# HOME AUTOMATION SYSTEM

A PROJECT REPORT

submitted by


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*in partial fulfillment for the award*

of

**B.Tech**

degree in

**Computer Science and Engineering**

**School of Computing Science and Engineering**


**April – 2016**


# School of Computing Science and Engineering

## DECLARATION

We hereby declare that the project entitled **"Home Automation System"** submitted by us to the School of Computing Science and Engineering, VIT University, Chennai Campus, Chennai 600127 in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology in Computer Science and Engineering** is a record of bonafide work carried out by us under the supervision of **Dr. Vijayakumar V, Associate Professor.** We further declare that the work reported in this project has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma of this institute or of any other institute or university.

Signature

**SAMAR KHAN (12BCE1006)**

**SACHIN KATIYAR (12BCE1021)**

# CERTIFICATE

The project report entitled "**HOME AUTOMATION SYSTEM**" is prepared and submitted by **SAMAR KHAN (12BCE1006), SACHIN KATIYAR (12BCE1021).** It has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology in Computer Science and Engineering** in VIT University, Chennai Campus, Chennai, India.

_____

**(Dr. Vijayakumar V)**

**Examined by**:

**Internal Examiner** **External Examiner**

# ACKNOWLEDGEMENT

We are highly indebted to **Dr. Vijayakumar V** for his guidance and constant supervision as well as for providing necessary information regarding the project & also for his support in completing the project work within the given time lapse.

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We would like to express our gratitude towards my parents for their kind co-operation and encouragement which help me in completion of this project. My thanks and appreciations also go to my colleague in developing the project and people who have willingly helped me out with their abilities.

**SAMAR KHAN (12BCE1006)**

**SACHIN KATIYAR (12BCE1021)**

# CONTENTS

## LIST OF TABLES

# LIST OF FIGURES

# LIST OF ABBREVIATIONS

| Abbreviation | Expansion |
|---|---|
| IOT | Internet of Things |
| DTMF | Dual Tone Multi Frequency |
| MOSFET | Metal-Oxide Semiconductor Field-Effect Transistor |
| API | Application Program Interface |
| V | Volts |
| A | Ampere |
| AC | Alternating Current |
| DC | Direct Current |
| USB | Universal Serial Bus |
| HTML | Hyper Text Markup Language |
| OS | Operating System |
| RDBMS | Relational Database Management System |
| GPIO | General Purpose Input Output |
| NO | Normally Open (Relay) |
| NC | Normally Close (NC) |
| www | World Wide Web |

# EXECUTIVE SUMMARY

Humans have always tried to make their life easier. This thought has formed the backbone of all innovations. Our project is also a one such attempt towards this process. As we see that the popularity of wireless networks in home has increased in recent years, and the advanced computer technology has made the personal digital device to commonly have the capability to communicate through the wireless network. In today's world where most of the things are being completed everyday automatically, we still have to turn on or off appliances physically. It is a difficult task for elderly or handicapped people. Humans make mistakes and forgot to switch off the appliances when there is no use and in this case our system would be useful in order to utilize the power effectively and also in a secured manner. The designed hardware works on wireless signals which in turn control the appliances. This application will allow the user to control devices that is connected to any home appliance that is Raspberry Pi enabled. In this project we have made a user-friendly interface to control home appliances with voice using smartphones at any time and from anywhere. The interface is intuitive and easy to use and provide the user with a more accessible interface than those found in the home. Many systems which proclaim "Home Automation" introduce automation for the sake of automation and sacrifice practicality and functionality. Due to this fundamental issue, Home Automation has not become mainstream but rather a fringe product support by a scattering of different companies with different ideas and solutions. The fundamental purpose of our home automation is to reduce the complexity in carrying out these control functions. As voice control is the future, so in order to differentiate our system from existing system and help blind people, we have integrated voice control commands to control the appliances. This device is also very easy to integrate into existing applications and require only a small amount of expertise to install. It can also be used to help elderly or handicapped people to live a more independent life as long as possible. This technology designed could be implemented in large infrastructures as well as in wide variety of applications that use sensors.

# CHAPTER 1

# INTRODUCTION

## 1.1 Objective

The aim of our project is to design a voice controlled home automation system to make life easier. Home automation involves introducing a degree of computerized or automatic control to certain electrical and electronics system in a building. The provision for the user to automate homes remotely is the main target of our system. There was a need to automate home so that users can take advantage of the technological advancement in such a way that a person can send a control signal to the home when he forgets to turn off devices such as air conditioner instead of returning home. Our design controls appliances by listening to voice commands which can be of great help to elderly, blind or handicapped people. It is essential that the different controllable appliances be interconnected and communicate with each other. The main component used to achieve this communication between host and client is Raspberry Pi. This project takes the existing function of the traditional on/off light appliances and adds significant voice automation benefits to it. We have also developed an interface for users to add the device names, pictures for their remembrance. The devices added can be controlled by voice or button at any time or from anywhere. This interface will also show the past status of those devices. It will not only make our life easier by reducing human effort and saving energy.

## 1.2 Motivation

We came across many IOT inventions before choosing this project but found most of them to be very specific and confined in their functions. Whereas this home automation can be included in wide variety of applications. Any appliance that runs of electricity can be controlled from anywhere using this technology. It can be a simple yet very useful innovation towards the future. We studied the existing systems but found that most of them are complex to install and not long lasting. They only work over short range too. This motivated us to build a system with more accessible user-friendly interface and can be used by blind people too.

## 1.3 Problem Description

We use many electrical appliances in our daily life. To keep track of each appliance is difficult because humans make mistakes and sometimes forgot to switch off the appliances when there is no use. It is difficult to remember. Also, turning each of the appliance ON/OFF physically is itself a hectic task. This makes life harder for handicapped people. It makes them dependent on someone. The focus of our project is on helping users to operate home appliances with their own smartphones and to help elderly or handicapped people live a more independent life as long as possible. These appliances can also be controlled by giving voice commands.

## 1.4 Background

Home Automation is not a new term for science society, it has been used from decades. As electronic technologies are advancing, the field of home automation is expanding rapidly. Various smart systems that have been implemented are:

1. **Home Appliances Control using a Remote Control**
   The lights, fans can be automatically turned on/off with the help of a remote where there will be a sensor instead of going near to a switch board and putting on/off the switch. Companies like Legrand and Gold Medal already started these kinds of control system and they are at present available in the market.

2. **Home Appliances Control using DTMF**
   In this method, the control of home appliances can be done even though when we are elsewhere just by using the DTMF tone generated when the user pushes mobile phone keypad buttons or when connected to a remote mobile.

3. **Wireless Home Appliances Control**
   In this method, the control of home appliances can be done from anywhere using a web interface but they don’t last long due to hardware glitches and complex user interface.

Many systems which proclaim "Home Automation" introduce automation for the sake of automation and sacrifice practicality and functionality. Due to this fundamental issue, Home Automation has not become mainstream but rather a fringe product support by a scattering of different companies with different ideas and solutions.

The functions of our Project are:

- It includes Raspberry Pi which is reliable and better than other available IOT devices in terms of memory and clock speed.
- The hardware integrated has been made long lasting as we have used relay for switching. It can also be done using MOSFET which will diminish the mechanical loss and delay.
- User can add the devices and their pics on the interface according to their requirements and remembrance.
- The devices can be controlled at any time and from anywhere.
- Devices can also be controlled using voice commands especially for blind people.
- The interface is easily accessible and the hardware requires only a small amount of expertise to install.

# CHAPTER 2

# PROJECT DESCRIPTION AND GOALS

## 2.1 Introduction

The focus of our project is on helping users to operate home appliances with their own smartphones and to help elderly or handicapped people live a more independent life as long as possible. The objective of our system is to take care of several domestic tasks that may normally be difficult for those who are handicapped especially blind persons. Voice control has always been a bit of a smart-home outlier. Command style products are definitely intriguing, but tend to disappoint in practice. Many of the voice-activated products have either had limited functionality or trouble understanding the voice commands. But this system will control all types of electrical appliances from thermostat to lights, speakers, motors etc. The interface is intuitive and one can control any device at anytime from anywhere one wishes.

## 2.2 Goals

1. To perform the task according to the schedule and complete the project right on time.
2. The project cost should be feasible and the components used are easily available.
3. The system should work perfectly and one can control the appliances using the interface from anywhere.
4. Devices must work well on voice commands and the interface should be user friendly.
5. Take strong efforts to make quality hardware and software and all the objectives should be met as promised.
6. This project will not only help the handicapped but also to the community to live an easier life.
7. The project should contribute to the environment by saving energy and efforts.
8. The project must be flexible in order to integrate more functionalities in the designed system without much efforts.

# CHAPTER 3

# TECHNICAL SPECIFICATIONS

## 3.1 Hardware Specifications

The hardware works on 230V AC supply and is capable of controlling 8 devices at a time via wireless network. This hardware also gets triggered by voice command. It works perfectly for all electrical appliances having maximum current rating 7A.

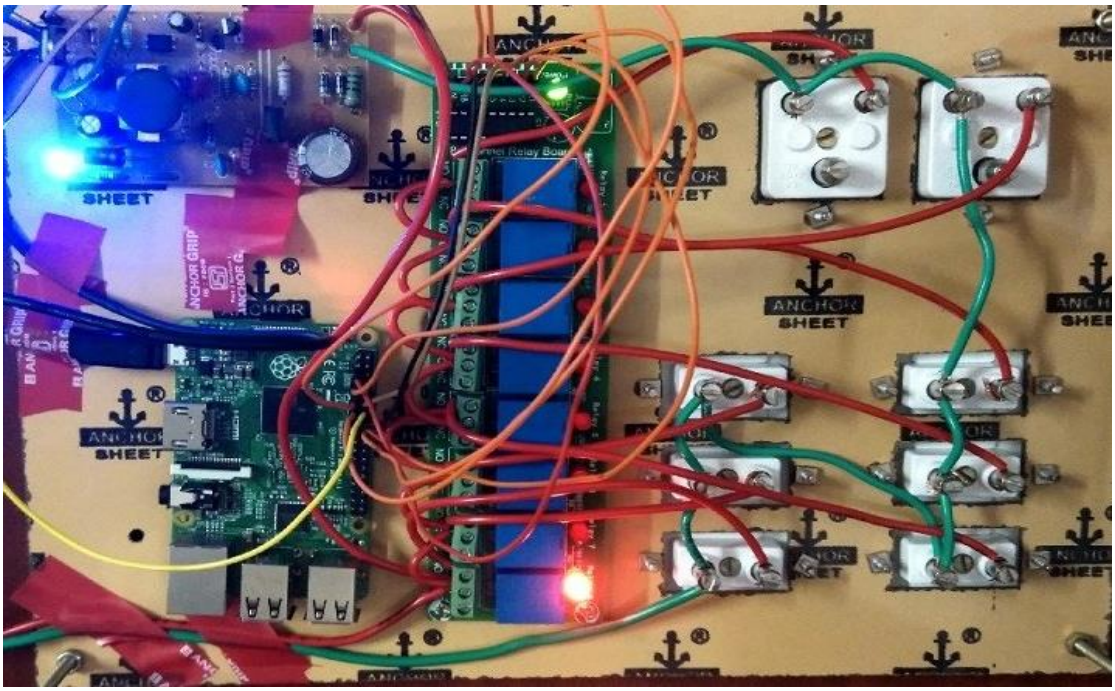


Figure 3.1: Hardware Design

### 3.1.1 Hardware Requirements

- Raspberry Pi Model B
- Relay Module (12V, 7A)
- 12 V Adapter
- Jumper Wires
- LM7805 Voltage Regulator
- Sockets and Ply Board
- BC547 Transistor
- 1N4001 diode.
- Micro USB Male

### 3.1.2 Functional Requirements

1. **Raspberry Pi**

   The Raspberry Pi is a low cost, credit-card sized computer that plugs into a computer monitor or TV, and uses a standard keyboard and mouse. It is a capable little device that enables us to explore computing.

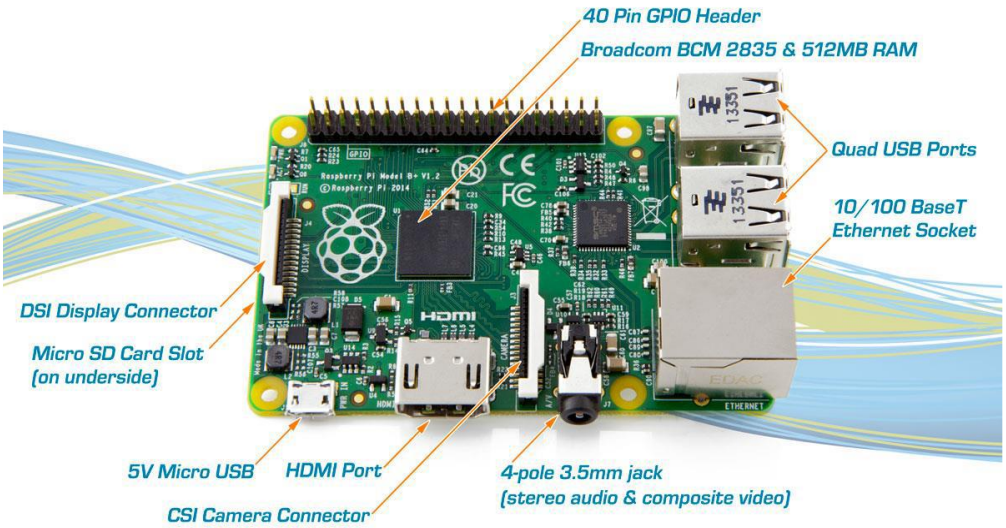


Figure 3.2: Raspberry Pi

2. **Relay Module**

   Relay board module is used for controlling higher current loads from your microcontroller development. Following board has 2 relays which can switch up to 7A.

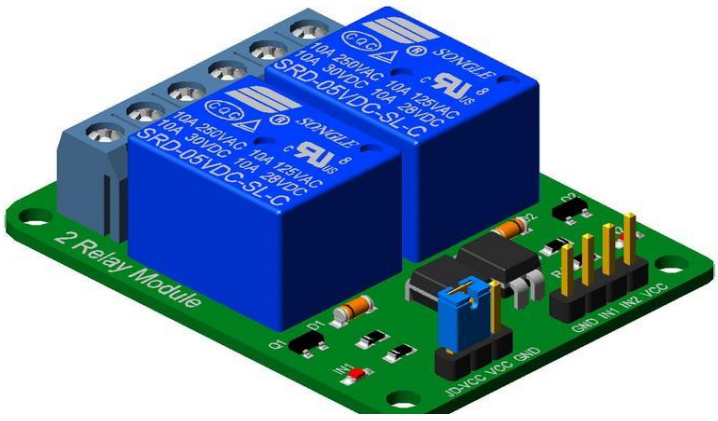


Figure 3.3: Relay Module

### 3. Rectifier

A rectifier is an electrical device that converts alternating current (AC) which periodically reverses direction to direct current (DC) which flows in only one direction. The process is known as rectification.

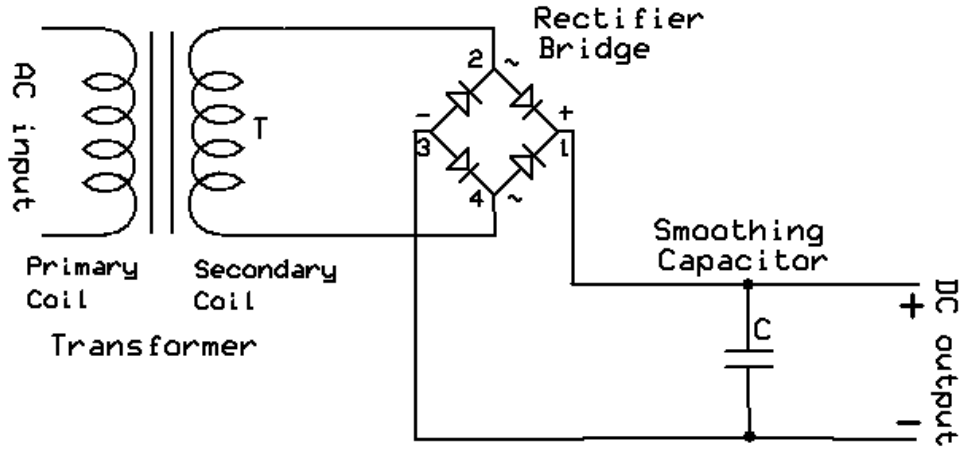


Figure 3.4: Rectifier Circuit

| SNo. | Component | Operating Current | Operating Voltage |
|---|---|---|---|
| 1 | Raspberry Pi | 2A | 5 Volts |
| 2 | Relay Module | 750 mA | 12 Volts |
| 3 | LM7805 | 500 mA | 5 Volts |
| 4 | Adapter | 2 A | 12 Volts |

Table 3.1: Specifications

## 3.2 Software Specifications

The software includes a user interface which communicates with hardware via wireless network. A user can add maximum no of 8 devices and multiple users can login at a time. Interface includes custom device manager where user can update the devices, their pics and can turn them ON/OFF by voice commands too.

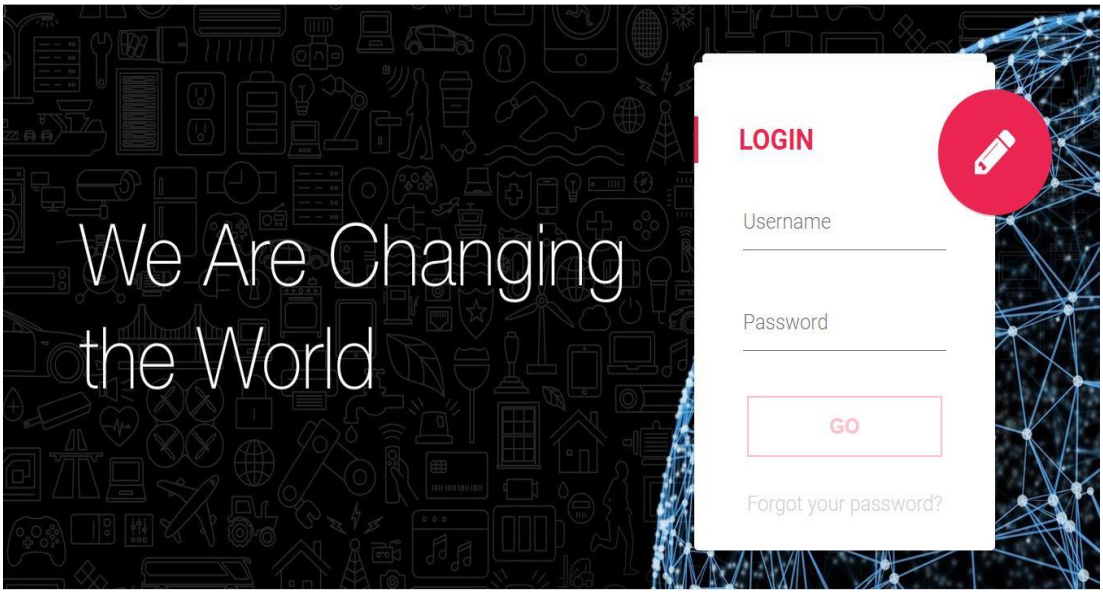


Figure 3.5: Login Page

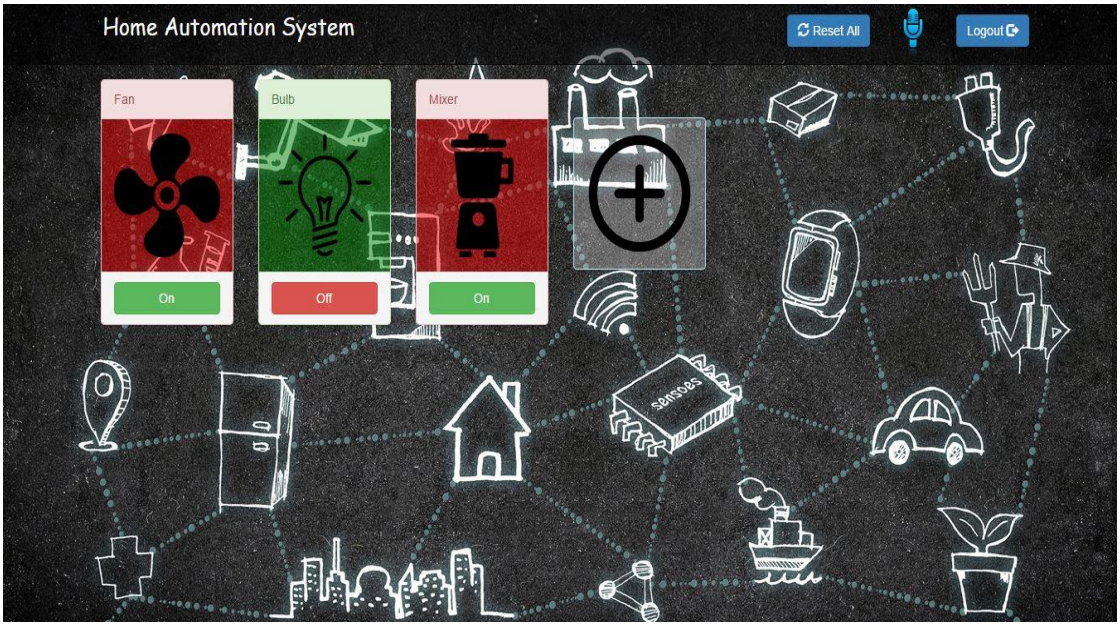


Figure 3.6: Home Page

### 3.2.1 Software Requirements / Languages

- **XAMPP**

  It is a free and open source cross-platform web server solution stack package. XAMPP stands Apache (A), Maria DB (M), PHP (P) and Perl (P). It is a simple, lightweight Apache distribution that makes it extremely easy for us to create a local web server for testing purposes. We used this software to make our computer as a local server.

- **Bootstrap**

  It is a free and open-source front-end library for creating websites and web applications. It contains HTML and CSS-based design templates for typography, forms, buttons, navigation and other interface components, as well as optional JavaScript extensions. It aims to ease the development of dynamic websites and web applications. It helps us in making responsive website.

- **HTML**

  Hyper Text Markup Language, commonly abbreviated as HTML, is the standard markup language used to create web pages. HTML is a cornerstone technology used to create web pages, as well as to create user interfaces for mobile and web applications. It helps us to describe the structure of a website semantically.

- **Python**

  It is a widely used high-level, general-purpose and dynamic programming language. Its design philosophy emphasizes code readability and its syntax allows programmers to express concepts in fewer lines of code. It helps us in establishing connection between web interface and raspberry pi.

- **PHP**

  It is a server-side scripting language designed for web development but also used as a general-purpose programming language. PHP code may be embedded into HTML code, or it can be used in combination with various web template systems. The web server combines the results of the interpreted and executed PHP code including images, with the generated web page. Our whole website works on PHP.

- **MySQL**

  It is an open-source relational database management system (RDBMS), it was the world's second most[a] widely used RDBMS, and the most widely used open-source client–server model RDBMS. MySQL is a popular choice of database for use in web applications. We used it to store status of all devices for all users registered.

- **Ajax**

  Ajax (short for asynchronous JavaScript and XML) is a set of web development techniques using many web technologies on the client-side to create asynchronous Web applications. With Ajax, web applications can send data to and retrieve from a server asynchronously (in the background) without interfering with the display and behavior of the existing page.

- **JavaScript**

  It is a high-level, dynamic and interpreted programming language. Alongside HTML and CSS, it is one of the three core technologies of World Wide Web content production; the majority of websites employ it and it is supported by all modern Web browsers without plug-ins. We used it to validate password during registration.

# CHAPTER 4

# DESIGN APPROACH AND DETAILS

## 4.1 Block Diagram

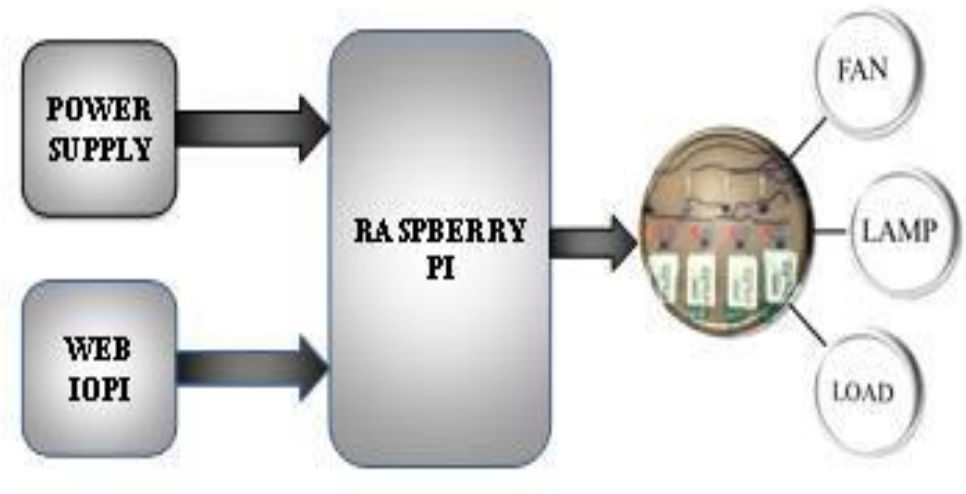


Figure 4.1: Block Diagram

## 4.2 Design Goals

The goal of our design is to minimize the size of the circuit as well as its cost. The relay used as switch operates on 12V while the Raspberry Pi operates on 5V. So we created an adapter to convert AC (220V) to DC 12V and 5V simultaneously. This reduces the size of the circuit board as we made a common voltage supplier for both components.

The circuit is made such that there won't be any short-circuiting. Standard wires are used to bear heavy load. Live wire is connected to common terminal of relay to prevent electrocution i.e. when Relay is switched off, no voltage will be there across the socket.

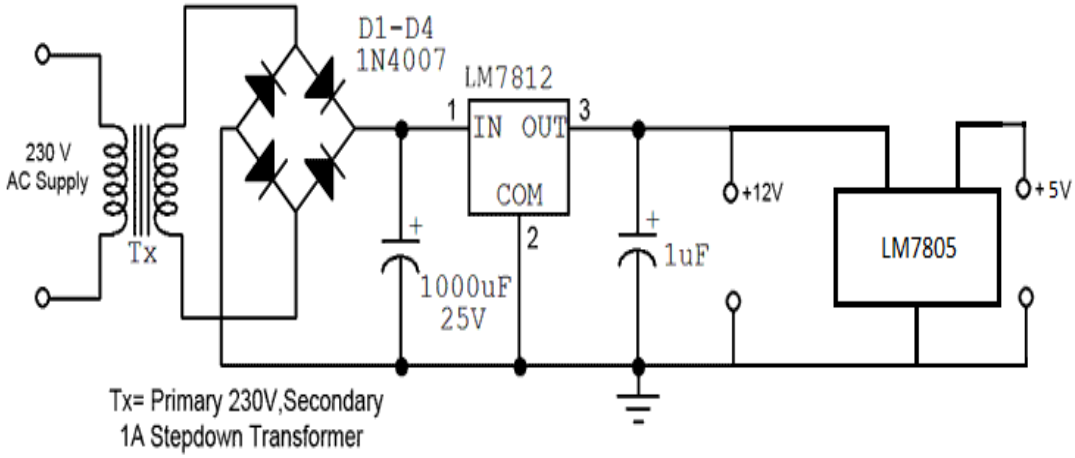


Figure 4.2: AC to DC Converter

Design Benefits:

Hardware:

- Same adapter for both Relay and Raspberry Pi
- Miniaturized circuit for easier installation
- No electrocution
- Adapter works on wide voltage range
- Relay has longer life than conventional switches
- It will work fine during voltage fluctuation

Software:

- Different User Login and Database
- Custom Device Manager for Each User
- Voice Control
- Button Control
- Retain Previous State of all Devices

The main reason for using Raspberry Pi is because it has Linux Distributions (OS). Raspberry Pi as it has high memory and higher clock speed which reduces delay and performs multiple functions at a time. It also requires less input voltage i.e. 5V.

The reason behind using relay is to control it by using a pulse. Other switches require manual switching. Also Relay has longer life. It is quick acting and reset fast.

As we know the most common available source is 230V AC. So we have used AC to DC converter to power up the 12V relay as well as Raspberry Pi. This removes compatibility issues from our product and simplifies it.

### 4.3 Standards Used

- IEEE 1860 (2014) Voltage Regulation
- IETF for Restricted DNS
- IEEE 802.11 Wireless Network Standards
- IEEE 802.3 Ethernet
- IEEE Std. C37.90-2005 (R2011), IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus

## 4.4 Design Constraints

#### 4.4.1 Economic Constraints

This product shows the cheaper version of the original fully functional product to control high power devices. A permanent internet connection or local network must be there at home and in the device for this product to work.

#### 4.4.2 Manufacturability Constraints

This product can handle maximum of 8 devices at a time. It can be improved using the Raspberry Pi GPIO Pin expansion board. It will also not work for the devices carrying higher current like AC, Elevator or Pump Motor. Improving the design for such design will increase the manufacturing cost.

### 4.4.3 Social Constraints

This project is designed to help the handicapped. Others can also benefit from this. Modifications can be done to this design by adding sensors, intensity regulators to make it a better product for the customers. Voice commands are only accepted in ENGLISH language which restricts its use to a certain group of people.

## 4.5 High Level Design

It explains the architecture that would be used for developing this product. The architecture diagram provides an overview of an entire system. It identifies the main components that would be developed for the product and their interfaces.

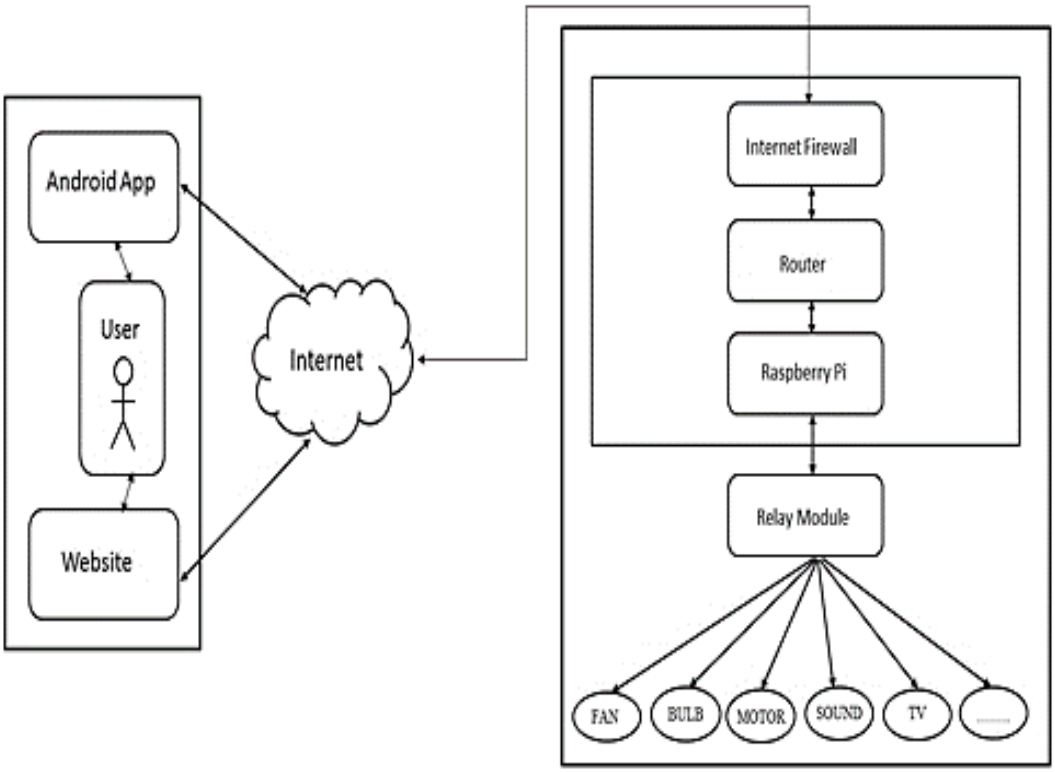


Figure 4.3: High Level Design

## 4.6 Low Level Design

It is a component level design process that follows a step-by-step refinement process. This can be used for designing data structures, required software architecture, source code and ultimately performance algorithms.

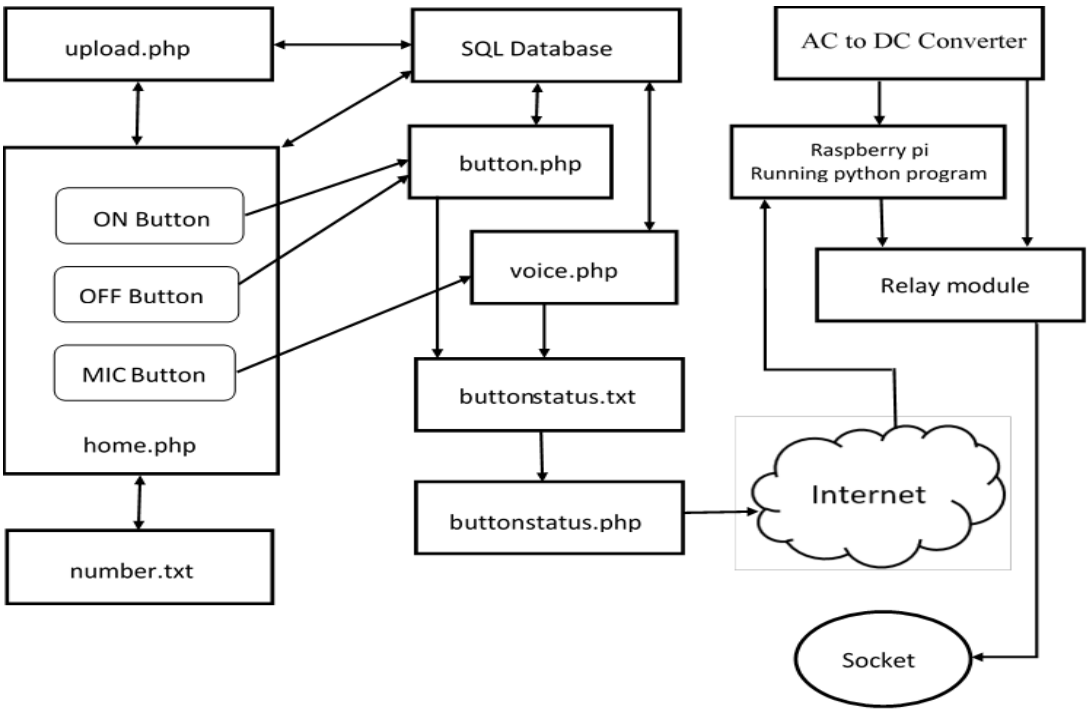


Figure 4.4: Low Level Design

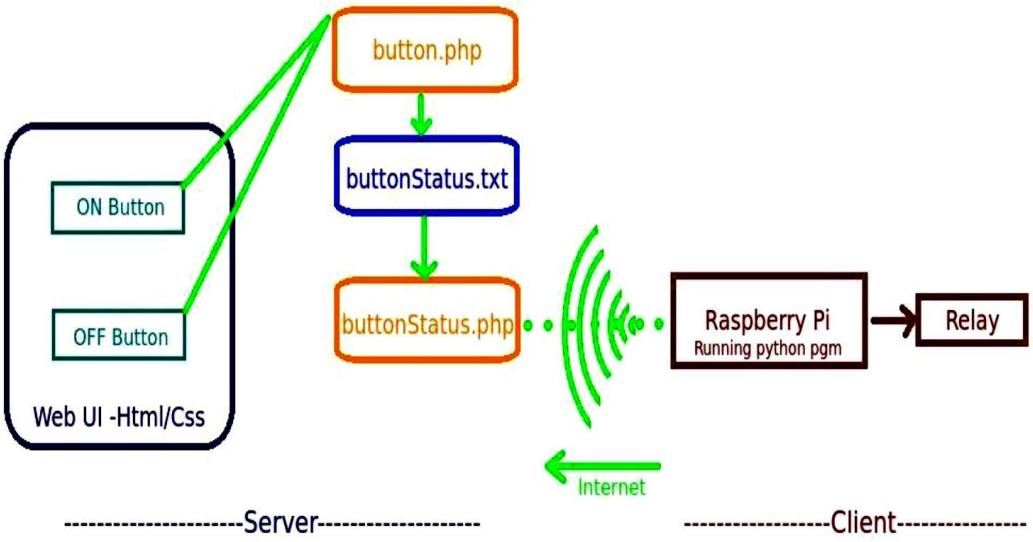


Figure 4.5: Home Automation Block Diagram

## 4.7 Software Design

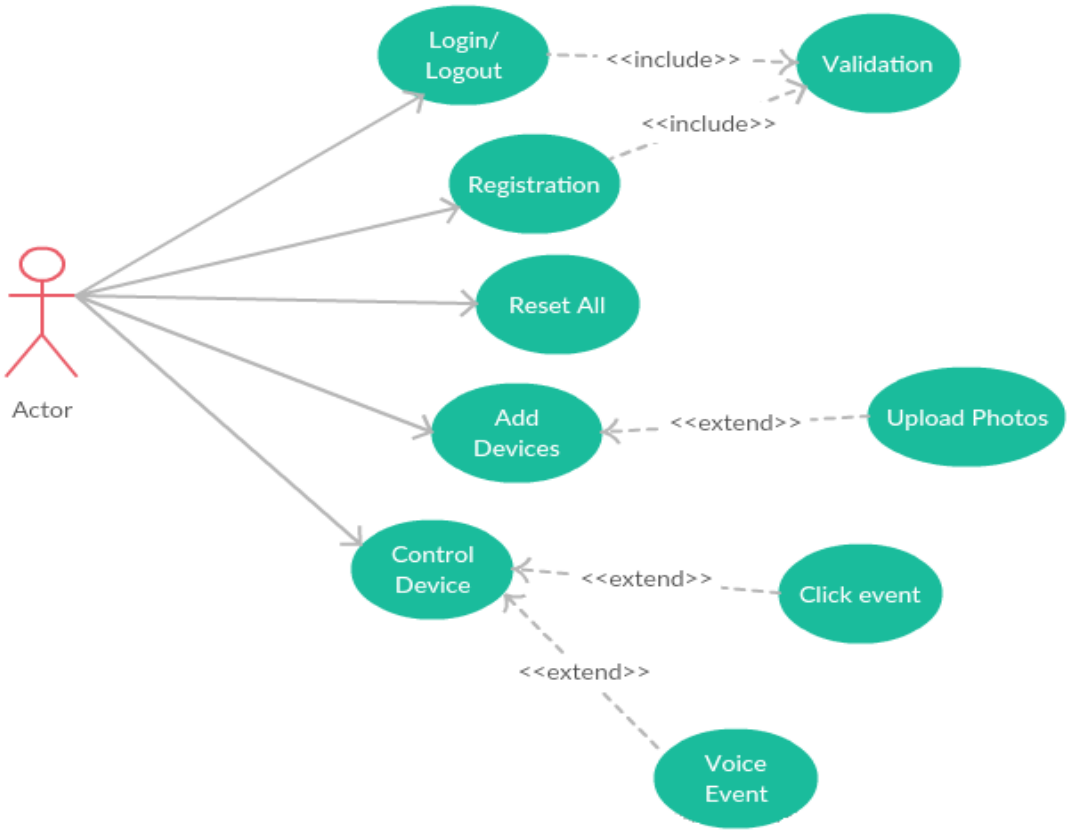


Figure 4.6: Use-Case Diagram

## 4.8 Features

1. Sign in and Register for users

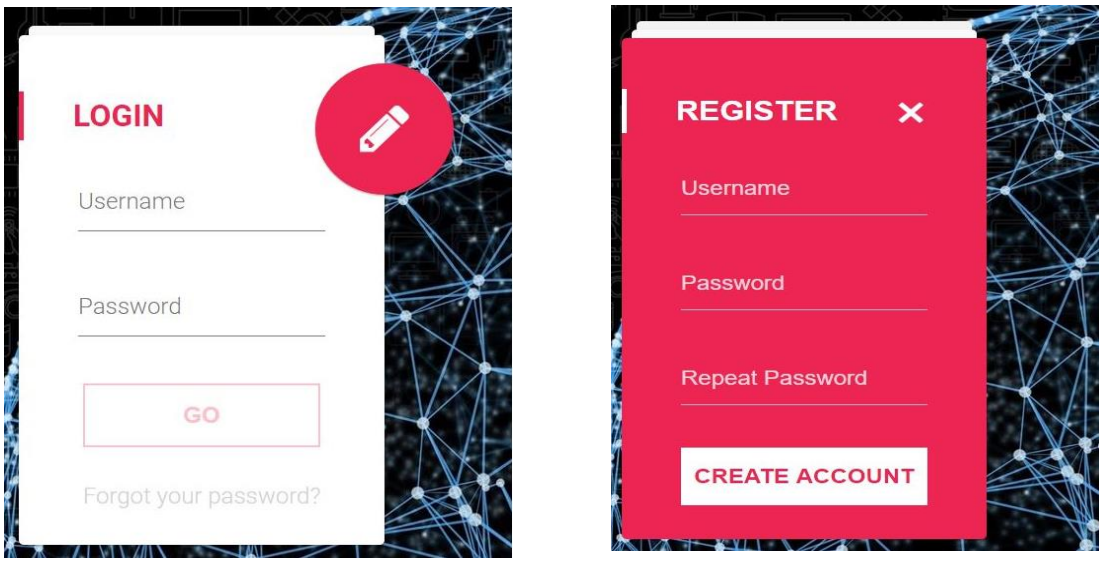


Figure 4.7: Login and Register

2. Multiple users can login at time
3. User can add or reset devices according to his requirements using Custom Device Manger.

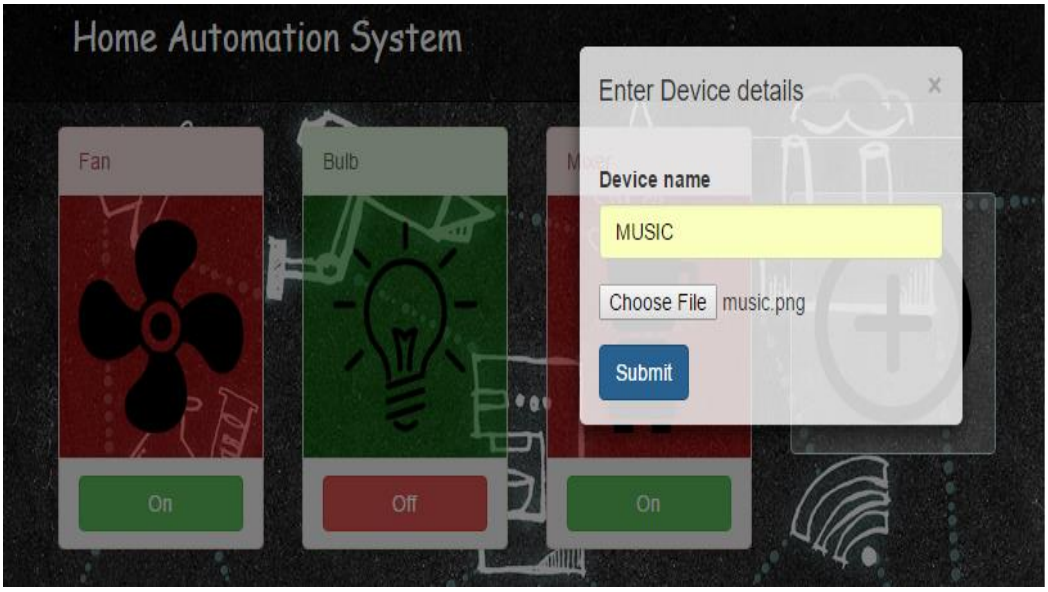


Figure 4.8: Custom Device Manager

4. User can also add the pics of the devices for remembrance
5. Maximum 8 devices can be controlled at a time by each user.


Figure 4.9: Maximum Device Limit

6. Database is used to store the previous state of devices for all users.
7. Voice commands are also integrated into the website
8. User can switch the device ON / OFF by giving voice commands
9. All input fields are validated and the website is responsive

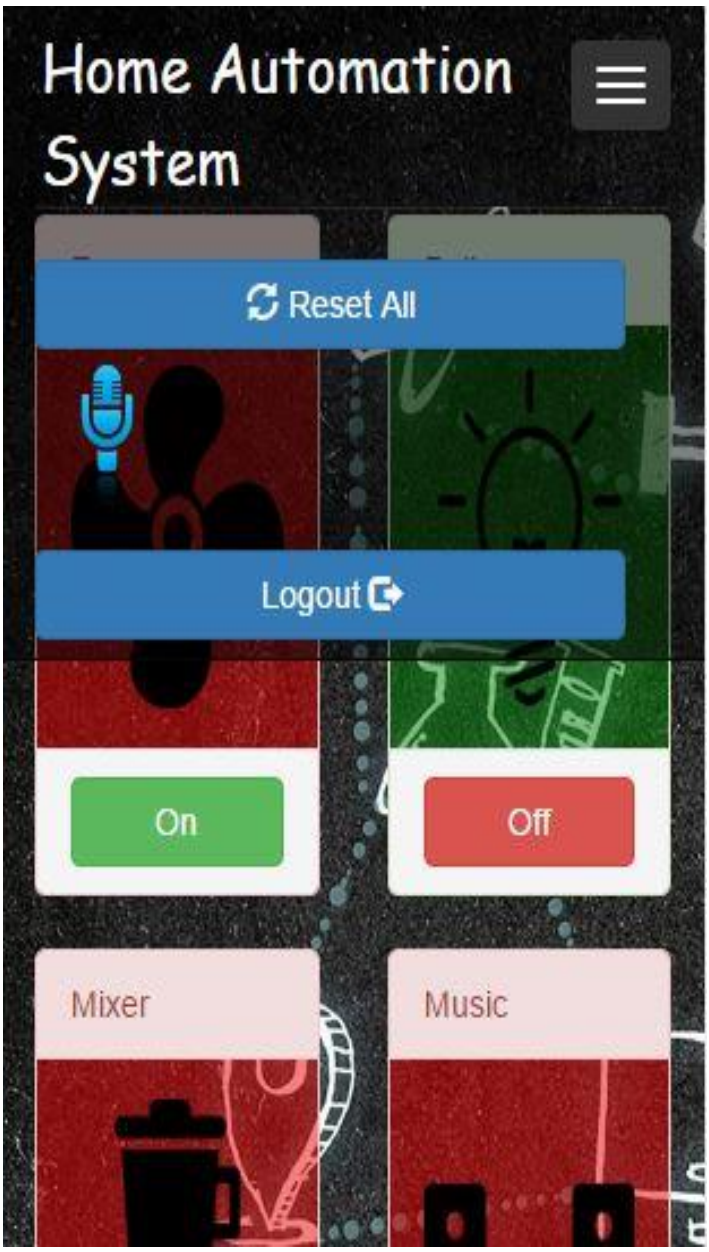


Figure 4.10: Responsive Webpage

# CHAPTER 5

# IMPLEMENTATION AND TESTING

We can consider the whole system to be composed of two parts: Server and Client

## 5.1 Server Side

The server is the web interface consisting of buttons and user interface that will allow you to turn ON or OFF a device by click or voice commands. It consists of PHP and Html files. We used text file to store status of a device. The server usually stores information regarding the button press on the page a text file. Clicking of the buttons will trigger the execution of a PHP file. This program serves as an API (Application Programming Interface) to store data on to a text file. The data is a string: “ON”, if ON button is clicked and “OFF”, if OFF button is clicked. Thus the current button press state is recorded in the text file.

## 5.2 Client Side

The client side consists of a Raspberry Pi with a relay circuit connected to its GPIO pin. The pi runs a python program which is used to Post a url link. So Pi constantly reads the contents of a url link. This PHP file serves as an API to read the contents of the text file. After reading the data, the python program checks if the string obtained is “ON” / “OFF” based on which it switches ON/OFF the relay respectively via its GPIO pin.

## 5.3 Implementation

### 5.3.1 Preparing HTML and PHP Files

The server side of the system is set up using XAMPP and those HTML and PHP files are put in htdocs directory of XAMPP. The python program which is to be copied to raspberry pi. XAMPP make our pc as a local web server.

### 5.3.2 Preparing HTML and PHP Files

The server side of the system is set up using XAMPP and those HTML and PHP files are put in htdocs directory of XAMPP. The program raspbi.py is the python program which is to be copied to your raspberry pi. XAMPP makes our PC as a local web server.

### 5.3.3 Preparing the database

The MySQL database is made to store the previous state of each device. A table is made to store the state of each user's device. Database gets updated every time user changes the device state or adds new device.

### 5.3.4 Setting up the Raspberry Pi

OS is installed on SD card for raspberry pi. The default OS used with the pi is the Raspbian. Pi is powered using the 5V supply from AC to DC Converter. Wi-Fi Module is configured to connect to the local server by giving local machine's IP address. The raspberry pi is used to continuously run a python program which reads the data from Web Interface. '**sudo filename.py python**' command is used to initiate the program.

### 5.3.5 Setting up the relay circuit for the Raspberry Pi

An eight channel relay module is used to switch an appliance ON or OFF by receiving pulse from Raspberry Pi. It consists of IC which acts like a switch. The IC triggers the relay when it receives a voltage at its base from the GPIO pin of raspberry pi. A 1N4001 diode is used to protect the transistor from reverse voltages created in the relay coil. The circuit is powered using the 12V supply from AC to DC converter.

## 5.4 Testing

System testing of software includes validating inputs and efficient code for faster loading and scripting. We have done multiple tests on voice commands and validated it with the results. While in hardware we have tested the efficiency and delay. Electromechanical relay that we have used in this project shows the delay of 40-50 milliseconds when going from NO to NC.

1. Status before clicking the button

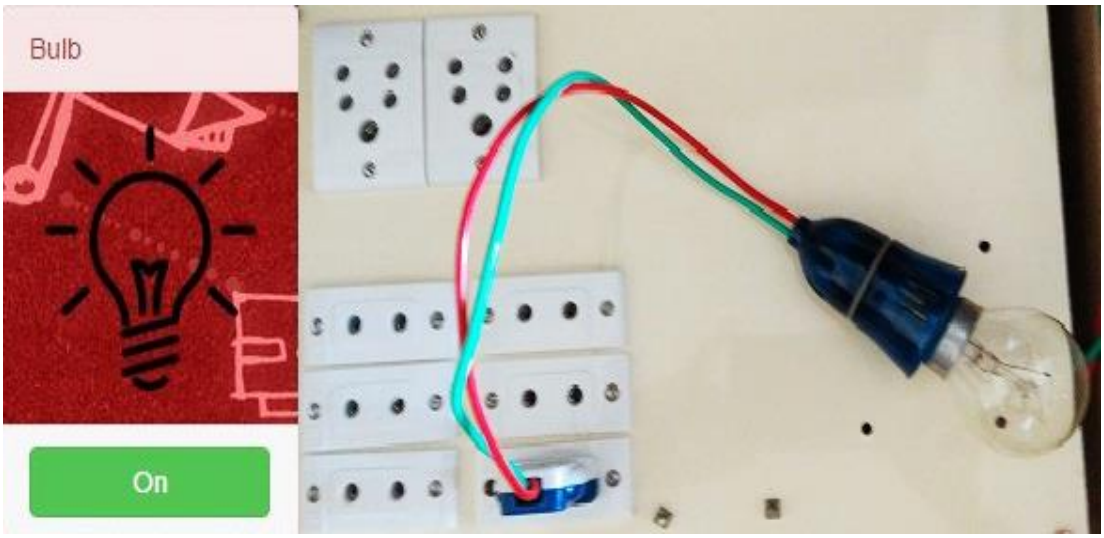


Figure 5.1: Before Click

2. Status after clicking the button

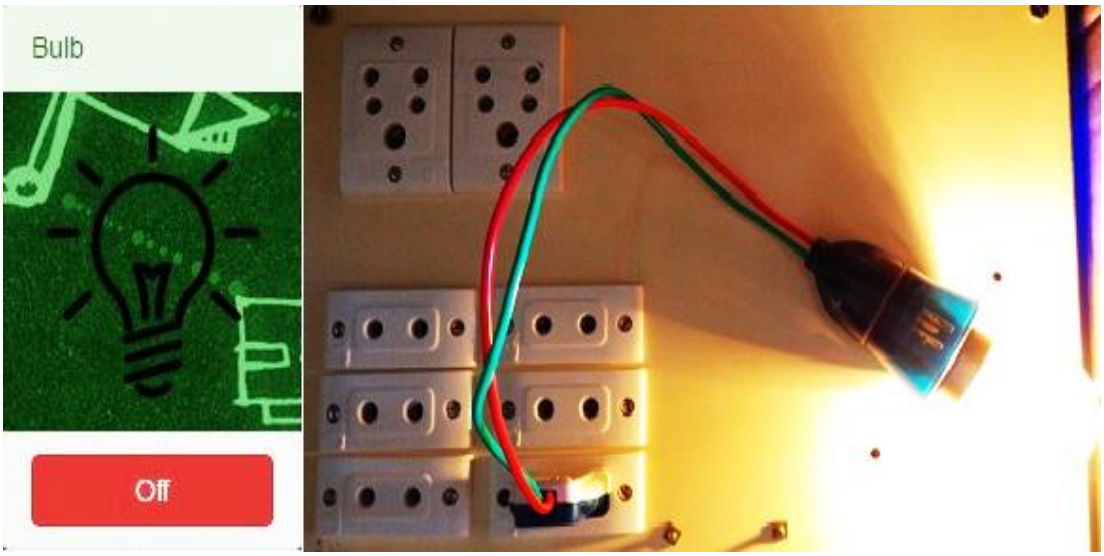


Figure 5.2: After Click

3. Pie chart 1 shows time taken by each event during transaction phase from switch ON to switch OFF

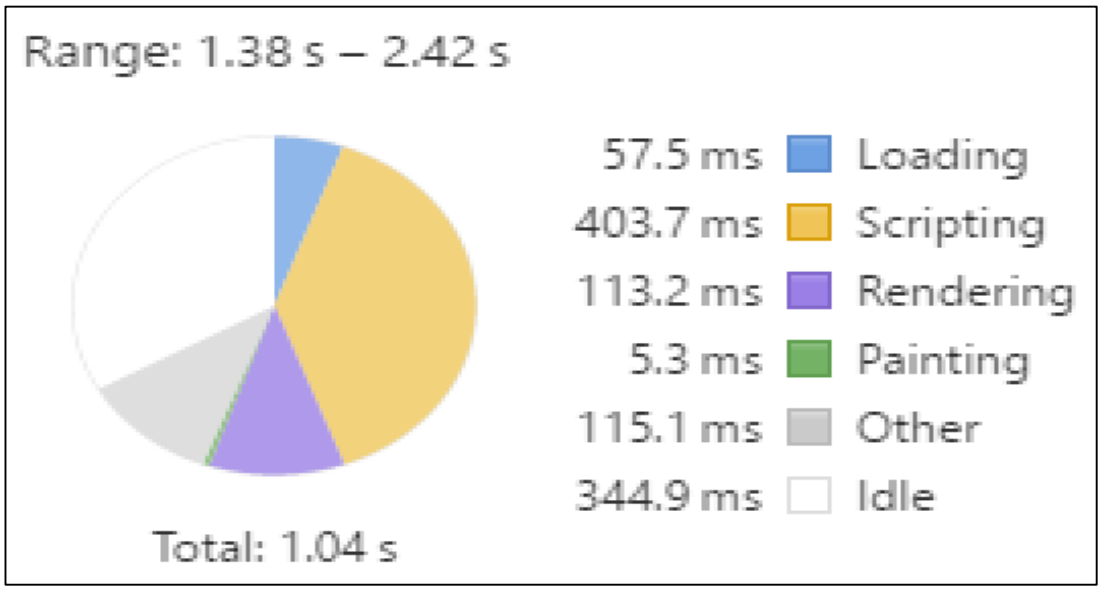


Figure 5.3: Pie Chart 1

4. Pie chart 2 shows time taken by each event during login

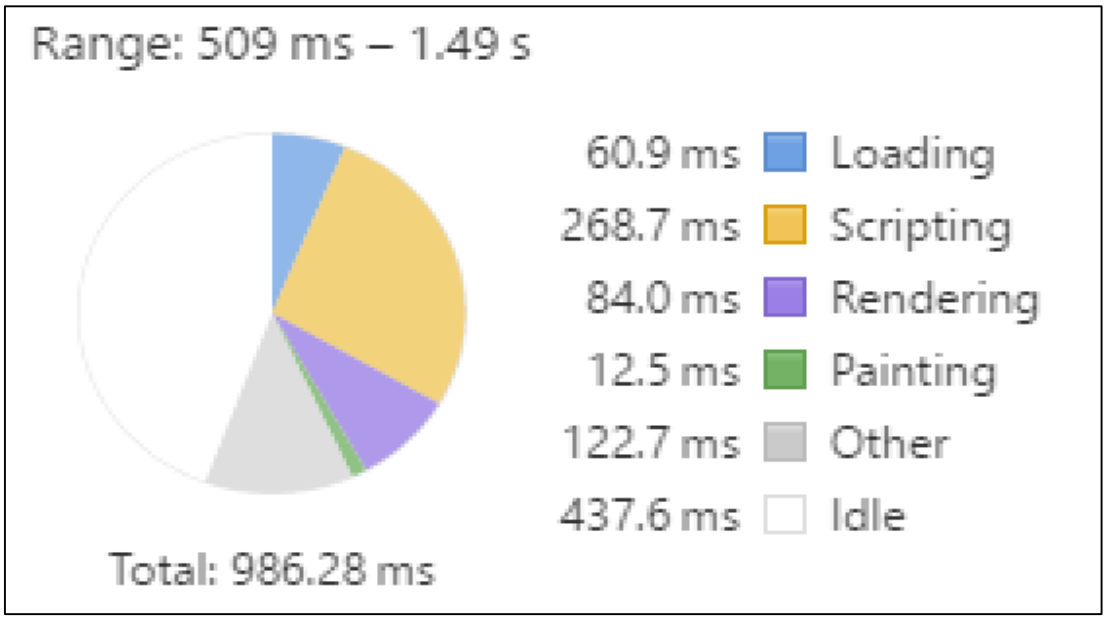


Figure 5.45: Pie Chart 2

5. Voice Commands also change the state of the device.
6. The commands "*Device name ON*" turns the Device ON and "*Device name OFF*" turns the device OFF.

# CHAPTER 6

# SCHEDULE TASKS AND MILESTONES

The whole project was broken down into a series of smaller steps to ensure a step by step methodology. This methodology was followed throughout the project. Each step of the methodology was a task and had to be done sequentially. Each task was allotted an appropriate number of days to be completed. According to this time requirement a schedule was made for the whole project as such. The tasks were performed according to the schedule and the project has been completed right on time. Extra effort was put in to ensure that no change in the planned schedule would be necessary whenever a particular task took a bit longer than planned. The initial tasks were study based where an accumulation of knowledge was necessary. This project also ensured that an individual learnt some valuable new skills that would enable him to work further in the same field or in other diverse fields.

| Start Date | Activity | Finish Date |
|---|---|---|
| 07/01/2016 | Studied about IOT and its applications | 11/01/2016 |
| 11/01/2016 | Studied about already existing system | 19/01/2016 |
| 19/01/2016 | Studied about already implemented websites | 23/02/2016 |
| 23/02/2016 | Bought and assembled components | 01/03/2016 |
| 01/03/2016 | Installed OS in Raspberry pi and connected it to the Internet | 11/03/2016 |
| 11/03/2016 | Website frontend development using Bootstrap | 28/03/2016 |
| 28/03/2016 | Backend development using PHP and Python | 09/04/2016 |
| 09/04/2016 | Code integration and testing | 18/04/2016 |
| 18/04/2016 | Prepared Report | 22/04/2016 |
| 27/04/2016 | Final submission | |

Table 6.1: Timeline

# CHAPTER 7

# PROJECT DEMONSTRATION

This project is tested on two types of inputs given by the user. One is by click and the other is by voice. The user gives those inputs using the designed web interface.

1. The user needs to Login or Register by giving the following details mentioned in Figure 7.1. Login page is essential as different users would be having different set of devices in their home.

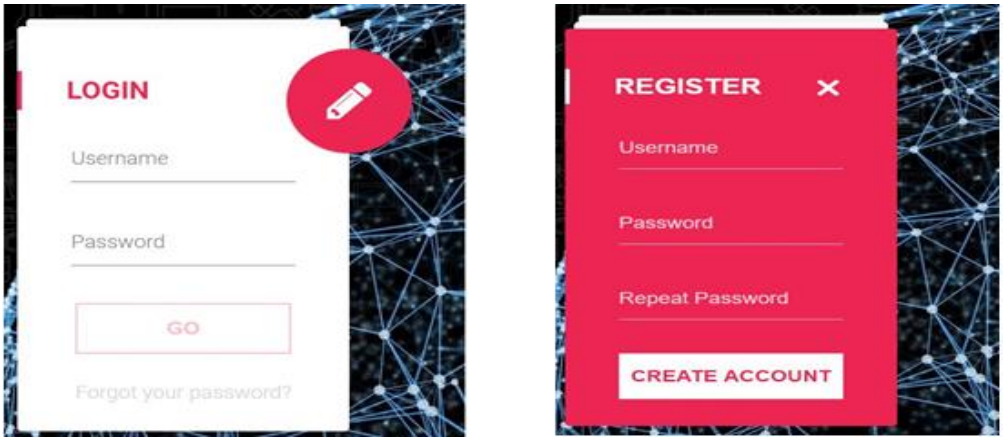


Figure 7.1: Login and Register

2. After the user is logged in. It is redirected to our home page which has CUSTOM DEVICE MANAGER. The user can add maximum of 8 devices in it that he/she wishes to control. It is done by clicking the ADD symbol button as shown in Figure 7.2

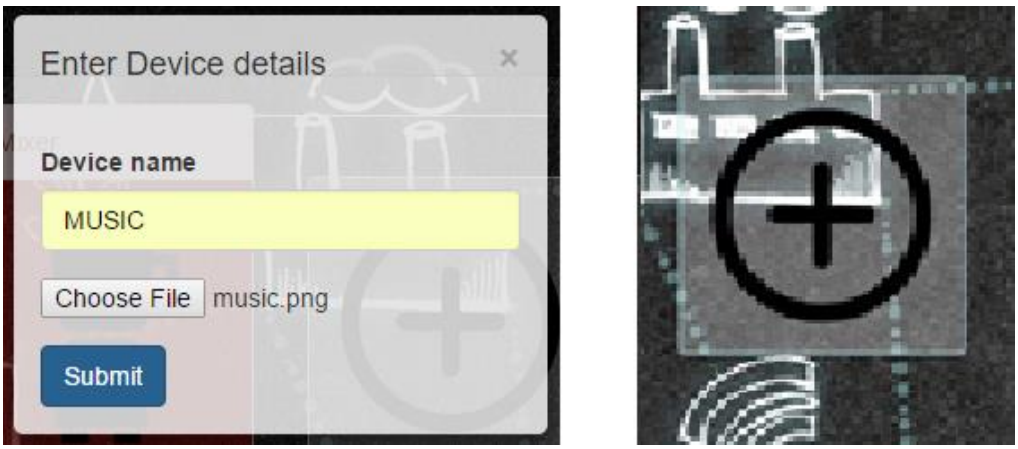


Figure 7.2: Custom Device Manager

3. User can give custom names to the devices and can also add the images of devices for remembrance. After adding the devices, the interface would like as shown in Figure 7.3

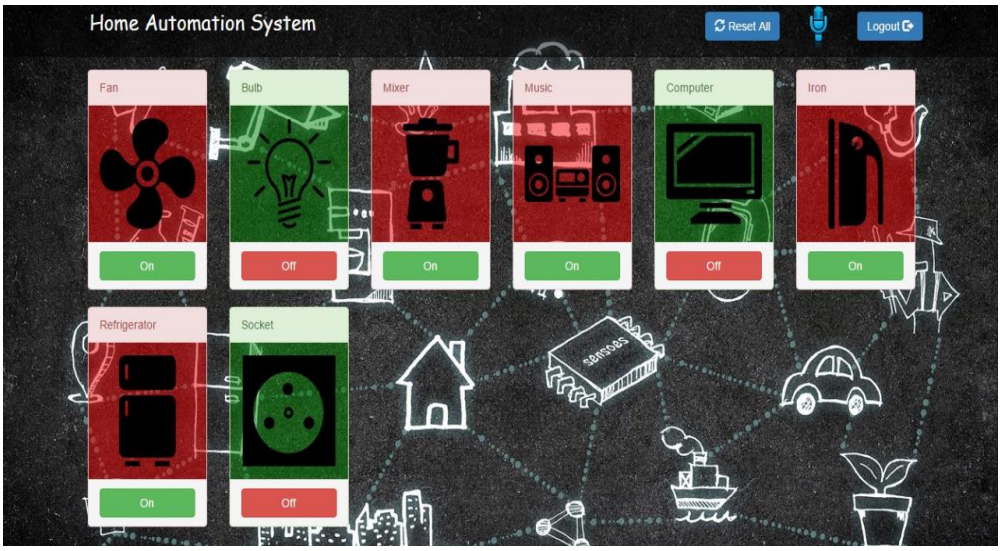


Figure 6: Home Page

4. The small microphone button on the top right corner of the interface is used to give voice commands to switch ON/OFF the devices. For e.g. In case of Bulb, the command "**BULB ON**" will switch ON the bulb and "**BULB OFF**" will switch OFF the bulb. Same is the case with ON and OFF buttons. Pressing the ON button will switch ON the bulb and Pressing the OFF button will switch OFF the bulb. This can be done for all the 8 devices at a time from anywhere.

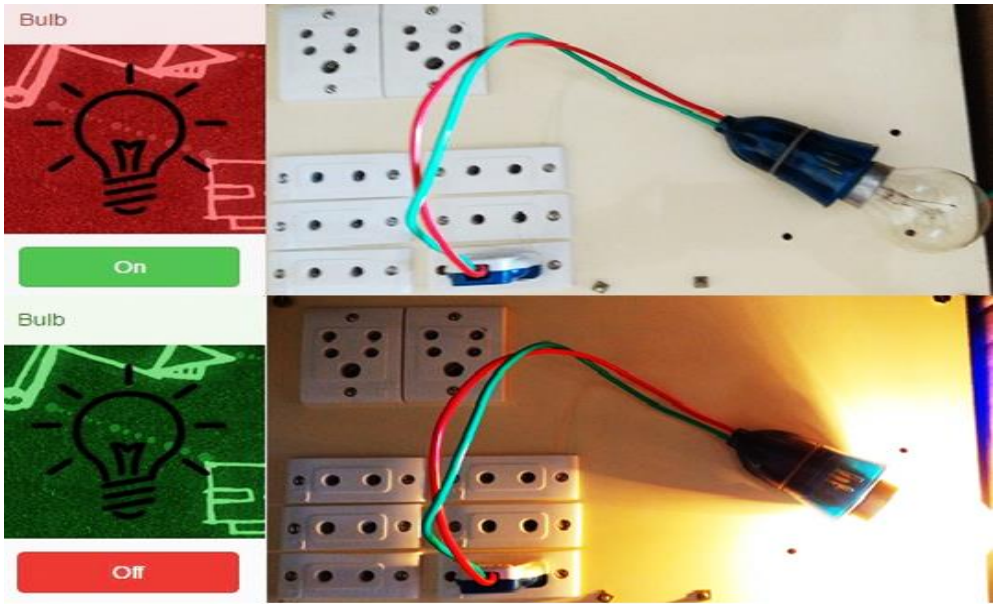


Figure 7: Device Status

# CHAPTER 8

# COST ANALYSIS

The software work does not require any addition cost other than the programming and designing effort. The reason behind this is because all tools and libraries used to design the system are licensed which guarantees end users the freedoms to use, study, share (copy), and modify the software. Extreme efforts have been taken to use only such tools, though much more efficient tools are available but with a usage cost. This is to ensure that the project is not a means to a profit but to help elderly and handicapped people in living a more independent life. The programming too was done without using a software which requires a cost of installation. The programming was done on Notepad and XAMPP is used to establish local server. However, the hardware design consists of several components. Their cost has been mentioned in Table 3.

| **SNo.** | **Name of the component** | **Cost of the component** |
|---|---|---|
| 1. | Raspberry Pi | Rs 3000 |
| 2. | 8 Channel Relay Module | Rs 300 |
| 3. | Adapter (12V, 2A) | Rs 200 |
| 4. | Ply Board | Rs 70 |
| 5. | 5 Pin Sockets | Rs 50 |
| 6. | 2 Pin Sockets | Rs 110 |
| 7. | Spacer bolts | Rs 30 |
| 8. | Jumper Wires | Rs 50 |
| 9. | Wi-Fi Module | Rs 600 |
| 11. | LM7805 | Rs 10 |
| 12. | Miscellaneous | Rs 200 |
| | **Total Cost** | **Rs 4620** |

Table 8.1: Cost

# CHAPTER 9

# CONCLUSION AND FUTURE ENHANCEMENT

## 9.1 Summary

A home automation system based on voice recognition is built and implemented. The system is targeted at elderly and disabled people. The prototype developed enables the user to control the appliances using pre-existing devices such as their smartphone or home computer. The interfaces are intuitive and easy to use with custom device manager. This device is also very easy to integrate into existing applications and require only a small amount of expertise to install. We have successfully designed a system that communicates with a mobile device such as a smartphone or laptop via Raspberry Pi to control electrical appliances, light switches by voice commands. These kinds of home automation systems are required because human can make mistakes and forgot to switch off the appliances when there is no use and in that case, they are useful in order to utilize the power effectively and also in a secured manner. It can also be used to help elderly or handicapped people to live a more independent life as long as possible.

## 9.2 Future Scope

- Adding more confirmation commands to the voice recognition system.
- Integrating variable control functions to improve the system versatility such as providing control commands other than ON/OFF commands. For example, “Decrease Temperature”, “Dim Lights” etc.
- This technology used could be implemented in a wide variety of applications that require the use of sensors.
- Buildings require security. It can be integrated in this system as a key element to the automation to detect intrusion.
- Solid-State Relay (MOSFET) can be used instead of mechanical relay to control high power devices like AC, Elevator etc.

# CHAPTER 10

# REFERENCES


1. Raspberry Pi and Wi-Fi Based Home Automation: International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 NATIONAL CONFERENCE on Developments, Advances & Trends in Engineering Sciences (NCDATES-09th & 10th January 2015)
2. https://diyhacking.com/raspberry-pi-home-automation/
3. Hari Charan Tadimeti, Manas Pulipati, “Overview of Automation Systems and Home Appliances Control using PC and Microcontroller”, Volume 2 Issue 4, April 2013
4. Monitor Your Home with the Raspberry Pi B+ Created by Marc-Olivier Schwartz
5. https://www.codepen.io/andytran/pen/RPBdgM
6. Smart Home Automation with Linux and Raspberry Pi by Steven Goodwin
7. https://en.wikipedia.org/

# APPENDIX

- **Ajax query to update switch from ON to OFF for a particular device using click event**

```
$(document).on('click','.statuson',function(event){
        event.preventDefault();
        var ref=event.target;
        var buttonNumber=$(event.target).attr('id').substring(2);

        $.ajax({type:"POST",url:"button.php",data:{'num':$(event.target).attr(
        'id').substring(2),'on':1}}).done(function(){
                $(ref).replaceWith('<button type="submit" class="btn btn-
                danger statusoff btn-block" name="off'+buttonNumber+'"
                id="off'+buttonNumber+'">Off</button>');
                });
        location.reload(true);
        });
});
```

- **Ajax query to update switch from ON to OFF for a particular device using voice event**

```
        $(document).on('click','.mic',function(event){
                var ref=event.target;
                if (window.hasOwnProperty('webkitSpeechRecognition')) {
                        var recognition = new webkitSpeechRecognition();
                        recognition.continuous = false;
                        recognition.interimResults = false;
                        recognition.lang = "en-US";
                        recognition.start();
                        recognition.onresult = function(e) {
                                var speech = e.results[0][0].transcript;
                                recognition.stop();
```

```
var num1=0;
var s=speech.split(" ");
<?php
        $query1=mysql_query("select * from $per");

    while($arr=mysql_fetch_array($query1))
{?>
var dev = <?php echo json_encode($arr['device']); ?>;
num1++;
if(dev.localeCompare(s[0])==0)
{
var qwe=s[1]+" "+num1;
if(s[1].localeCompare("on")==0)
{
        check=1;
        var msg = newSpeechSynthesisUtterance(s[0]+" is turning on.");
        window.speechSynthesis.speak(msg);

    $.ajax({type:"POST",url:"voice.php",data:{'button':qwe}}).done(function(){
$(".panel-danger").each(function(index){
if($(this).find(".panel-heading").html().toLowerCase()==s[0]){
        $(this).removeClass('panel-danger').addClass('panel-success');
        $(this).find(".btn-success").replaceWith('<button type="submit" class="btn btn-danger statuson btn-block" name="off'+num1+'" id="off'+num1+'">Off</button>');
        }
});
```

```
        });
    }
    else
if((s[1].localeCompare("off")==0)||(s[1].localeCompare("of")==0))
    {   //Similarly, code to switch off the device.}
```

- **Code to store status in database and update status in real time**

```
$per=$_SESSION["person"];
$file = "buttonStatus.txt";
if (isset($_POST['on']))
{
    $handle = fopen($file,'w+');
    $onstring = "ON".$_POST['num'];
    fwrite($handle,$onstring);
    fclose($handle);
    $store=$_POST['num'];
    $query=mysql_query("UPDATE $per SET status=1 WHERE
stat='$store';");
}
```

- **Python code to switch GPIO pin**

```
import RPi.GPIO as GPIO
import urllib2
GPIO.setwarnings(False)
GPIO.setmode(GPIO.BCM)
GPIO.setup(4,GPIO.OUT)
GPIO.setup(17,GPIO.OUT)
true = 1
status=0
while(true):
        try:
            response =
            urllib2.urlopen('http://192.168.43.176/Project/buttonSt
            atus.php')
            status = response.read()
            except urllib2.HTTPError, e:
                    print e.code
            except urllib2.URLError, e:
                    print e.args

            print status
```

```
if status=='ON':
        GPIO.output(4,True)
elif status=='OFF':
        GPIO.output(4,False)
```

- **Upload photo and update database with new added device**

```
if(move_uploaded_file($_FILES["fileToUpload"]["tmp_name"],$targ
et_file))
{
        echo "file uploaded successfully";
        $str=strtolower($device);
        $query=mysql_query("INSERT INTO $per values
        ('$str','$target_file',0,'$stat')");
        $fdata = file_get_contents ( $file );
        $fdata = intval($fdata) + 1;
        file_put_contents($file, $fdata);
        header("location:home.php");
}
```