: Smart fire detectors, carbon monoxide monitors, pressure sensors, and other home automation security features can help protect your home from disaster.

Energy efficiency: Home automation allows you to be more mindful of your power usage. For example, you can save on energy bills by reducing the length of time that lights stay on, or by lowering temperatures when you leave a room.

Contact Xfinity Home to get a fully integrated home automation system set up in home today.

After the professional installation of a home automation system is complete, you can enjoy

The benefits of living in a safer, smarter home.

1.3 Types of Home Automation Systems

Implementation of home automation depends on the type of controls like wired or wireless. There are mainly three types of home automation systems:

1. Power line Based Home Automation
2. Wired or BUS Cable Home Automation
3. Wireless Home Automation

1. Power Line Home Automation System

This automation is inexpensive and doesn't require additional cables to transfer the information, but uses existing power lines to transfer the data. However, this system involves a large complexity and necessitates additional converter circuits and devices.

2. Wired Home Automation System

Wired Home Automation System

In this type of automation, all the home equipment is connected to the main controller (programmable logic controller) through a communication cable. The equipment is attached with actuators to communicate with the main controller. The entire operations are centralized by the computer that continuously communicates with the main controller.

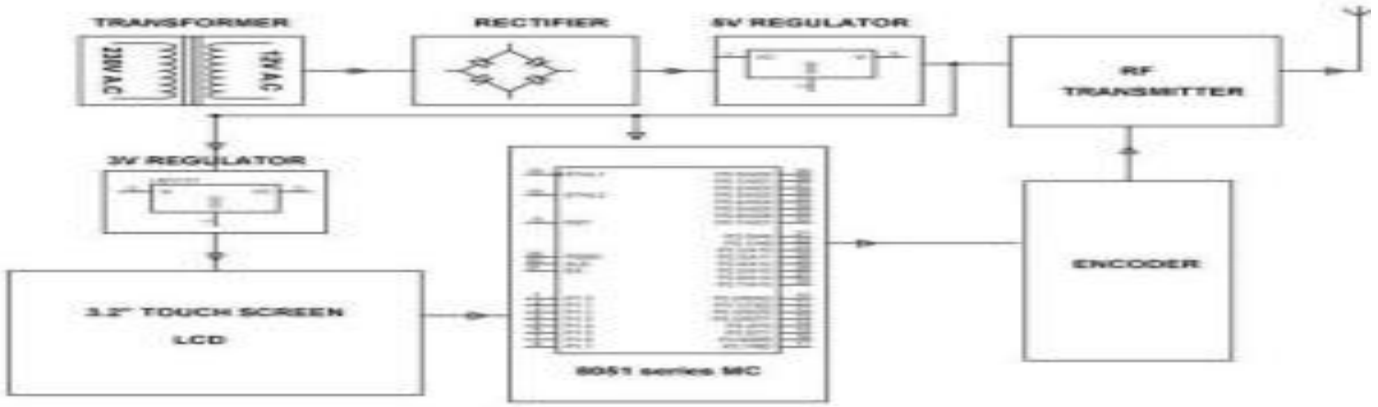
3. Wireless Home Automation

This is the expansion and advancement of wired automation which uses wireless technologies like IR, Zigbee, WI-Fi, GSM, Bluetooth, etc., for achieving remote operation. As an example, the GSM based home automation provides the controlling of home equipment by an SMS to the GSM modem.

As a practical example, the following home automation system project, in which loads are controlled by a touch panel, is very informative.

Touch Screen Based Home Automation System

This touch-screen based home automation project explains how the automation can be implemented to our homes at lower costs. In this system, a microcontroller is attached to the light loads to control them. Program written, it sends the command signals to the encoder circuit. An encoder converts this data into binary format, and then transfers that to an RF transmitter; from there the data is transmitted to the receiver section.



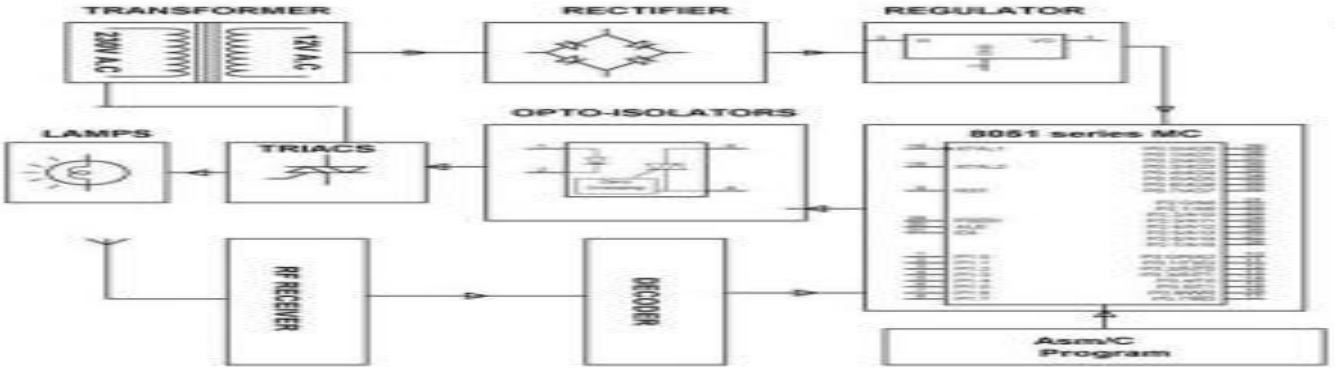
Touch Screen Based Home Automation System- Transmitter

At the receiver side, the RF receiver receives the information sent by the transmitter section,

And then decodes and transfers that to the microcontroller. Therefore, the

Microcontroller sends the command signals to an opt isolator, which triggers the TRAICs.

All the light loads are controlled by the TRIACs; as switches, these are enabled only after



Triggering their gates.

Touch Screen Based Home Automation System- Reciever

It is,therefore,possible to implement home automation using GSM as an extension to the above.

CHAPTER-02.

2.1 COMPONENT REQUIREMENTS:

The Implementation of the project design can be divided into two sections

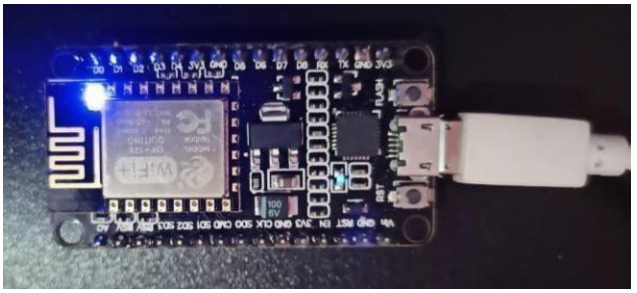
A. Hardware implementations.
B. Software implementation.

2.1.1 HARDWARE REQUIREMENTS

1. Node-MCU – 32-bit ESP8266
2. Relay module
3. One 15W Bulb
4. Male & Female connector

➢ NODE MCU (ESP8266)

Node-MCU is an open-source IoT platform, includes firmware that runs on the ESP8266 Wi-Fi Module from Express-if Systems, and hardware that is based on the ESP-12 module. The term "Node-MCU" by default refers to the firmware rather than the development kits. Node-MCU firmware was developed so that AT commands can be replaced with LUA scripting making the life of developers easier. The ESP8266 is a low-cost Wi-Fi chip with a full TCP/IP stack and microcontroller capability produced by Shanghai-based Chinese manufacturer, Espressif.



FEATURES OF NODE MCU (ESP8266):

1. Open-source
2. Interactive
3. Programmable
4. Low cost
5. Simple
6. Smart
7. WI-FI enabled
8. USB-TTL included
9. Plug & Play

9. Code: Arduino Cpp

10. IDE Used: Arduino IDE

11. GPIO: 10

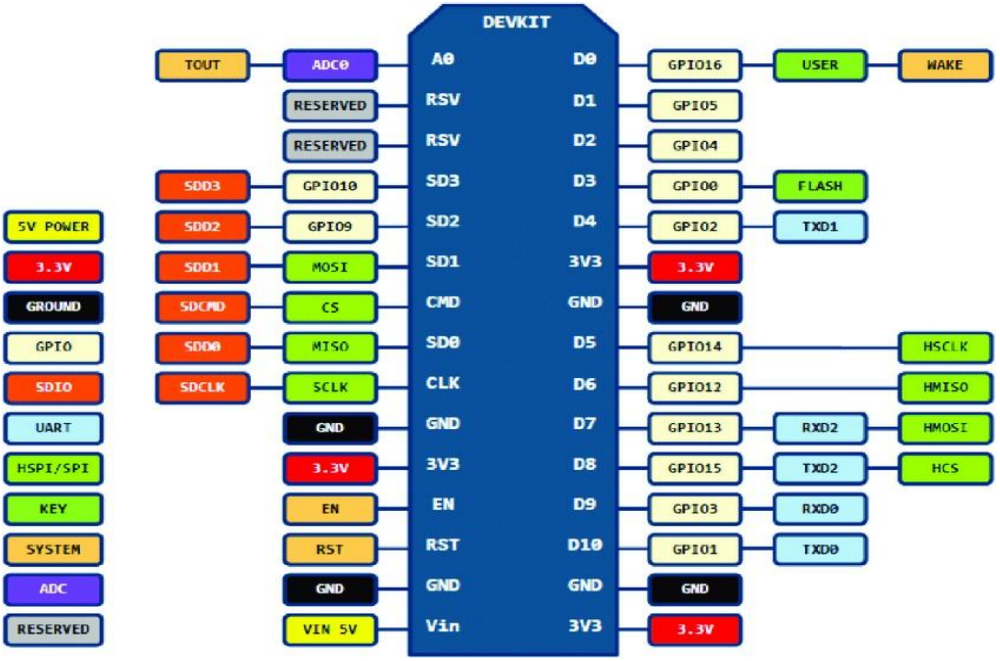
ADVANTAGES OF NODE MCU (ESP8266):

1. Low energy consumption

2. Integrated support for WIFI network

3. Reduced size of the board

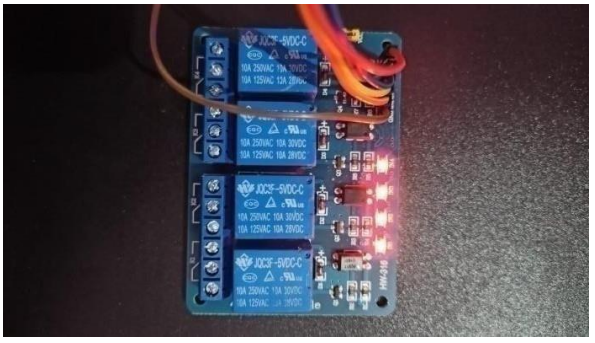
4. Low Cost



Pin Diagram of Node MCU

➢ *RELAY MODULE*

A 4-Channel Relay interface board allows us to control various appliances, and other equipment's with a large current. It can be controlled directly by a Micro-controller.



SPECIFICATIONS:

- 5V 4-Channel Relay interface board.
- Requires 15-20mA signal drive Current.
- TTL logic is compatible.
- High-current AC250V/10A, DC30V/10A relay.
- Status LED.
- Equipped with 3.1mm screw holes for easy installation
- 75 x 55 x 19.3mm (2.95 x 2.16 x 0.76″

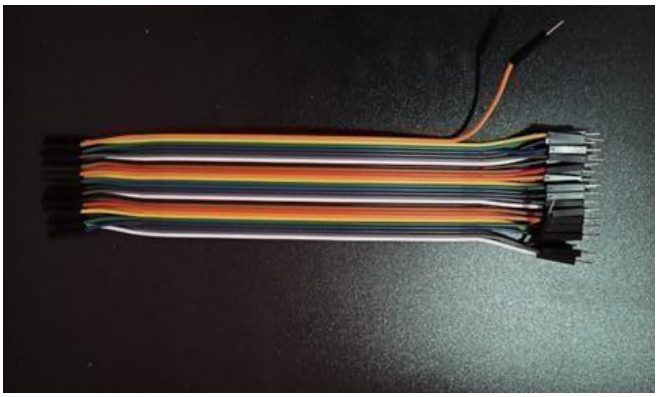
ADVANTAGES:

1. Relays can switch AC and DC, transistors can only switch DC.
2. Relays can high voltages, transistors cannot.
3. Relays are a better choice for switching large currents (>5A).
4. Relays can switch many contacts at once.

➢ ***BULB:*** We have shown the output of the project through a bulb.

➢ *MALE& FEMALE CONNECTOR:*

Through this, we have made the connection between the Node-MCU and Relay Module.



2.1.2 SOFTWARE REQUIREMENTS

1. Google assistant application
2. Ada-fruit IO
3. IFTTT Service.
4. Arduino IDE

➢ ***GOOGLEASSISTANT***

The Google Assistant is an Artificial Intelligence-based virtual assistant software that allows its users to control all the apps on their device. It allows the users to control and command most of the apps on their devices using voice commands. This provides more convenience to the people as they only have to command the google assistant through voice command. 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.

➢ ***ADAFRUIT IO***

Adafruit IO is used to connect projects to the Internet. It can handle and visualize multiple feeds of data. Dashboards are a feature integrated into Adafruit IO which allows users to chat, graph, gauge, log, and display our data. Users can view their dashboards from anywhere in the world. Adafruit IO is used to control and react to the user data. It is a platform designed to display,

respond, command, and interact with a project's data. It also keeps our data private and secure for us. It's the internet of things - for everyone. Ada-fruit IO also allows the set-up of dashboards that let users directly manipulate or view the current value of each topic. Since it can be accessed from a web browser, it makes it the ideal hub for monitoring and controlling all of various IoT projects.

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.

➢ ***ARDUINO IDE***

The Arduino integrated development environment (IDE) is a cross-platform application (for Windows, mac-OS, Linux) that is written in the programming language Java. It is used to write and upload programs to Arduino compatible boards, but also, with the help of 3rd party cores, other vendor development boards. The source code for the IDE is released under the GNU General Public License, version 2. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that is compiled and linked with a program stub main() into an executable cyclic executive program with the GNU toolchain, also included with the IDE distribution. The Arduino IDE employs the program to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

2.2 METHODOLOGY

The methodology of this project design includes the implementation of the proposed method. There are some basic steps involving in the Methodology of the product. The first major step is setting up the Ada-fruit IO. Ada-fruit IO is a website used to create virtual switches which will be turned ON or OFF depending on the commands given to the Google Assistant and the second step is connecting the ESP8266 and the last step is connecting to Google assistant through IFTTT, IFTTT is also a website used to create a simple chain of conditional statements for like if-else statements. By following these three steps, the implementation of the proposed system is going to be done.

ADAFRUIT IO:

- First, create an account at www.Adafruit.io
- Now, create a dashboard at Ada-fruit. This dashboard is a user interface to control things remotely.
- After following above steps, provide a name to the dashboard and save it.
- Now, create feed (user interface) to control light ON-OFF. To create it, just click on the "+" symbol and select toggle.
- After selecting the toggle feed, pop-up window.
- Enter name of the feed and create it. After creation, select the created feed and then click on the next step.
- In the next step configure the feed.
  Here. 0 is used as OFF and 1 is used as ON. Then click on create.

IFTTT (If This Then That):

- If This Then That, also known as IFTTT is a free web-based service to create chains of simple conditional statements, called applets.
- Here, IFTTT is used to use google assistant service and Ada-fruit service in the chain. So, Google assistant is used to controlling the light of my home by saying Ok Google, turn the light ON or OFF. Then IFTTT interprets the message and can send it to Ada-fruit's dashboard as an understandable command to the created feed.
- To create an account on IFTTT we have to use the same e-mail id which has been used for Ada-fruit.
- After account creation, click on My Applets and then select New Applet.
- After selecting a new applet, we get a new page. And click on the 'THIS' option.
- Then search for Google Assistant and select it.
- Now, enter voice phrases which will be used as a command for Google assistant.
- Creating trigger for making light ON and making light OFF.
- Now, another page will be shown in which users have to click on the 'THAT' option which is used to connect Google Assistant with Ada-fruit.
- Then search for Ada-fruit and select it.
- After selecting Ada-fruit, choose action.
- Now enter what data needed to send to which feed off the Ada-fruit dashboard.
- Click on 'Create Action'. Completing action fields. So, when Google Assistant is used on mobile. This will trigger the event on the Ada-fruit dashboard which is

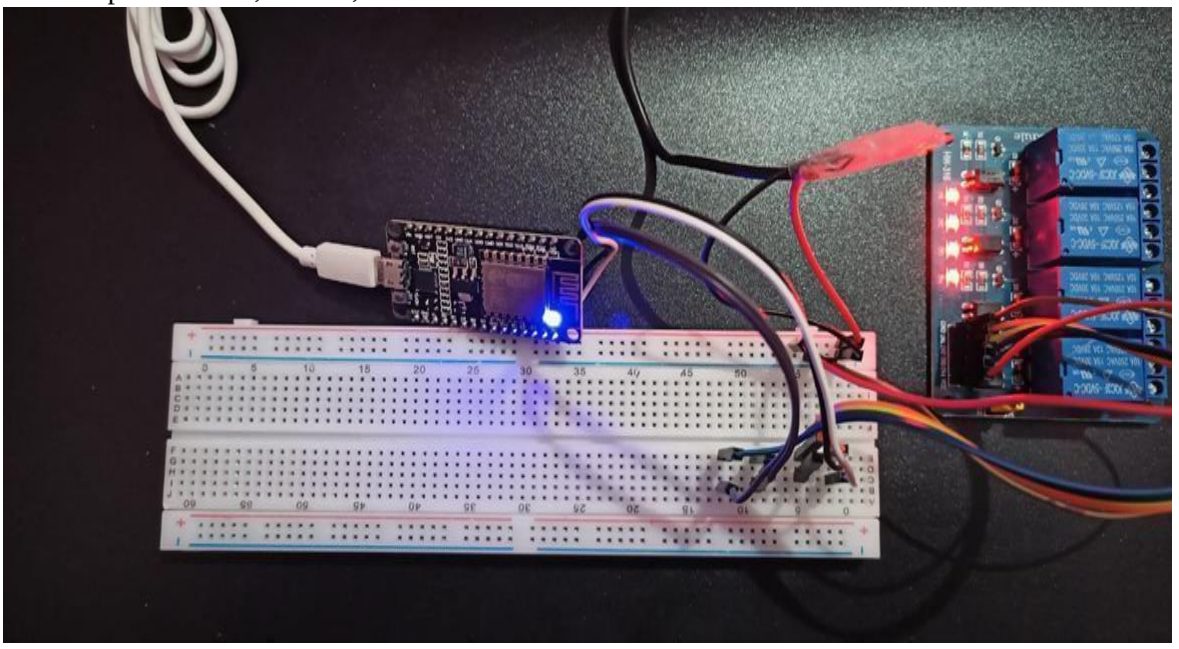
continuously monitored by the microcontroller (here Node-MCU). This microcontroller will take action as per the data change on the Ada-fruit dashboard.

BLOCK DIAGRAM :

In Google assistant-controlled home automation, first, the user should have an Android smartphone with Google assistant installed in it. When the user gives commands to the Google assistant, the commands will be checked with the commands in the IFTTT website which are already set. Then the next step is setting up the virtual switches on the Ada-fruit website. If the commands given by the user matches with the commands in the IFTTT website, then depending on that commands, the virtual switches in Ada-fruit will be turned ON or OFF. This will be sensed by the Node microcontroller and it will turn ON or OFF the relay depending on the commands. All this will be done over the WIFI. In this, the relay will act as a switch and the Home appliances connected to the relay will be turned on or off. The number of Home appliances connected depends upon the number of relays.

INTERFACING Node-MCU WITH RELAY:

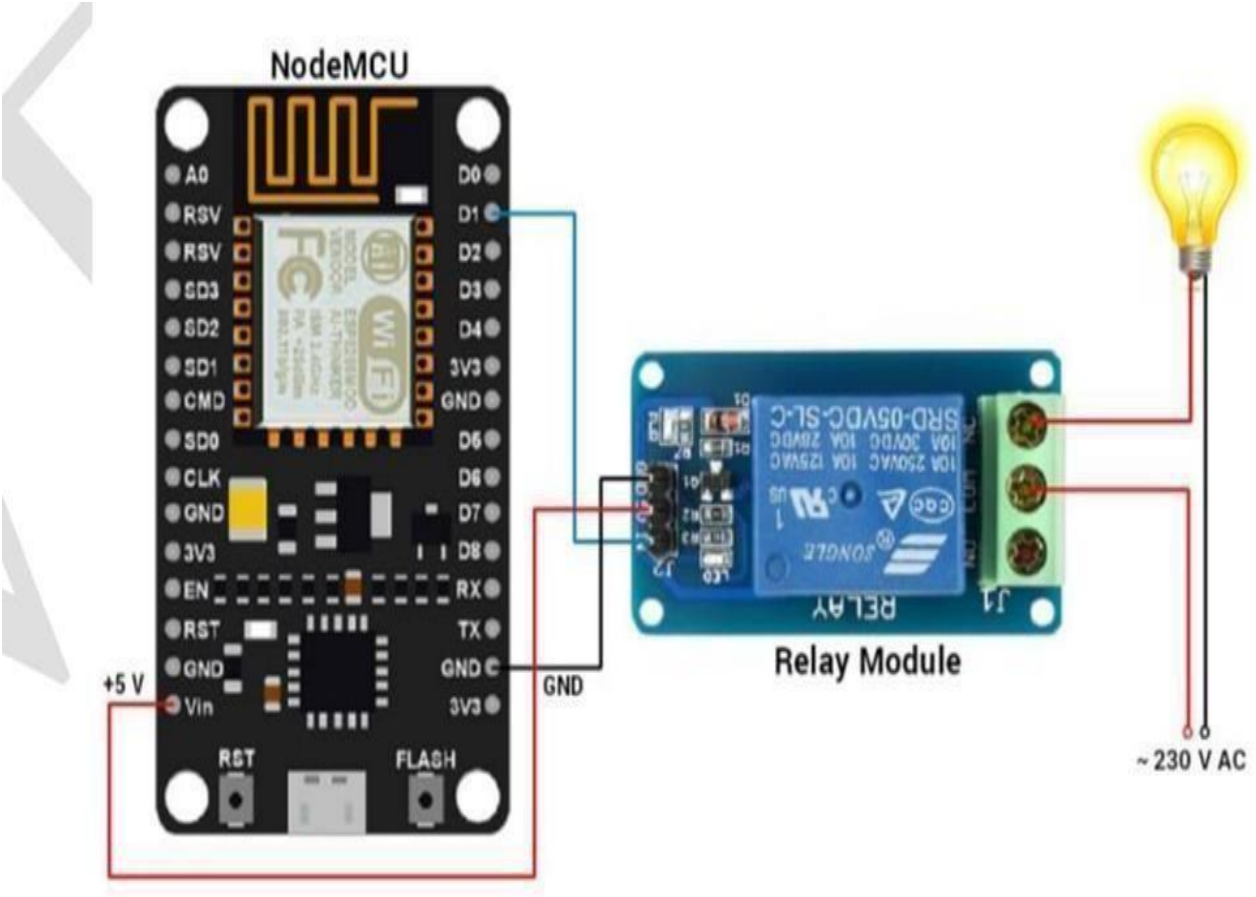
The +5v V-in pin of the Node-MCU is given to the voltage pin of the relay module. The ground pin of Node Microcontroller is connected to the ground pin of the Relay module. The Node-MCU consists of 8 data pins, clock, reset, enable, transmitter, receiver, flash, etc. If the 4-Channel relay is used, then the data pins D0, D1, D2, D3 are connected to the 4 data pins of the relay in which D0 is used to control 1st relay, D1 is used to control the 2nd relay, D3 is used to control the 3rd relay and D4 is used to control the 4th relay. The output of the relay consists of 3 pins in which two of them are given to the output like bulb, fan etc., and the one is of no connection.



Interfacing Diagram of Node-MCU with Relay Module

CONNECTION OF BULB TO RELAY MODULE :

While connecting a bulb with the relay module, one of the wires of the bulb is directly connected to the power supply, the other wire of the bulb will be given to the power supply through relay module as shown in the Figure.



CHAPTER-03.

3.1 PROGRAM:

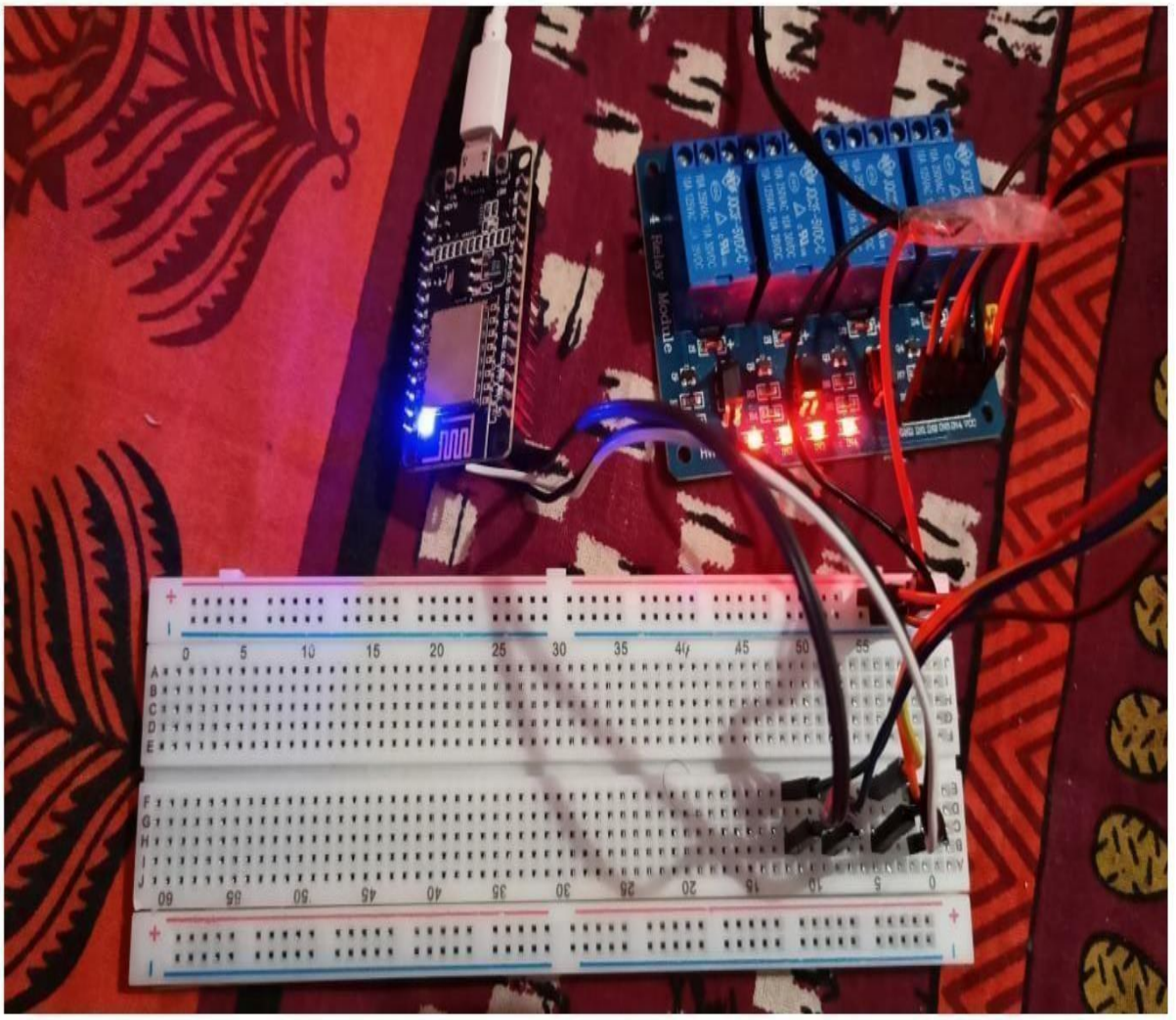
```
#include <ESP8266WiFi.h>
#include "Adafruit_MQTT.h"
#include "Adafruit_MQTT_Client.h"
#define Relay1          D1
#define Relay2          D2
#define Relay3          D3
#define Relay4          D4
#define WLAN_SSID       "ABACUS"                // Your SSID
#define WLAN_PASS       "***********"           // Your password
/************************ Adafruit.io Setup *********************************/
#define AIO_SERVER      "io.adafruit.com"
#define AIO_SERVERPORT  1883                    // use 8883 for SSL
#define AIO_USERNAME    "sdg143"                // Replace it with your username
#define AIO_KEY         "aio_QyXU53pDSsXgwRxBPC3onBx82Sex" // Replace with your Project Auth Key
/************ Global State (you don't need to change this!) ******************/
// Create an ESP8266 WiFiClient class to connect to the MQTT server.
WiFiClient client;
// or... use WiFiFlientSecure for SSL
//WiFiClientSecure client;
// Setup the MQTT client class by passing in the WiFi client and MQTT server and login details.
Adafruit_MQTT_Client mqtt(&client, AIO_SERVER, AIO_SERVERPORT, AIO_USERNAME, AIO_KEY);
/****************************** Feeds ***************************************/
// Setup a feed called 'onoff' for subscribing to changes.
Adafruit_MQTT_Subscribe Light1 = Adafruit_MQTT_Subscribe(&mqtt, AIO_USERNAME"/feeds/Relay1"); // FeedName
Adafruit_MQTT_Subscribe Light2 = Adafruit_MQTT_Subscribe(&mqtt, AIO_USERNAME "/feeds/Relay2");
Adafruit_MQTT_Subscribe Light3 = Adafruit_MQTT_Subscribe(&mqtt, AIO_USERNAME "/feeds/Relay3");
Adafruit_MQTT_Subscribe Light4 = Adafruit_MQTT_Subscribe(&mqtt, AIO_USERNAME "/feeds/Relay4");
void MQTT_connect();
void setup() {
Serial.begin(115200);
pinMode(Relay1, OUTPUT);
pinMode(Relay2, OUTPUT);
pinMode(Relay3, OUTPUT);
pinMode(Relay4, OUTPUT);
```

```
  // Connect to WiFi access point.
 Serial.println(); Serial.println();
 Serial.print("Connecting to ");
 Serial.println(WLAN_SSID);
 WiFi.begin(WLAN_SSID, WLAN_PASS);
 while (WiFi.status() != WL_CONNECTED) {
 delay(500);
  Serial.print(".");
 }
 Serial.println();
 Serial.println("WiFi connected");
 Serial.println("IP address: ");
 Serial.println(WiFi.localIP());
  // Setup MQTT subscription for onoff feed.
 mqtt.subscribe(&Light1);
 mqtt.subscribe(&Light3);
 mqtt.subscribe(&Light2);
 mqtt.subscribe(&Light4);
}
void loop() {
  MQTT_connect();
   Adafruit_MQTT_Subscribe *subscription;
 while ((subscription = mqtt.readSubscription(20000))) {
  if (subscription == &Light1) {
    Serial.print(F("Got: "));
    Serial.println((char *)Light1.lastread);
    int Light1_State = atoi((char *)Light1.lastread);
    digitalWrite(Relay1, Light1_State);
  }
  if (subscription == &Light2) {
    Serial.print(F("Got: "));
    Serial.println((char *)Light2.lastread);
    int Light2_State = atoi((char *)Light2.lastread);
    digitalWrite(Relay2, Light2_State);
  }
```

```
  if (subscription == &Light3) {
    Serial.print(F("Got: "));
    Serial.println((char *)Light3.lastread);
    int Light3_State = atoi((char *)Light3.lastread);
    digitalWrite(Relay3, Light3_State);
  }
  if (subscription == &Light4) {
    Serial.print(F("Got: "));
    Serial.println((char *)Light4.lastread);
    int Light4_State = atoi((char *)Light4.lastread);
    digitalWrite(Relay4, Light4_State);
  }
 }
}
void MQTT_connect() {
 int8_t ret;
 // Stop if already connected.
 if (mqtt.connected()) {
 return;
 }
 Serial.print("Connecting to MQTT... ");
 uint8_t retries = 3;
    while ((ret = mqtt.connect()) != 0) { // connect will return 0 for connected
  Serial.println(mqtt.connectErrorString(ret));
  Serial.println("Retrying MQTT connection in 5 seconds...");
  mqtt.disconnect();
  delay(5000); // wait 5 seconds
  retries--;
  if (retries == 0) {
    // basically die and wait for WDT to reset me
    while (1);
  }
 }
 Serial.println("MQTT Connected!");
```

3.2 RESULT:

The output for Google Assistant controlled Home Automation is shown below:



3.3 COSTING

- **NodeMCU-ESP8266(Rs. 485+80)**
- **Relay module(Rs. 429+75)**
- **One Bulb(Rs. 50)**
- **Male & Female connector(Rs.171+50)**
- **Micro Usb Cable(Rs.149)**
- **Veero Board (Rs. 110+18)**
- **Bulbe Holder (40)**
- **Wire (Rs. 30)**
- **Promming Cable (Rs.150)**

Total Costing = 1837/-

CHAPTER-04.

4.1 APPLICATIONS:

- Lighting control system.
- Appliance control with a smart grid.
- Indoor positioning systems.
- Home automation for elderly and disabled people.
- Improved home safety and security.
- Home air quality and water quality monitoring.
- Natural language-based voice assistants.
- Better infotainment delivery.

4.2 CONCLUSION

In this project, voice commands are given to the Google assistant. The voice commands for Google assistant have been added through the IFTTT website and the Ada-fruit account is linked to it. In this home automation, users have 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 user's request to the Google Assistant. The microcontroller used is Node-MCU (ESP8266) and the communication between the microcontroller and the application is established via Wi-Fi (Internet).

4.3 FUTURE SCOPE

One can implement several of their tasks with just a single command of verbal instructions. These technologies can be used to build a fully functional home automation system and control smart home devices including smart lights, connected thermostats, and appliances.

4.4 REFERENCE

Books:

Electrical measurement & Instrumentation.

A course In Electrical & Electronics Measurement and Instrumentation by A.K. Sawhney.

Principles of Electronics by V. K. Mehta.

DEDICATED TO OUR TEACHERS