SMART HOME USING GOOGLE ASSISTANT

BY

NAYAN MOZUMDER

ID: 162-15-7994

AND

MD. SALMAN

ID: 162-15-8002

This Report Presented in Partial Fulfillment of the Requirements for the Degree of Bachelor of Science in Computer Science and Engineering

Supervised By

Ms. Nazmun Nessa Moon

Assistant Professor

Department of CSE

Daffodil International University

DAFFODIL INTERNATIONAL UNIVERSITY

DHAKA BANGLADESH

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APPROVAL

This Project/internship titled **"Smart Home Using Google Assistant"**, submitted by Nayan Mojumder, ID No: 162-15-7994 and Md. Salman, ID No: 162-15-8002 to the Department of Computer Science and Engineering, Daffodil International University has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 12 September 2019.

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Department of Computer Science and Engineering
Faculty of Science & Information Technology
Daffodil International University

Dr. Dewan Md. Farid — **External Examiner**
Associate Professor
Department of Computer Science and Engineering
United International University

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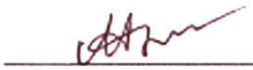
We hereby declare that, this project has been done by us under the supervision of **Ms. Nazmun Nessa Moon (NNM), Assistant Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

Supervised by:



Ms. Nazmun Nessa Moon
Assistant Professor
Department of CSE
Daffodil International University

Submitted by:

Nayan Mojumder
ID: -162-15-7994
Department of CSE
Daffodil International University

Md. Salman
ID: -162-15-
Department of CSE
Daffodil International University

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ABSTRACT

This report aims to describe the process and procedure to build a very effective home automation system titled as “Smart Home Using Google Assistant”. The main objective of this system is to give a user the control of the power of his home appliances from the internet. The Smart Home project is a combination of Hardware and Software. ESP8266-01 has been used as the controller of devices that is connected with mains voltage & Smart Home system which is configured to stay connected to the internet. ESP8266-01 synchronizes the device statuses with the web server. There is a relay device for switching control. After the successful setup of both the hardware and software of the system, users will get access to their personal Google Assistant interface. The software part consists of a web server based on PHP server (Central Database Controller) and Dialog flow to voice analyzer. There is a responsive user interface that users have to use to setup and configure their devices which are connected to the Smart Home hardware interface. In the android device users will be able to manipulate their added devices. There is an AI for each user that can be used to control the power of their devices.

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CHAPTER 1
INTRODUCTION

1.1 Introduction

Home automation is a concept of **"Internet of Things".** People are used to use electricity for last many years. Day by day the electricity become more flexible and necessary for our daily life. After inventing electricity our life has become more modern then before. All the home appliance which we generally use in a house for our betterment. After observed all this we have thought why not life becomes easier. This think inspires to make this project happen. Many years ago, people were on the think that one day all electronic device will run by remote control. We have made that dream come true. This is an innovation of modern life which will impact our daily life activities. We can set the time chart and the rest is automated and based on our personal preferences thus providing control, money savings, and an overall smart home. At any time, we can grab our iPhone, Android device or other remote control and change the settings in our house as desired.

1.2 Motivation

We cannot think our daily life without light, fan, TV, AC and so on. We are using switch to operate them. Day by day our life is becoming so easy and modern that's why the modern Smart Home concept came. Our team has thought about implementing a new concept of home automation. We have an idea to gain control of home appliances that are based on a comparatively cheap embedded system "ESP8266-01". This device gives us almost all the functionalities of a micro controller. This embedded system connects all the hardware of our home automation system. It is connected to the internet. Our android application and web server which is based on PHP and Android application synchronizes device status with ESP8266-01 in which there is a web client.

1.3 Objectives

Objectives of this projects are as follows:

- To develop a home automation system using ESP8266-01 and Android Application
- To make an easy and flexible access to the devices from an Android application Google Assistant.
- To make the system secure for users.
- To use cheap devices to build the system to make it cheaper.

1.4 Expected Outcome

We are very much expected that it will enhance our daily life in a positive way. We will control our home appliance by using this application. There is no doubt that it is going to transform our daily lives. We are going to discuss the advantages of using this application below,

1.4.1 Saving time: Time is the most valuable think in our life. We all should respect the value of time. Our application will reduce the time killing of our daily life. We had to operate our appliance manually however now it will work automatically.

1.4.2 Saving money: Life security the most important think our life millions of dollars are used for life and property security. Our application will help the user for surveilling throughout CC TV. Which will save our money and time as well.

1.4.3 Improving the quality of life: It will help us in our daily life and make our life easier. We can control our appliance by not staying our own house. To turn off and turn on we do not need to use any switch board.

1.5 Report Layout

This project report has six chapters in total.

The First Chapter describes Introduction, Motivation, and Objectives Outcome Etc.

The Second Chapter describes related works of the project and it also provides problems of the project.

The Three Chapter describes Specification of requirement.

The Fourth Chapter describes the design and component description of the project.

The Five Chapter describes the implementation and testing of the project.

The Six Chapter describes the conclusion and the future scope of the project.

CHAPTER 2
BACKGROUND

2.1 Introduction

We think our application will put a good impact in the user's life. The application will make the user life batter and smatter. From that point of view, we named our project as "Smart Home". We can control all of our electronic home appliance from anywhere by sending our voice command via Wi-Fi connection.

2.2 Related Work

Omar et. al. shows a home automation system using WIFI module. This task is one of the WIFI module. In the proposed system, home appliances are interfaced with a general-purpose digital and analog inputs and outputs of a single chip microcontroller. The microcontroller has a built-in wireless access point that enables the system to communicate with a home server. The system has two different operation modes. The first mode makes use of a mobile app interface with virtual switches and sliders to monitor and control appliances. The second mode is chat-based that uses text or audio commands fitted with natural language processing to monitor and control the home appliances. The proposed system is scalable in that it is able to add and remove rooms on demand. For validation and testing purpose, a prototype is built that includes home appliances, room controllers, home server and a mobile app [1].

Another paper shows a home automation system using google assistant. This task is one of the ESP Project. ESP based home mechanization utilizing google colleague venture encourages the client to control any electronic gadget utilizing device control application on their android smartphone. The google aide sends directions to the server (adafruit), through remote correspondence. The ESP module is associated with that server(adafruit) by means of remote system. When server get the order, it send the direction to the ESP modules in the twofold shape (o,1) with their comparing port number. When the user says

"turn on the light" the command will go to server in light feed and from there the command will be forwarded to the ESP module i.e. "1" with the port number and it will turn on the relay connected to that port and the light turns on [2].

Another paper shows a Voice Controlled Automation Using Raspberry Pi. This task is one of the Raspberry Pi projects. The systems prototype that they have make applies home automation by listening to the user's voice, it then takes this voice as an input command for operating various appliances. They so use mics to record this input & then send it to the raspberry pi through there circuitry. The pi processor analyzes this voice speech & search's for keywords related to load switching, and performs the automation accordingly [3].

Another paper shows the IoT based smart security and home automation system. This task is one of the ESP8266 projects. Home automation system using ESP8266 and servo motor SG90 to control the appliances of home. The system is used for controlling and handling home appliances like Lights, Fans, AC, Motor etc. Home automation is one of the major applications of WI-FI technology. The fundamental technical knowledge of home automation is transferring and restraining automatically with each device and sensor in Wi-Fi based on the home network. Home Automation is the most frequently spelled term in the field of electronics. This automation has exceedingly significance than any other technologies owing to its user-friendly nature. These can be used as a replacement of the existing switches in the home which furnishes sparks and also results in fire accidents in few situations [4].

Another paper shows the Internet of Thing for Smart Home System Using Web Services and Android Application. This task is one of the Arduinos Uno. A smart home is a home based on the internet of thing to enable the control and the remote monitoring of home's devices and to allow the user to adapt the system to his desires and needs. This paper presents an approach to implement a smart home system using the Internet of thing IoT, Web services, and an Android App. The proposed model focuses on An Arduino Uno Wi-Fi platform for interoperability among sensors, actuators, and communication

protocols. The REST framework makes the home appliances accessible and connected also it improves data exchange. An Android App providing several functionalities by which the user can control the home device from anywhere [5].

Another paper shows the Voice Controlled Home Automation System. This is one of the Bluetooth devices. The project Voice controlled home automation project helps to control the electrical loads based on Bluetooth input signal. The Bluetooth device receives this input signal from android device. This system is especially beneficial in case of handicapped or aged people who find it difficult to walk and operate the electrical switches to turn on or off the loads. This system solves this issue as now the user just has to give voice commands to turn on or off the loads. Here 4 loads are used to demonstrate light, fan, heater and AC. All these loads can be individually turned ON/OFF or all loads at the same time [6].

2.4 Comparative Studies

We are very first group who are introducing this fresh concept in this country. There are very few people who has worked on this project. Among all the projects, we are completely deferent from them**.** We often found people are working with wifi module, google assistant, esp8266, android application web server and so on. However, the Smart home concept is quite different from all this concept. Our project task is googling assistant & ESP8266-01. Our goal is to control electrical devices through voice command using Google Assistant. When user feel any necessary, he or she send a command via google assistant, google assistant will send that command to webhook, webhook server will process that command by sending that to ESP8266-01. The device works by receiving the command from ESP8266-01. ESP8266-01 with smart home circuit & make this process happens.

2.5 Scope of The Problem

We had to face a lot of problem and will have to face a lot off problem to stablish ours project. So, there is a big scope of device and driver incompatibility and a vast library required where smart devices and sensors can communicate without any third-party

integration. The sensors and device will use alike data themselves to increase device compatibility and to totally eliminate language complexity.

2.6 Challenges

Power Supply and hardware component things are to be needed for the system. Because the electric supply is the most important for running the project. The electric supply thing is very dangerous as the current or voltage is very dangerous so the people should be more careful. Wifi is very essential for running out this project, Smart device is also very important for this project. The Server will play vital role in this project. There may be some technical error in the server for that time our smart device will not work.

CHAPTER 3
REQUIREMENT SPECIFICATION

3.1 Introduction

Here actually the introducing part of different kinds of the parts and the objects that we have used in this project. In a smart home system, we have used many kinds of parts electronic equipment. Here is mostly the supply of dc (direct current) and supply of ac. actually the converting of the current supply. While they are said to convert dc to ac, this is a simplification, and as we will see, the output of any inverter is built up by pulsed dc. Voltages.

3.2 Requirement Collection and Analysis

The requirement collection and analysis we have to follow these requirements ESP8266-01, USB to ESP8266-01 WiFi module adapter, Relay Module for Wifi ESP8266-01, Step Down transformer 220v AC ~ 12v DC, 7805 Voltage regulator IC. We are going to discuss the requirements thoroughly in table 3.1.

Table 3.1: List of Components used in Circuit

Name	Image	Unit	Used
ESP8266-01		01	Used as a main control device
7805 Voltage Regulator IC		01	Used as 12v to 5v converter

220v to 12v step down transformer		01	Used as 220v AC ~ 12v DC transformer
Relay Module		01	Used as ESP8266-0-1 command-based device on and off
ESP8266 programmer model number		01	Used as ESP8266 program write.
Electrical Appliance tv/light			Used as output device

3.2.2 ESP8266-01

These modules include 1MB (8Mbit) of flash memory, twice the size of the older blue colored ESP8266-01 module. The ESP8266-01 Serial/UART to WiFi module is a great way to connect our Arduino or other microcontroller projects to a WiFi network. Create our next internet of things (IOT) project with affordable network connectivity by implementing this module into our design. The module has the ability to run independent of a host controller. The ESP8266-01 has 3.6V tolerant I/Os so you will need a logic level converter to connect it with higher voltage devices such as Arduino. The ESP8266-01 requires 3.3V power so us may need a 3.3V voltage regulator to provide the correct voltage, depending on our setup [7].

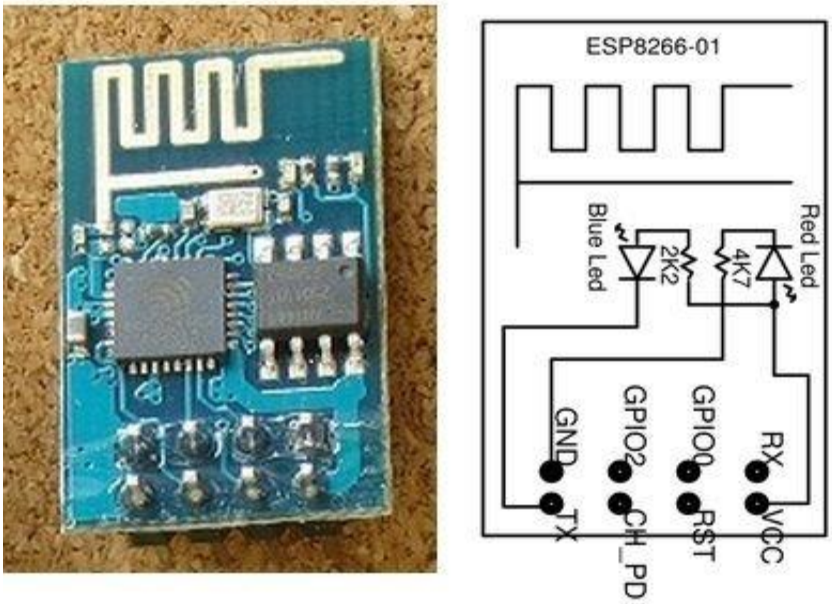


Figure 3.1: ESP8266-01

Figure 3.1 shows the ESP8266-01 circuit diagram. ESP8266-01 has 8 pins. There are TX, GND, CH_PD, GPIO 2, RST, GPIO 0, VCC, RX. GPIO pins are mainly used to send electrical pulse with various modulation. We are using GPIO 2 as voltage HIGH and voltage LOW to drive the relay module.

3.2.3 USB to ESP8266 WiFi Adapter Module

USB to ESP8266-01 WiFi module adapter board computer phone WiFi wireless communication microcontroller. The ESP8266-01 WiFi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to our WiFi network.

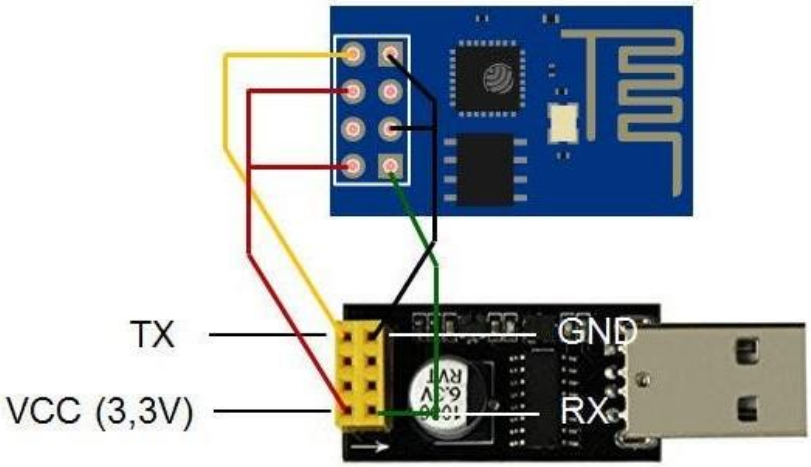


Figure 3.2: USB to ESP8266-01 WIFI Adapter Module

Figure 3.2 shows the USB ESP8266-01 WiFi Adapter Module. This module is mainly used to program in ESP8266-01 module.

3.2.4 Relay Module for Wifi ESP8266-01

The ESP8266-01 Wi-Fi Module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266-01 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. The relay module a WiFi repeater or extender is used to extend the coverage area of your WiFi network. It works by receiving your existing WiFi signal, amplifying it and then transmitting the boosted signal.

Figure 3.3: Relay Module for Wifi ESP8266-01

Figure 3.3 shows the Relay module for Wifi ESP8266-01. This module triggers the relay to switch on and off an electrical connection.

3.2.5 Step down transformer 220v AC ~ 12v DC

AT our outlet have 220 volts. In this case the transformer can 220v AC ~ 12v DC convert the electricity. A transformer converts alternating current (AC) from one voltage to another voltage. It has no moving parts and works on a magnetic induction principle; it can be designed to "step-up" or "step-down" voltage.

Figure 3.4: Step Down transformer 220v AC ~ 12v DC

Figure 3.4 Shows the Step-Down transformer 220v AC ~ 12v DC convert the electricity. The concept of a step-down transformer is actually quite simple. The transfer has more turns of wire on the primary coil as compared to the turns on the secondary coil. This reduces the induced voltage running through the secondary coil, which ultimately reduces the output voltage.

3.2.6 7805 Voltage Regulator IC

MC7805 5V 1A Voltage Regulator. The MC7805 is a LOW DROP Voltage Regulator able to provide up to 1A of Output Current at a fixed 5V output voltage.

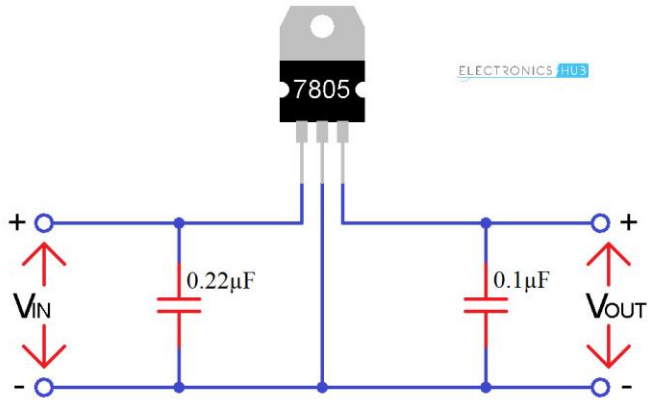


Figure 3.5: 7805 Voltage regulator IC

Figure 3.5 Shows the 7805 Voltage Regulator IC. 7805 IC, a member of fixed linear voltage regulators used to maintain such fluctuations, is a popular voltage regulator integrated circuit (IC). The 7805 indicates the output voltage it provides. 7805 IC provides +5 volts regulated power supply with provisions to add a heat sink.

3.3 Use Case Modeling and Description

The main part of this figure 3.6 is user controller. User controller has three parts they are login system, speak voice command and exit system. The User sign-up user will directly login to google assistant and the new user has to sign up first and then access the login. The veiled user can directly send the voice command Jarvis home control system execute. The Jarvis home control system will send a request system. If the command is veiled request system will send the request to cloud API device. The cloud API device will cross verify the request and send it to webhook in PHP for save the memory. Webhook send the header request SQL status change and JSON. The JSON will send the final request to ESP8266-01 for execute the ESP8266-01 is include in relay module. The outcome of this command outcome from the device.

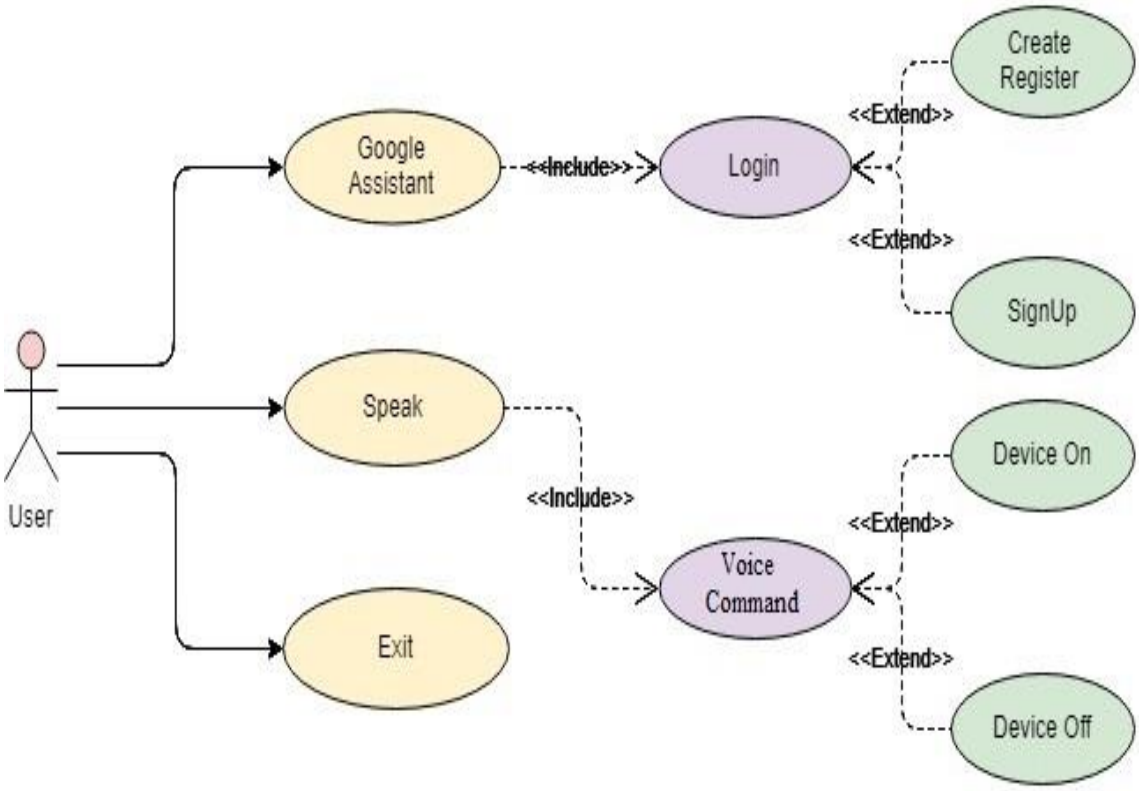


Figure 3.6: Use Case Modeling and Description

CHAPTER 4

DESIGN SPECIFICATION

4.1 Implementation Requirements

First of all, internet connection is necessary & a smart device along with google assistant. Like, android OS, google home. Iot google assistant device. Electricity is must necessary. Some more device hardware also needed like ESP8266-01, USB to ESP8266-01 WIFI Adapter Module, relay module for Wifi ESP8266-01, Step Down transformer 220v AC ~ 12v DC, 7805 Voltage regulator IC, electric ware, light, fan & home appliance etc. Some software will maintain this system like C++, webhook, json of server, PHP etc. We are going to discuss the Implementation requirements thoroughly in table 4.1.

Table 4.1: Implementation Requirements component

Name	Image	Description
Smart Home Device		This is full hardware circuit board
Google Assistant APP		Google assistant app download & install mobile or device.
Electrical Appliance		There are output device

4.2 Data flow diagram

The following figure 4.1 represents the data flow diagram of smart home system. The main part is the google assistant or user control. User controller has two parts they are login system and sign up system, the sign-up user will directly login to google assistant and the new user has to sign up first and then access the login. The veiled user can directly send the voice command Jarvis home control system execute. The Jarvis home control system will send a request system. If the command is veiled request system will send the request to cloud API device. The cloud API device will cross verify the request and send it to webhook in PHP for save the memory. Webhook send the header request SQL status change and JSON. The JSON will send the final request to ESP8266-01 for execute the ESP8266-01 is include in relay module. The outcome of this command from the device.

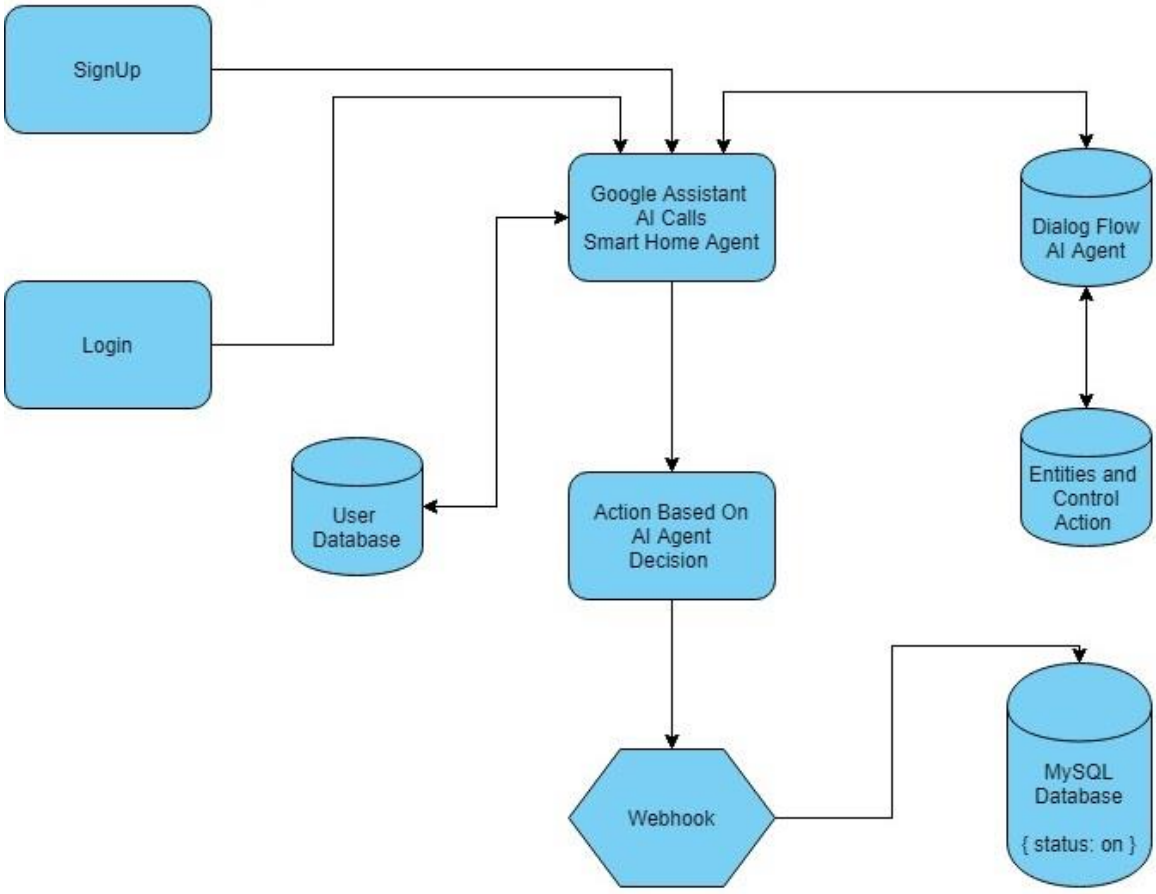


Figure 4.1 Data flow diagram

CHAPTER 5
IMPLEMENTATION AND TESTING

5.1 Implementation of Smart Home

To implement our project, we have to follow these procedures wiring with main power line, installing smart home hardware device, signing up user, installing google assistant, connecting electrical component with smart home hardware. We are going to discuss the procedures thoroughly below.

5.1.1 Wiring with Main Power Line to Smart Home Electric Circuit

This figure 5.1 states that wiring with main power line with will connect with relay module for Wifi ESP8266-01. Rest of the hardware's are connected with relay module for Wifi ESP8266-01.

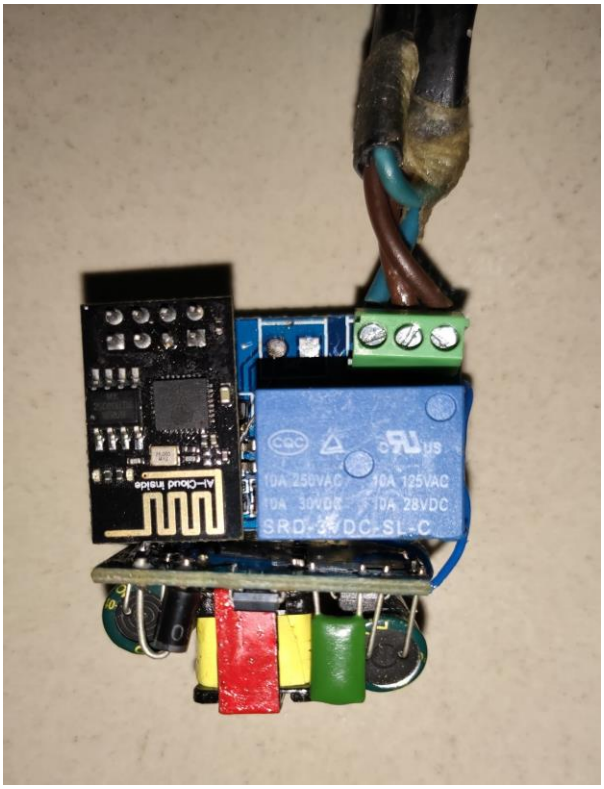


Figure 5.1: Wiring with Main Power Line

5.1.2 Installing Smart Home Electric Circuit

This figure 5.2 states that how to installing smart home hardware device with light, fan & home appliance. How to connect smart home hardware device to light, fan, home appliance.

Figure 5.2: Installing Smart Home Electric circuit

5.1.3 Signing Up User

This figure 5.3 states that how to signing up user google assistant. Sign up user and request to Jarvis home control. The Jarvis home control response to the user.

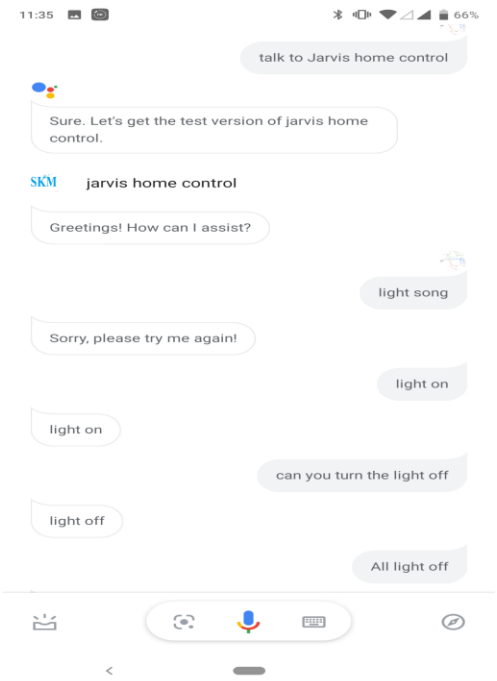


Figure 5.3: Signing Up User

5.1.4 Installing Google Assistant

This figure 5.4 states that how to install required application for both Android and IOS mobile phones. Google Assistant app is available for both phones, tv, car etc. Download google assistant from google play store.

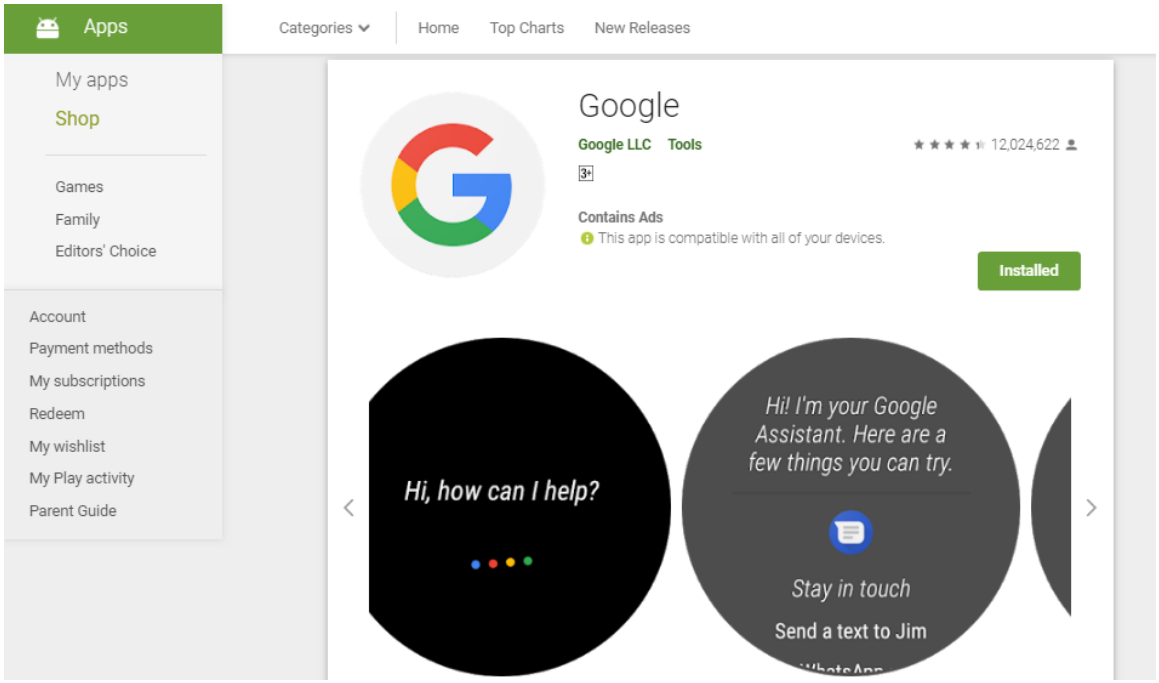


Figure 5.4: Installing Google Assistant

Google Assistant is an official Google app which allows you to turn your Android smartphone into a virtual assistant. You can 'awaken' your assistant by clicking on the button on your smartphone's homepage or simply by saying 'OK Google' into the microphone.

5.1.5 Connecting Electrical Component with Smart Home Device

This Figure 5.5 states that connecting electrical component with smart home hardware device. There are ESP, hit sink, relay, resister, signal light, capacitor, switch, circuit board, wires are included in the circuit board.

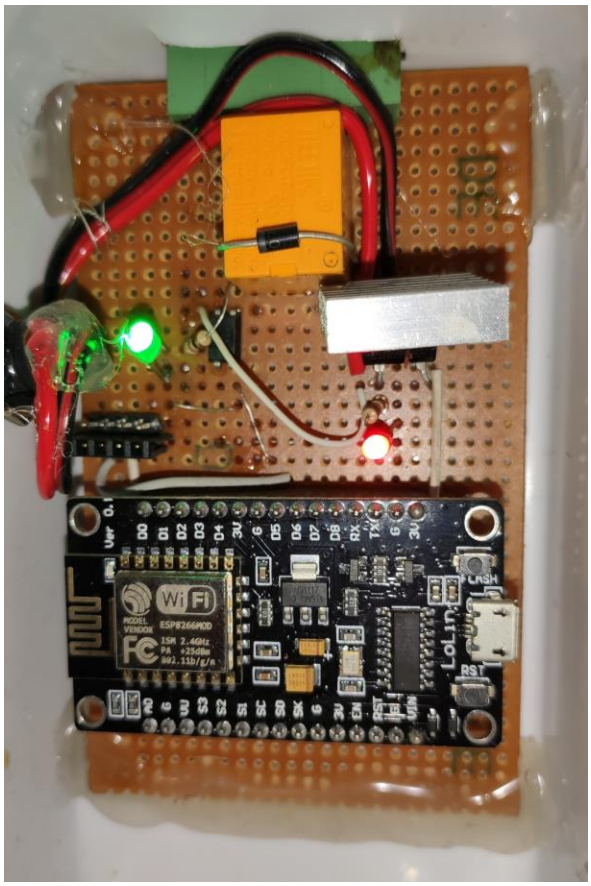


Figure 5.5: Connecting Electrical Component with Smart Home Hardware

5.2 Test Results and Reports

JSON output including requests and commands:

Figure 5.6: JSON output including request and commands

This figure 5.6 stats that JSON output including request and commands. It is the test report and result. In the first step of test report we found students id, User id is including in token, Action is including in status, header data accordingly.

Table 5.1: Device Performance Table

Device Command	Value	Tested Actual Value	Accuracy (Percentage)
Light On	30	27	90%
Light Off	27		85.18%
Fan On	25		92%
Fan Off	24		95.83%
AC On	35		94.28%
AC Off	33		87.87%

CHAPTER 6
CONCLUSION AND FUTURE SCOPE

6.1 Discussion and Conclusion

Our project will run by the google assistant, google assistant will assist all smart home appliance according to their uses. This project will minimize time consumption and make our life very easier. Hence, we have some shortage in this project however we will come out with some smart solution.

6.2 Scope for Further Developments

There is a lot of development scope in coding and hardware section. In programming section, we don't have a dashboard for our users where they can change or review or add new device themselves. Also, user should have a control panel where he/she can give access to multiple devices. In hardware segment we have to change monolithic design to modular design. So, if user wants to increase device from one HUB then just plug the new switching module and tagging it like they want to tag. There is still a big part to develop in AI sector. As like we want to integrate new sensor driven control to our device so that our AI can make decision on its own based on sensor data. As like as security monitoring, intruder detection, gas leak, water pump self-start and monitoring, boundary light control etc. AI can detect human mode from sensor value so there is a scope to develop a simulated environment where user will experience different type of home environment for each home members.

6.3 Limitations of our Application

Our current project is running by the basis of LAN (Local Area Network). So, land network will play a vital role in this project. Without the same LAN network connection our device will not work. The distance between smartphone & smart device are very important. Access id is very important to control the access. Only the accessed user can control the home appliance by using google assistant.

APPENDIX

Web-hook in PHP

```php
<?php
if($_SERVER["REQUEST_METHOD"]=="POST"){
    require 'connection.php';
    createStudent();
}

function createStudent()
{
    global $connect;

//  parsing header request info
    $command = "";
    foreach (getallheaders() as $name => $value) {
        $datas = "name: ".$name."   value: ".$value;
            $command = $command." -- ".$datas;
        // echo "$name: $value <br>";
    }

//  parsing date
    date_default_timezone_set('Australia/Melbourne');
    $date = date('m-d-Y h-i-s a', time());
    if ($date) {
        echo ($date."<br>");
    } else {
        echo "Unknown Time";
    }

//  parsing body of POST
    $data = "";
    $data = file_get_contents('php://input');
    $obj = json_decode($data,true);
    $elementCount  = count($obj);
    // $responseId = " ".$obj['responseId'];
    $responseId = "  ".$elementCount;

// ------------- method 1 to get value ----------------
    $mKey = "";
    $mValue = "";
    foreach($obj as $key => $val) {
    $mKey = $mKey."---".$key;
    foreach(((array)$json)[$key] as $val2) {
        $mValue = $mValue."++++".$val2;
        }
    }
// ------------- method 2 to get value ----------------
    $fkey = "responseId";
    $queryKey = "queryResult";
    $actionKey = "action";
    $queryRes = $obj[$queryKey];
    $actionRes = $obj[$queryKey][$actionKey];
    $action = "action: ".$actionRes;
```

```php
    if ($date) {
        echo ($date."<br>");
    } else {
        echo "Unknown Time";
    }

//  parsing body of POST
    $data = "";
    $data = file_get_contents('php://input');
    $obj = json_decode($data,true);
    $elementCount  = count($obj);
    // $responseId = " ".$obj['responseId'];
    $responseId = "  ".$elementCount;

// ------------- method 1 to get value ----------------
    $mKey = "";
    $mValue = "";
    foreach($obj as $key => $val) {
    $mKey = $mKey."---".$key;
    foreach(((array)$json)[$key] as $val2) {
        $mValue = $mValue."++++".$val2;
        }
    }

// ------------- method 2 to get value ----------------
    $fkey = "responseId";
    $queryKey = "queryResult";
    $actionKey = "action";
    $queryRes = $obj[$queryKey];
    $actionRes = $obj[$queryKey][$actionKey];
    $action = "action: ".$actionRes;

    $origin = "originalDetectIntentRequest";
    $kpayload = "payload";
    $kUser = "user";
    $kId = "idToken";

    $uid = $obj[$origin][$kpayload][$kUser][$kId];
    $userID ="userID: ".$uid;



//  saving data to db
    $sql = "INSERT INTO `messenger_table` (`id`,
    `token`, `status`, `header_data`) VALUES (NULL,
     '".$userID."', '".$action."', '".$data."')";

    $result = mysqli_query($connect, $sql) or
    die (mysqli_error($connect));
    mysqli_close($connect);

    echo("query resutl ");
    echo($result);
```

Webhook Header Data Sample

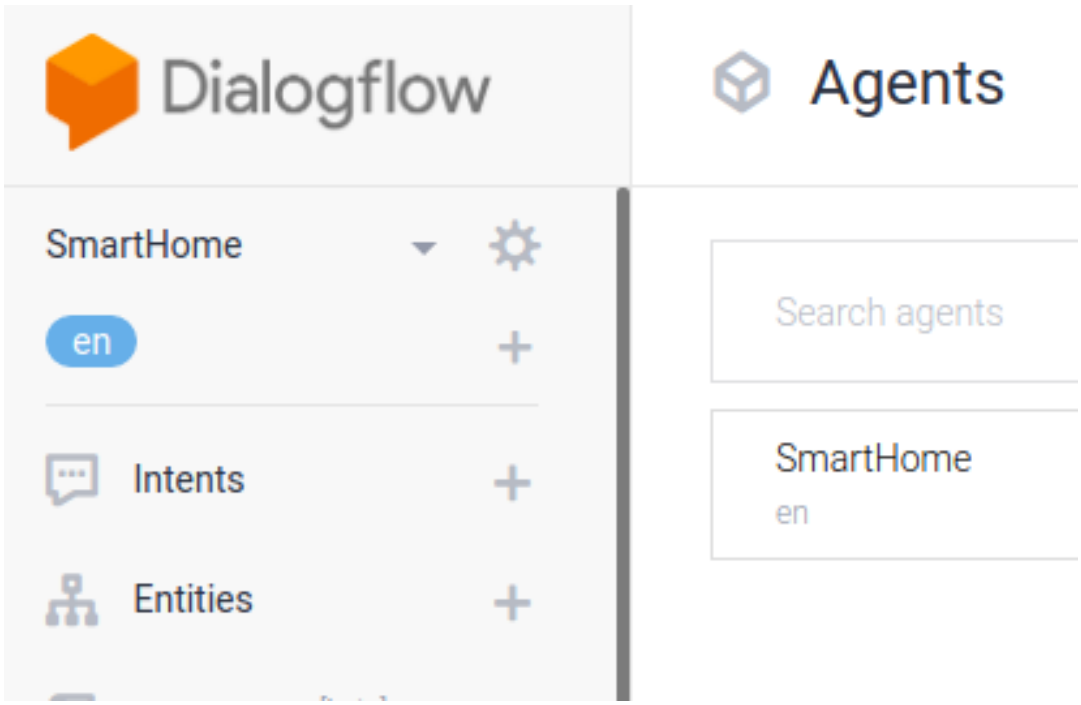
{
id: "87",
token: "userID:
eyJhbGciOiJSUzI1NiIsImtpZCI6IjZlNTUwOGQyNzk2NWFkNzkwN2MyMzIyMTJkZWZhNDhlZDc2MzcyN2UiLCJ0eXAiOiJKV1QifQ",

```
status: "action: light_off",
header_data: "{
        "responseId": "88f41cd6-04e3-477f-8125-9b75db23b3ee-fd8ff490",
        "queryResult": {
                "queryText": "can you turn the light off", "action": "light_off",
                        "parameters": { "light-status": "light offline" },
                "allRequiredParamsPresent": true, "fulfillmentText": "light off",
                ..........
                ..........
                ..........
                "type": "ACTIVE", "conversationToken": "[]" },
         "inputs": [{
                "intent": "actions.intent.TEXT",
                "rawInputs": [{
                        "inputType": "VOICE", "query": "can you turn the light off" }],
                "arguments": [{ "name": "text", "rawText": "can you turn the light off",
                "textValue": "can .capability.SCREEN_OUTPUT" },
        { "name": "actions.capability.MEDIA_RESPONSE_AUDIO"
        },
        { "name":capability.SCREEN_OUTPUT"
            }]
        }]
    }
},
"Session":"projects/sm.../agent/sessions/ABwppHEAdPc2s9cazg3q8vpa1pCDDbJNMx4M-
yaruCFGSyvfoAhnTXLf8VNud2p5corTDdeagIv_UXpCHOo50w" }"
}
```


Database Schema:

☐	1	**id** 🔑	int(4)		No	*None*		AUTO_INCREMENT
☐	2	**token**	varchar(2000)	latin1_swedish_ci	No	*None*		
☐	3	**status**	varchar(1000)	latin1_swedish_ci	No	*None*		
☐	4	**header_data**	mediumtext	latin1_swedish_ci	Yes	*NULL*		

AI Agent


Dialogflow
Agents
SmartHome
en
Intents
Entities
Search agents
SmartHome
en

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