INTRODUCTION

Home automation is the control of any or all electrical devices in our home or office, whether we are there or away. Home automation is one of the most exciting developments in technology for the home that has come along in decades. There are hundreds of products available today that allow us control over the devices automatically, either by remote control; or even by voice command. Home, it 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 theirs 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 cozier 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 are blessed with these 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. This paper proposes such inexpensive system. It uses the Google Assistant, the IFTTT application, the adafruit service and the Node MCU microcontroller as the major components along with a relay board comprising of 4/8 relays along with ULN 2803 IC. Natural language voice is used to give commands to the Google Assistant . All of the components are connected over the internet using Wi-Fi which puts this system under the IoT.

LITERATURE REVIEW

One of the topics which is gaining popularity is Home Automation System because of its numerous advantages. Home automation refers to the monitoring and controlling of home appliances remotely. with the never-ending growth of the Internet and its applications, there is much potential and scope for remote access and control and monitoring of such network enabled appliances. This paper deals with discussion of different intelligent home automation systems and technologies from a various features standpoint. The effort targeted on the home automation concept of where the controlling and monitoring operations are expediting through smart devices. Wide-ranging home automation systems and technologies considered in review with central controller based (Arduino), cloud-based, Bluetooth-based, SMS based, ZigBee based, mobile-based, RF Module based, web based and the Internet with performance**.**The Home automation system that uses Wi-Fi technology. System consists of three main components; web server, which presents system core that controls, and monitors users' home and hardware interface module, which provides appropriate interface to sensors and actuator of home automation system. The System is better from the scalability and flexibility point of view than the commercially available home automation systems. The User may use the same technology to login to the server web based application. .If server is connected to the internet, so remote users can access server web based application through the internet using compatible web browser. Application developed using the Android platform controlled and monitored from a remote location using the smart home app and an Arduino Ethernet based micro web-server [8]. The sensors and actuators/relays are directly interfaced to the main controller. Proposed design offers are the control of energy management systems such as lightings, heating, air conditioning, security, fire detection and intrusion detection with siren and email notifications.

OBJECTIVES

Our main objective is to utilise easily available electronics modules to implement a cost effective but efficient home automation project. This system gives service at low cost compared to the cost of the available home automation systems in the market. We want to make a system that will give 24 into 7 service. By using a cheap power bank or any sort of solar power units, we can power up the system easily and the only condition is that the system requires only 5V supply. The device is having lesser number of components also they are easily available. And that makes easier for replacements. And as we are using NodeMCU, utilising WiFi, we are able to program the microcontroller through air and that makes the project more effective and efficient. This project aims at designing an advanced home automation system using normal web server and Wi-Fi technology. The devices can be switched ON/OFF and sensors can be read using a Personal Computer (PC) through Wi-Fi. Automation is the mostfrequently spelled term in the field of electronics. The hunger for automation brought many revolutions in the existing technologies. These had greater importance than any other technologies due to its user-friendly nature. These can be used as a replacement ofthe existing switches in home which produces sparks and also results in fire accidents in few situations. Considering the advantagesof Wi-Fi an advanced automation system was developed to control the appliances in the house. Wi-Fi (Short for Wireless Fidelity)is a wireless technology that uses radio frequency to transmit data through the air. Wi-Fi has initial speeds of 1mbps to 2mbps. Wi-Fi transmits data in the frequency band of 2.4 GHz. It implements the concept of frequency division multiplexing technology

ORGANISATION OF PROJECT

The project was developed through the following six phases:

1. Idea development
2. Component identification
3. Bread board verification of designed circuit
4. Micro controller study and programming
5. Testing
6. Final assembly

BLOCK DIAGRAM AND EXPLANATION

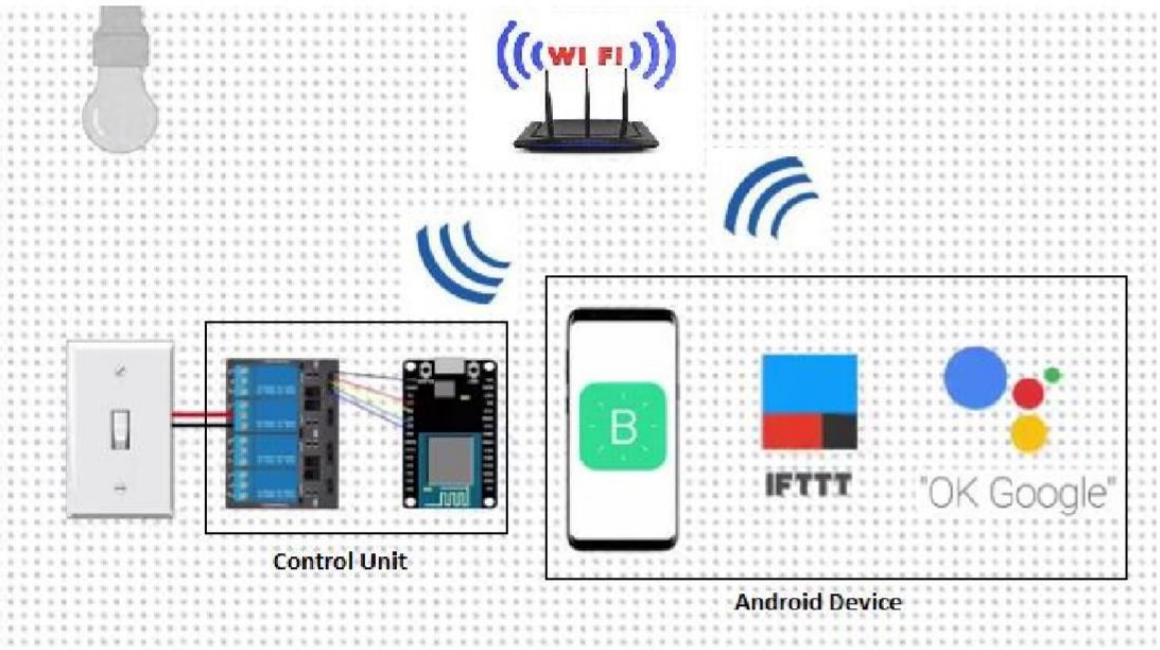

Figure 1 Block Diagram

The system design is broken down into two main categories,

i. 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,

ii. The Software- 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 ULN 2803 IC to control the relays. The Android device communicates with the microcontroller and sends the desired signal via the internet. Figure 1 above shows the basic system design architecture. The hardware also called the Control Unit comprises of the NodeMCU microcontroller and the Realy board. NodeMCU's digital output pins are connected to the Relay pins of the Relay board. Finally, each Relay is connected to an appliance.

To build home automation application, we used three different platforms

- Google Assistant
- Adafruit
- IFTTT

To use above services we need to configure them.

First, created account at www.Adafruit.io. Now, create dashboard at Adafruit. This dashboard is a user interface to control things remotely. After following this, provide name to the dashboard and save it. Now, create feed (user interface) to control light On-Off. Select toggle feed and after selecting toggle feed, pop-up window appears. Enter name of our feed (shown in red box) and create it. After creation, select the created feed. Here, we used 0(OFF) and 1(ON) text for button and then click on create. This will create toggle button on your dashboard which can be used to control things remotely. Now, the,dashboard is ready for IoT application like home automation. 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. Here, we used IFTTT to use google assistant service and Adafruit service in chain. So, when we use google assistant to control light of my home by saying Ok Google, turn the light ON or OFF. Then IFTTT interpret the message and can send it to Adafruit's dashboard as a understandable command to the created feed. Now we have to configure IFTTT. First step is creating account on IFTTT. Create account on IFTTT by using same e-mail id which you have used for Adafruit. After account creation, click on My Applets and then select New Applet. After selecting a new applet, we get a new page in which we should click on to This. Then search for Google Assistant and select it. Now, enter voice phrases which we will use as a command for google assistant as shown below,

We can enter any phrase as per our application. As you can see, the phrases entered in the above fields is for making Light ON. For making Light OFF, we have to create another applet with different phrases. Now, we get another page on which we have to click on that option which is used to connect Google Assistant with Adafruit. Then search for Adafruit and select it. Now enter what data we need to send to which feed of Adafruit dashboard. Click on Create Action.So, when I use Google Assistant on my mobile and give voice command as "Ok Google, Turn LED ON", applet created in IFTTT receive this command and will send data '1' to the Adafruit feed. This will trigger the event on Adafruit dashboard which is continuously monitored by the microcontroller (here NodeMCU). This microcontroller will take action as per the data change on the Adafruit dashboard

CIRCUIT DIAGRAM AND EXPLANATION

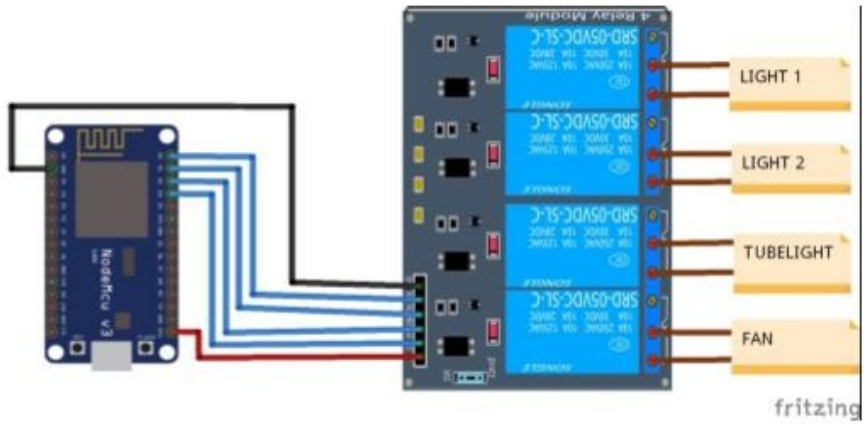

Figure 2 Circuit Diagram

Google assistant is AI (Artificial Intelligence) based voice command service. Using voice, we can interact with google assistant and it can search on internet, schedule events, set alarms, control appliances, etc. This service is available on smartphones and Google Home devices.We can control smart home devices including lights, switches, fans and thermostats using our Google Assistant. As the components are minimum in number and hence the connection between them are quite simple. As we are using 4 relays ,the relay module is having 4 control pins and they are connected to the node Mcu as control pin of relay 1 goes to the digital pin D0 , relay control pin 2 to D1 , relay control pin 3 to D2 , relay control pin 4 to D3. And nodeMcu and the 4 channel relay module is provided with 5V DC supply. And as the circuit diagram, the outputs of the each relay are connected to corresponding appliances as we require.

The basic principle of this home automation project is that to control home appliances by voice command with certain commands that are predefined to the networking cloud. Here as shown in the circuit diagram, it consists of four relays that are connected to the four digital pins of NodeMCU(digital pin1,digital pin2, digital pin3, Digital pin4) and we can add more number of relays accordingly for controlling more devices by Google automation. A 5v power supply is required for circuit operation. Adafruit IO service is used to connect Google assistant and the Wi-Fi module. The values are all predefined in the Adafruit webcloud .When the required command1 (Lights On) is given, then Google assistant and Adafruit service get linked so that the data or command is sent through Adafruit IO and are collected by NodeMCU with the help of Wi-Fi module. Then the relay connected to the first digital pin gets activated thereby relay switches on the components connected to it. When command 0 or data0(Lights OFF) is given then the

relay connected to the the first digital pin goes down thereby the switches off the electronic component connected to it.

MQTT Protocol

This IoT based Home Automation Project uses MQTT protocol for exchanging data between server and client. This protocol is very fast compared to the TCP/IP protocol. And the working concept is also different from the TCP/IP protocol. This protocol has three main components.

- Publish
- Broker
- Subscriber

According to MQTT.org (official website), “MQTT stands for MQ Telemetry Transport. It is a publish/subscribe, extremely simple and lightweight messaging protocol, designed for constrained devices and low-bandwidth, high-latency or unreliable networks. Thedesign principles are to minimize network bandwidth and device resource requirements whilst also attempting to ensure reliability and some degree of assurance of delivery. These principles also turn out to make the protocol ideal of the emerging “machine-to-machine” (M2M) or “Internet of Things” world of connected devices, and for mobile applications where bandwidth and battery power are at a premium.” MQTT is an extremely simple and lightweight messaging protocol. It stands for Message Queuing Telemetry Transport. Its publish/subscribe architecture is designed to be open and easy to implement, with up to thousands of remote clients capable of being supported by a single server. MQTT reduces device resource requirements and network bandwidth while attempting to ensure reliability and delivery.

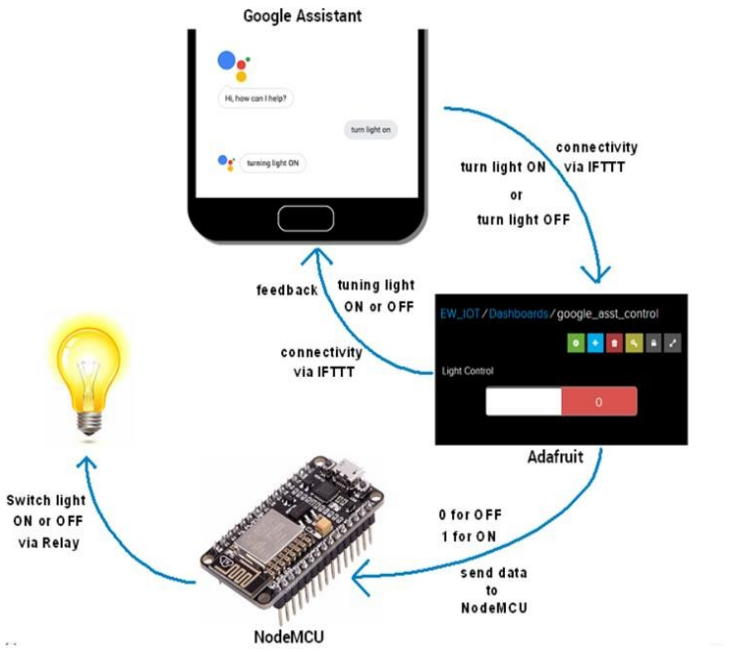

Figure 3 Interfacing Diagram

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 favourite 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.

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.

PROGRAM CODE

```
#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 ”------- ” // Your SSID
#define WLAN PASS ”------- ”
 // Your password
/************************* Adafruit.io
Setup *********************************/
#define AIO SERVER ”io.adafruit.com”
//Adafruit Server
#define AIO SERVERPORT 1883
#define AIO USERNAME ”username here”
// Username
 #define AIO KEY ”with key here”
// Auth Key
//WIFI CLIENT
 WiFiClient client;
```

```
Adafruit MQTT Client mqtt(&client,
```

```
AIO SERVER, AIO SERVERPORT, AIO USERNAME, AIO KEY);

 Adafruit MQTT Subscribe Light1 =

Adafruit MQTT Subscribe(&mqtt, AIO USERNAME"/feeds/Relay1"); // Feeds name
should be same everywhere

Adafruit MQTT Subscribe Light2 =

Adafruit4 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());
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;
 if (mqtt.connected())
 {
 return;
}
```

```
}
Serial.print(”Connecting to MQTT... ”);
 uint8 t retries = 3;
 while ((ret = mqtt.connect()) != 0)
 { Serial.println(mqtt.connectErrorString(ret));
 Serial.println(”Retrying MQTT connection in 5 seconds...”);
mqtt.disconnect();
delay(5000);
 retries–;
 if (retries == 0)
{
while (1);
}
 }
 Serial.println(”MQTT Connected!”);
}
```

COMPONENTS REQUIRED

The components required are;

- Node Mcu (ESP8266)
- Relay module
- Power source
- Appliances
- Gadget with Google assistant

Node MCU (ESP8266)

NodeMCU Development Board is based on ESP8266 system on chip which combines the feature of Wi-Fi and microcontroller to satisfy the need of prototyping IoT applications within less time and with few lines of Lua Scripts. Wi-Fi is wireless LAN technology used for short distant wireless networking applications. It is based on IEEE 802.11standards.NodeMCU firmware provides Event driven APIs for network applications. NodeMCU Wi-Fi networking can be used to connect, fetch or upload data to internet. NodeMCU Wi-Fi subsystem is running in background tasks periodically. If any function takes more than 15 milliseconds, it may cause the wi-fi subsystem to crash. To handle such functionalities NodeMCU has their APIs through which we can control this subsystem.The NodeMCU (Node MicroController Unit) is an open source software and hardware development environment that is built around a very inexpensive System-on-a-Chip (SoC) called the ESP8266. The ESP8266 is designed and manufactured by Express, contains all crucial elements of the modern computer: CPU, RAM, networking (wi-fi), and even a modern operating system and SDK. When purchased at bulk, the ESP8266 chip costs only $2 USD a piece. That makes it an excellent choice for this system design. The Node MCU aims to simplify ESP8266 development. It has two key components.

1. An open source ESP8266 firmware that is built on top of the chip manufacturer's proprietary SDK. The firmware provides a simple programming environment based on eLua (embedded Lua), which is a very simple and fast scripting language with an established developer community. For new comers, the Lua scripting language is easy to learn. And to add on Node MCU can be programmed with the Android IDE too.

2. A development kit board 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.

NodeMCU has four Wi-Fi modes as,

Station (STA) Mode:

In this mode, NodeMCU joins the existing networks. The NodeMCU connects the existing wi-fi router. This provides the internet access to the NodeMCU through the wi-fi router.

Access Point (AP) Mode:

In this mode, NodeMCU creates its own network and others can join this network. Here it has local IP address with which other devices can connect to it. NodeMCU assigns next available IPs to the other devices.

Station + Access Point (BOTH) Mode:

This is the mode, where it creates its own network while at the same time being joined to another existing network.

Wi-Fi OFF Mode:

In this mode, wi-fi remains OFF.

Figure4 below shows the NodeMCU development board.

Figure 4 NodeMcu(ESP8266) Development Board

ESP8266 is a low cost wifi enabled chip. It comes in a variety of module types and can be programmed in a variety of ways. It is easy to program and includes a 5V to 3V3 supply as well as a built in relay and access to the ESP8266 GPIO pins. Since these modules connect to the internet (via wifi), security is important. The code generator and library shown supports 128 bit security. This security does not encrypt the messages but instead adds a cryptographic hash to each message to protect against un-authorized connection and control. The ESP8266 has 3.3V supply rails

Relay Board

A relay is an electrical device which is generally used to control high voltages using very low voltage as an in this consists of acoil wrapped around a pole and a two small metal flaps (nodes) that are used to close the circuit. One of the node is fixed and other is movable. Whenever an electricity is passed through the coil, it creates a magnetic field and attracts the moving node towards the static node and the circuit gets completed. So, just by applying small voltage to power up the coil we can actually complete the circuit for the high voltage to travel. Also, as the static node is not physically connected to the coil there is very less chance that he Microcontroller powering the coil gets damaged if something goes wrong. We know that most of the high end industrial application devices have relays for their effective working. Relays are simple switches which are operated both electrically and mechanically. Relays consist of an electromagnet and also a set of contacts. The switching mechanism is carried out with the help of the electromagnet. There are also other operating principles for its working. But they differ according to their applications. Most of the devices have the application of relays. The main operation of a relay comes in places where only a low-power signal can be used to control a circuit. It is also used in places where only one signal can be used to control a lot of circuits. The application of relays started during the invention of telephones. They played an important role in switching calls in telephone exchanges. They were also used in long distance telegraphy. They were used to switch the signal coming from one source to another destination. After the invention of computers they were also used to perform Boolean and other logical operations. The high end applications of relays require high power to be driven by electric motors and so on. Such relays are called contactors. 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 Node MCU 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.

The number of appliances can be modified according to the user's requirements. A relay circuit is used to realize logic functions. They play a very important role in providing safety critical logic. Relays are used to provide time delay functions. They are used to time the delay open and delay close of contacts. Relays are used to control high voltage circuits with the help of low voltage signals. Similarly they are used to control high current circuits with the help of low current signals. They are also used as protective relays. By this function all the faults during transmission and reception can be detected and isolated.

A relay is an electrical device which is generally used to control high voltages using very low voltage as an Input. This consists of a coil wrapped around a pole and a two small metal flaps(nodes) that are used to close the circuit. One of the node is fixed and other is movable. Whenever electricity is passed through the coil, it creates a magnetic field and attracts the moving node towards the static node and the circuit gets completed. So, just by applying small voltage to power up the coil we can actually complete the circuit for the high voltage to travel. Also, as the static node is not physically connected to the coil there is very less chance that the Microcontroller powering the coil gets damaged if something goes wrong.

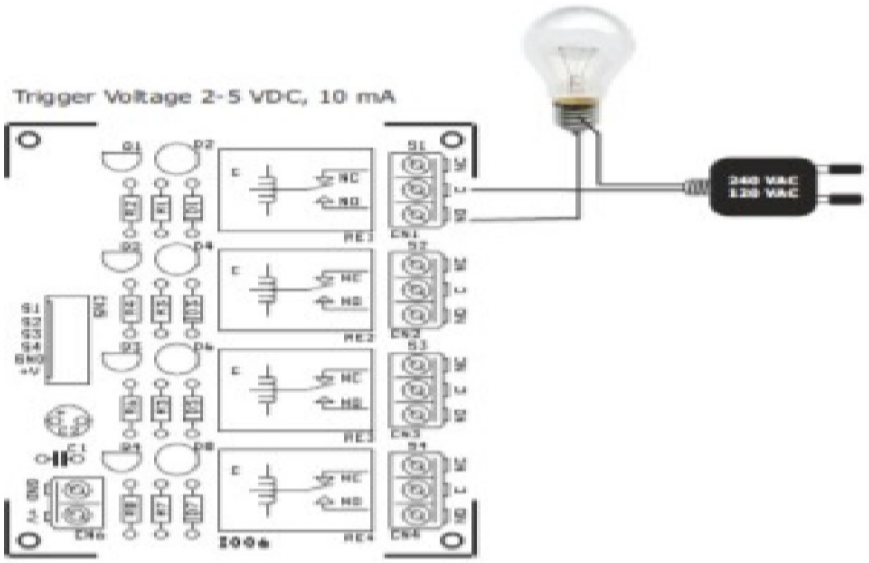

Figure 5 Relay Board Writing Diagram

Relays are switches that open and close circuits electromechanically or electronically. Relays control one electrical circuit by opening and closing contacts in another circuit. As relay diagrams show, when a relay contact is normally open (NO), there is an open contact when the relay is not energized. Switching things off and on again is one of the main features of home automation. It is usually achieved through electronic switches or relays that are controlled by NPN or PNP transistor outputs which in turn are toggled by even lower power and isolated microcontroller output pins. The sensor acts as a switch that will send the low voltage to the coil of the motor starter. When we use a relay to power a high voltage or high current device, while a lower voltage is used to power the controls that energize the relay. Relays are commonly controlled with switches, push buttons, and sensors.

The typical applications of electromechanical relays include motor control, automotive applications such as an electrical fuel pump, industrial applications where control of high voltages and currents is intended, controlling large power loads, and so on. The input circuit is switched off and no current flows through it until something (either a sensor or a switch closing) turns it on. The output circuit is also switched off. When a small current flows in the input circuit, it activates the electromagnet, which produces a magnetic field all around it. The energized electromagnet pulls the metal bar in the output circuit toward it, closing the switch and allowing a much bigger current to flow through the output circuit. The output circuit operates a high-current appliance such as a lamp or an electric motor.

Power Sources

A power supply is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load. As a result, power supplies are sometimes referred to as electric power converters. Some power supplies are separate standalone pieces of equipment, while others are built into the load appliances that they power. Examples of the latter include power supplies found in desktop computers and consumer electronics devices. Other functions that power supplies may perform include limiting the current drawn by the load to safe levels, shutting off the current in the event of an electrical fault, power conditioning to prevent electronic noise or voltage surges on the input from reaching the load, power-factor correction, and storing energy so it can continue to power the load in the event of a temporary interruption in the source power (uninterruptible power supply).All power supplies have a power input connection, which receives energy in the form of electric current from a source, and one or more power output connections that deliver current to the load. The source power may come from the electric power grid, such as an electrical outlet, energy storage devices such as batteries or fuel cells, generators or alternators, solar power converters, or another power supply. The input and output are usually hardwired circuit connections, though some power supplies employ wireless energy transfer to power their loads without wired connections. Some power supplies have other types of inputs and outputs as well, for functions such as external monitoring and control.

A DC power supply is one that supplies a constant DC voltage to its load. Depending on its design, a DC power supply may be powered from a DC source or from an AC source such as the power mains. DC power supplies use AC mains electricity as an energy source. Such power supplies will employ a transformer to convert the input voltage to a higher or lower AC voltage. A rectifier is used to convert the transformer output voltage to a varying DC voltage, which in turn is passed through an electronic filter to convert it to an unregulated DC voltage. The filter removes most, but not all of the AC voltage variations; the remaining AC voltage is known as ripple. The electric load's tolerance of ripple dictates the minimum amount of filtering that must be provided by a power supply. In some applications, high ripple is tolerated and therefore no filtering is required. For example, in some battery charging applications it is possible to implement a mains-powered DC power supply with nothing more than a transformer and a single rectifier diode, with a resistor in series with the output to limit charging current.

An AC power supply typically takes the voltage from a wall outlet (mains supply) and uses a transformer to step up or step down the voltage to the desired voltage. Some filtering may take place as well. In some cases, the source voltage is the same as the output voltage; this is called an isolation transformer. Other AC power supply transformers do not provide mains isolation; these are called autotransformers; a

variable output autotransformer is known as a variac. Other kinds of AC power supplies are designed to provide a nearly constant current, and output voltage may vary depending on impedance of the load. In cases when the power source is direct current, (like an automobile storage battery), an inverter and step-up transformer may be used to convert it to AC power. Portable AC power may be provided by an alternator powered by a diesel or gasoline engine (for example, at a construction site, in an automobile or boat, or backup power generation for emergency services) whose current is passed to a regulator circuit to provide a constant voltage at the output. Some kinds of AC power conversion do not use a transformer. If the output voltage and input voltage are the same, and primary purpose of the device is to filter AC power, it may be called a line conditioner. If the device is designed to provide backup power, it may be called an uninterruptable power supply. A circuit may be designed with a voltage multiplier topology to directly step-up AC power; formerly, such an application was a vacuum tube AC/DC receiver. In modern use, AC power supplies can be divided into single phase and three phase systems. "The primary difference between single phase and three phase AC power is the constancy of delivery." [3] AC power Supplies can also be used to change the frequency as well as the voltage, they are often used by manufacturers to check the suitability of their products for use in other countries 230 V 50 Hz or 115 60 Hz or even 400 Hz for avionics testing.

Google Assistant

The 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, the 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. 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 smart home appliances. The functionality of the Assistant can also be enhanced by third-party developers. Users primarily interact with the 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. At CES 2018, the first Assistant-powered smart displays (smart speakers with video screens) were announced, with the first one being released in July 2018 .

Google Assistant allows users to activate and modify vocal shortcut commands in order to perform actions on their device (both Android and iPad/iPhone) or configuring it as a hub for home automation.This feature of the speech recognition is available in English, among other languages. In July 2018, the Google Home version of Assistant gained support for multiple actions triggered by a single vocal shortcut command.

At the annual I/O developers conference on May 8, 2018, Google's SEO announced the addition of six new voice options for Google Assistant, one of which being John Legend's[66]. This was made possible by WaveNet, a voice synthesizer developed by DeepMind, which significantly reduced the amount of audio samples that a voice actor was required to produce for creating a voice model. In August 2018, Google added bilingual capabilities to Google Assistant for existing supported languages on devices.Recent reports say that it may support multilingual support by setting a third default language on Android Phone.As a default option, Google Assistant doesn't support two common features of the speech recognition on the transcribed texts, like punctuation and spelling. However, a Beta feature of Speech-to-text enables only en-Us language users to ask "to detect and insert punctuation in transcription results. Speech-to-Text can recognize commas, question marks, and periods in transcription requests.

About Adafruit

Adafruit IO is an IOT platform built around the Message Queue Telemetry Transport (MQTT) Protocol. MQTT is a lightweight protocol that allows multiple devices to connect to a shared server, called the MQTT Broker, and subscribe or write to user defined topics. When a device is subscribed to a topic, the broker will send it a notification whenever that topic changes. MQTT is best suited for applications with low data rates, strict power constraints, or slow Internet connections. In addition to providing the MQTT Broker service, Adafruit IO also allows you to set up dashboards that let you 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 your various IOT projects. After creating your Adafruit IO account, you should be taken to the home screen. Select "Feeds" from the left-hand menu. Click the Actions drop-down menu, and create a new feed. I called mine "onoff". Next, go to Dashboards in the left-hand menu. Click the Actions drop-down menu, and create a new dashboard. I called mine "LightSwitch". Open the new dashboard, and you should be taken to a mostly blank page. Pressing the blue + button will let you add new UI components to the dashboard. For now, all we'll need is a toggle button, which should the first option. When prompted to choose a feed, select the one you just made, and keep the defaults for the rest of the settings.

- Create an account on the Adafruit.io platform.
- Select the Welcome Dashboard which is already loaded.
- Start the dashboard creation process by selecting the ACTIONS menu which is on the upper left hand side.
- Next, select Create a New Dashboard from the menu.
- Enter the description and name of the newly created dashboard, and select the Create button when you are done.
- Select your new dashboard, once it has been created.
- You should be able to see your new blank dashboard.
- Next step is to create and add blocks.
- There are various blocks available some of which can be used as outputs, and some can be used as inputs. Go to + (plus) button to add a new block which is on the upper right corner of the dashboard.
- Here we are using a Toggle Button, Gauge.

- The toggle button will allow you to switch between any two text or numeric values.
- Until you click the button again to toggle to the second value, the values will be same.
- You can instantly view the current value of a numeric feed on the gauge block.
- The values are graphically displayed using percentage scale; one can set a minimum and maximum threshold value for the gauge.
- The values in the gauge will be updated automatically whenever a new value is published to the feed.
- Login to Google Assistant using same account which was used for IFTTT and IO.ADAFRUIT.

WHY GOOGLE ASSISTANT?

Amazon just wants to sell you stuff; the public doesn't see Amazon as an information source. Amazon won't give you the best price on something if that something isn't for sale on Amazon. Microsoft doesn't have a foothold of any significance in mobile or in virtual-assistant appliances. Apple has no interest in serving people who don't buy Apple hardware. So Apple won't even try to reach everybody with Siri. Meanwhile, Google is at its core a search engine company. Because virtual assistants will largely supplant search engines, Google Assistant must predominate in order for Google to continuing being Google. Google Voice Search is being completely replaced by Google Assistant. Apple's advantage was that it started early with the acquisition of Siri eight years ago. Amazon's advantage was the prescient release of the Amazon Echo appliance three years ago. But as the competition heats up, it turns out Google has most of the advantages needed to win. For starters, Google's Android is the world's most widely used operating system, and its Play Store has by far the most apps. That translates to far more developers familiar with Google's development tools and processes, which will eventually translate into far more apps for the Assistant. Second, the quality of A.I. will increasingly become a deciding factor, and on this score Google is way ahead of Amazon. Already, Google Assistant is being improved on Wear OS (formerly Android Wear) with a new feature called smart suggestions, enabling users to dig deeper into their Assistant queries by simply choosing one of the contextually relevant follow-up options it presents. Behind the scenes, Google's superior A.I. will reduce errors, increase predictive interaction and generally make Assistant more satisfying and powerful to use than the competition. Third, Google has more user data, which improves personalization and agency as those very qualities become more central to the virtual-assistant experience. Beyond Search and other services, Google has access to data in your Gmail account, if you use Gmail, which is a gold mine of actionable user data for a personal assistant. And these favour to make use of Google assistant for our project than other virtual assistants available now.

RESULT AND DISCUSSION

The main aim of the project was to design a system in such a way that it can yield maximum output with minimum complexity and this home automation system successfully delivered it. There are some issue that arises when using this system. The problems are the pronunciation of the user when doing the process. For the pronunciation matter; the system takes it a quite high level of sensitivity. So when the user wishes to use the system the user must produce the word with correct pronunciation as in the training process. The result was positive and the system responded well. The diagram below shows the complete prototype implementation of the proposed system.

ADVANTAGES

- The systems have lesser number of components.
- Easy replacements.
- Cheaper components.
- High accuracy.
- The quality of the electronics used in this module is kept up to the standards and demands a long life.
- Power bank or small solar power sources can power up the system.
- Replacing human operators in tasks that involve hardphysical or monotonous work.
- Replacing humans in tasks done in dangerous environments (i.e. fire, space, volcanoes, nuclear facilities, underwater, etc.).
- Performing tasks that are beyond human capabilities of size, weight, speed, endurance, etc.

DISADVANTAGES

- Wifi with internet is needed all the time.
- Good knowledge about programming to make necessary changes and improvements
- Limit in controlling higher load appliances using relays.
- The basic requirement for the smart home system is the internet. Without a good and strong internet connection, you will not be able to take control of this. If there is no internet connection for some reason, there is no other way through which you can access and control your system.
- In case there is a problem with the smart home system, you cannot simply call a handyman or someone similar to repair or manage the bug. You will have to depend on the professionals.

FUTURE ENHANCEMENT

Android app will also develop for easily use. In Android app there will be direct buttons for ON or OFF the system. For more security purpose camera module can also be implemented on the system. If any person attempt to enter in home with more than three time wrong password then at that time camera module will be activate. And camera module will capture the image of person who trying to attack on system. It can use antivirus so that hacking of the system can be difficult. Future homes will be able to offer almost all required services, e.g., communication, medical, energy, utility, entertainment, and security. As we move into the next generation, more and more devices will begin to connect to one another. The dream is a future in which data is communicated between devices and humans without relying on manual input of individual bytes. Computers that can automatically mine data and then use that data to change aspects of the home environment is the future. For example, a smart thermostat that is able to automatically gauge the temperature of a room and then adjust the central heating and cooling units as necessary or a washing machine that automatically detects its contents and programs itself to be finished washing at a specified time. These are all goals that engineers are working toward and depend not only on advances in data-mining technologies but also in big data computing. Pert is the next generation home automation innovation that lets you control, monitor and secure your home with your smartphone. The future healthcare service provider will consider the smart home an effective way of providing remote healthcare services, especially to the elderly and disabled who do not require intensive healthcare support. As technologies continue to advance, you can expect the house of tomorrow to be even more automated than that of today.

APPLICATIONS

The most common applications of home automation are lighting control, HVAC, outdoor lawn irrigation, kitchen appliances, and security systems.

Lighting Control

Smart lighting allows you to control wall switches, blinds, and lamps; its capabilities are extensive. Able to schedule the times lights should turn on and off, decide which specific rooms should be illuminated at certain times.

HVAC Regulation

As fuel costs rise and the availability and sustainability of our resources becomes a greater concern, heating/cooling our homes efficiently is less a budgetary bonus and more of a necessity. Over the past year, smart thermostats and automated home heating systems have become more readily available and easily incorporate into any home. Heating and cooling our homes consumes an average of 50% of energy costs yearly, making daily HVAC regulation progressively rewarding.

Smart Appliances

By automating your kitchen appliance and making them accessible from your smart device, you're able to sever the electricity supplied to unused appliances and reduce your energy consumption and costs. Considering the number of appliances the average household owns; this could save a substantial amount of money over time.

Security Systems

While efficiency and conservation are certainly IoT benefits, its potential to have improved control over home security is a primary focus. Smart locks, a Bluetooth enabled electronic deadbolt, and various connected home security systems, such as iSmartAlarm, offer a variety of features including door and window sensors, motion detectors, video cameras and recording mechanisms. All of which are connected to a mobile device and accessible via the cloud, thus enabling you to access real-time information on the security status of your home.

CONCLUSION

The home automation and home security provides better access to the home appliances and ensure home security, the project can be implemented in smart cities. Nowadays, home security is very important which can also be controlled by using this project. 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 Google Assistant Con- trolled 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 of our project is huge. There are many factors to improve on to make our project more powerful, intelligent, scalable, and to become better overall for home automation. For example, con- trolling the speed of the fan, more number of devices can be integrated, like a coffee machine, air conditioner etc. 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. Based on surveyed study the comparison of home automation systems is presented. Microcontroller, user interface, a communication interface and their performance factor are compared. There are a number of do-it-yourself (DIY) platforms available that allow to create Home Automation system quickly and easily with low cost and high performance e.g. Raspberry pi, Arduino, other microcontrollers, etc. In this review explained different home automation system e.g. Web based, email based, Bluetooth-based, mobile-based, SMS based, ZigBee-based, Dual Tone Multi Frequency-based, cloud-based and Internet based. In future home automation will more smart and fast. It would be extended to the largescale environment such as colleges, offices and factories etc.

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