PROJECT REPORT ON

RASPBERRY PI BASED HOME AUTOMATION SYSTEM

Submitted in partial fulfilment of the requirements

Of the degree of

Bachelor of Engineering

By

Rishi Gupta	**BE-5 01**
Narendra Rawal	**BE-5 07**
Netra Phatak	**BE-5 05**
Karan Mamaniya	**BE-6 30**

Under the guidance of

Ms. Archana Chaugule

DEPARTMENT OF INFORMATION TECHNOLOGY

SHAH AND ANCHOR KUTCHHI ENGINEERING COLLEGE

CHEMBUR,MUMBAI – 400088

2018-2019

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Mahavir Education Trust's

SHAH & ANCHOR KUTCHHI ENGINEERING COLLEGE

Mahavir Education Trust Chowk,W.T. Patil Marg,Chembur,Mumbai 400088

Affiliated to University of Mumbai, Approved by D.T.E. & A.I.C.T.E.

Awarded provisional accreditation for Computer & Electronics Engineering by NBA

(for 2 years from 06-08-2014)

Certificate

This is to certify that the report of the project entitled

Raspberry Pi Based Home Automation

is a bonafide work of

Rishi Gupta	BE-5 01
Narendra Rawal	BE-5 07
Netra Phatak	BE-5 05
Karan Mamaniya	BE-6 30

submitted to the

UNIVERSITY OF MUMBAI

during semester VIII in partial fulfilment of the requirement for the award of the degree of
BACHELOR OF ENGINEERING

in

INFORMATION TECHNOLOGY

(Ms. Archana Chaugule)	(Ms. Swati Nadkarni)
Supervisor/Guide	I/c Head of department

(Dr. Bhavesh Patel)

Principal

Approval for Project Report for B.E. semester VIII

This project entitles by **Raspberry Pi based Home Automation** *Rishi Gupta,Netra Phatak,Narendra Rawal,Karan Mamaniya* is approved for semester VII in partial fulfilment of the requirement for the award of the degree of Bachelor of Engineering.

Examiners:

1._____

2._____

Guide.

1._____

Date : / /

Place : Mumbai

DECLARATION

I declare that this written submission represents my ideas in my own words and where other's ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and any violation of the above will cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Rishi Gupta	**BE-5 01**	_____
Narendra Rawal	**BE-5 07**	_____
Netra Phatak	**BE-5 05**	_____
Karan Mamaniya	**BE-6 30**	_____

(Name and Roll No.) (Signature)

Date : / /

ABSTRACT

Internet of things is an interconnection of physical gadgets installed with hardware, programming, sensor which is equipped for gathering information from the encompassing and sending information over web is called IOT. This IoT project focuses on building a smart wireless home Automation system which controls and manages hardware devices accessed by the owner using IoT technology which includes Raspberry Pi and Android application as User Interface(UI).Our project is an integration of electronic devices and hardware's by establishing connection into the system remotely through mobile application. Internet of Things (IoT) conceptualizes the idea of remotely connecting and monitoring real world objects (things) through the Internet. When it comes to our house, this concept can be aptly incorporated to make it smarter, safer and automated. This IoT project focuses on building a smart wireless home security system which sends alerts to the owner by using Internet in case of any trespass and raises an alarm optionally. Besides, the same can also be utilized for home automation by making use of the same set of sensors. Home Automation is a way to have things around your home happen automatically. The first thing that comes to mind when folks think of home automation are robots, flashing lights, complicated electronics and a general feeling that their home is less of a warm home and more of a cold science experiment.

Date :

To,
The Principal
Shah And Anchor Kutchhi Engineering College,
Chembur,Mumbai-400088

Subject:Confirmation of Attendance

Respected Sir,

This is to certify that Final year(BE) students

Rishi Gupta	**BE-5 01**
Narendra Rawal	**BE-5 07**
Netra Phatak	**BE-5 05**
Karan Mamaniya	**BE-6 30**

Have duly attended the sessions on the day allotted to them during the period from 12-07-2018 to 05-10-2018 for performing the Project titled "*Raspberry Pi Based Home Automation*".

They were punctual and regular in their attendance. Following is the detailed record of the student's attendance.

Attendance Record:

Date	Rishi Gupta	Netra Phatak	Narendra Rawal	Karam Mamaniya
09/01/2019	Present	Present	Present	Present
16/01/2019	Present	Present	Present	Present
23/01/2019	Absent	Present	Present	Present
06/02/2019	Present	Present	Present	Present
20/02/2019	Present	Absent	Present	Absent
27/02/2019	Present	Present	Present	Present
06/03/2019	Present	Present	Absent	Present
13/03/2019	Present	Present	Present	Present
20/03/2019	Present	Present	Present	Present
27/03/2019	Present	Present	Present	Present
03/04/2019	Present	Present	Present	Present
11/04/2019	Present	Present	Present	Present

Ms.Archana Chaugule

(Signature of Guide)

CONTEXTS

List of Figures:

CHAPTER 1

INTRODUCTION

INTRODUCTION

This chapter contains a brief Introduction to this system. It states about the Home Automation , how we can access electronic devices using this system.

1.1 Introduction

The home automation system is mainly implemented by sensors, controlling devices and actuators. The sensors detects light, motion, temperature and other sensing elements, and then send that data to the main controlling device. These sensors can be thermocouples or thermostats, photo detectors, level sensors, pressure sensors, current transformers, IR sensors, etc., which need an additional signal conditioning equipment to communicate with the main controller. Controllers may be personal computers/laptops, touch pads, smart phones, etc., attached to the controlling devices like programmable-logic controllers or microcontrollers that receive the information from the sensors, and based on the program, control the actuators like relays. The system can be modified based on the load operations. The programmable controller allows to connect various sensors and actuators through various input and output modules whether they are analog or digital. Actuators are the final controlling devices like limit switches, relays, motors and other controlling mechanisms which finally control the home equipments. Communication plays an important role in this home automation system for the remote access of these operations. There are various communication protocols available for home automation systems like RF, IR, DTMF, Wi-Fi, Bluetooth, GSM, Zigbee, Ethernet, IOT and PC Serial Communication. A thing in the internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an IP address and is able to transfer data over a network.

Increasingly, organizations in a variety of industries are using IoT to operate more efficiently, better understand customers to deliver enhanced customer service, improve decision-making and increase the value of the business.

Raspberry Pi is the name of a series of single-board computers made by the Raspberry Pi Foundation, a UK charity that aims to educate people in computing and create easier access to computing education.

The Raspberry Pi launched in 2012, and there have been several iterations and variations released since then. The original Pi had a single-core 700MHz CPU and just 256MB RAM, and the latest model has a quad-core 1.4GHz CPU with 1GB RAM. The main price point for Raspberry Pi has always been $35 and all models have been $35 or less, including the Pi Zero, which costs just $5. All over the world, people use Raspberry Pis to learn programming skills, build hardware projects, do home automation, and even use them in industrial applications. The Raspberry Pi is a very cheap computer that runs Linux, but it also provides a set of GPIO (general purpose input/output) pins that allow you to control electronic components for physical computing and explore the Internet of Things (IoT)

1.2 Objective

In this project, we are going to implement a system for home automation system, mainly for regular size homes. This will be useful to monitor your active/ inactive electric home appliances on go into the mobile/ tablet display itself.

1.3 Methodolgy Used:

Basically, the design and development of this project are divided into two main parts which are hardware architecture and software details. In the hardware architecture, the design of the circuit was constructed and the prototype of the project was built. While in the software development, the whole complete prototype was operated via programming codes.

1.4 Proposed System

In the research, special attention is put on the critical condition that makes the component and the module operate efficiently. All components are discussed and the functions in this section. The major problem accosted in engineering design is to fully and correctly specify the requirements of the design. The “Raspberry Pi based Home Automation“ system design process involves the following:

1. Full analysis of the system specification.
2. Hardware design.

The hardware tasks include the definition and analysis of suitable circuit components used in achieving the circuit design of the PCB Board. We have the Relay modules,

these convert 240v current to appropriate voltage suitable for the appliances; the raspberry pi then assesses whether the combination of readings from the sensors is actually a trigger event ; based on this, the device or appliance will get on and off,

Raspberry Pi 3:

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CHAPTER 2
REVIEW OF LITERATURE

LITERATURE SURVEY

The home automation system is mainly implemented by sensors, controlling devices and actuators. The sensors detects light, motion, temperature and other sensing elements, and then send that data to the main controlling device. These sensors can be thermocouples or thermostats, photo detectors, level sensors, pressure sensors, current transformers, IR sensors, etc., which need an additional signal conditioning equipment to communicate with the main controller. Controllers may be personal computers/laptops, touch pads, smart phones, etc., attached to the controlling devices like programmable-logic controllers or microcontrollers that receive the information from the sensors, and based on the program, control the actuators like relays. The system can be modified based on the load operations. The programmable controller allows to connect various sensors and actuators through various input and output modules whether they are analog or digital. Actuators are the final controlling devices like limit switches, relays, motors and other controlling mechanisms which finally control the home equipment's. Communication plays an important role in this home automation system for the remote access of these operations. There are various communication protocols available for home automation systems like RF, IR, DTMF, Wi-Fi, Bluetooth, GSM, Zigbee, Ethernet, IOT and PC Serial Communication.

The main objective of this project is to develop a home automation system with Android application controlled remote. As technology is advancing so houses are also getting smarter. Modern houses are gradually shifting from conventional switches to centralized control system, involving wireless controlled switches. Presently, conventional wall switches located in different parts of the house makes it difficult for the user to go near them to operate. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled home automation system provides a simpler solution with Android application technology. Remote operation is achieved by any smartphone/Tablet etc., with Android OS, upon a GUI (Graphical User Interface) based touch screen operation. In order to achieve this, Android application act as transmitter, which sends ON/OFF commands to the receiver where loads are connected. By operating the specified remote switch on the transmitter, the loads can be turned ON/OFF remotely through wireless technology. The microcontroller used here is of 8051 family.

CHAPTER 3
PROBLEM STATEMENT

PROBLEM STATEMENT

Considering today's Normal Home System, People are struggling to operate switches and bulbs at multiple places in home. This project mainly focuses on allowing users to have access to all components and devices in their home on their palm (Web site). In the hardware architecture, the design of the circuit was constructed and the prototype of the project was built. While in the software development, the whole complete prototype was operated via programming codes.

CHAPTER 4
REQUIREMENT ANALYSIS

REQUIREMENT ANALYSIS

4.1 SRS Document

4.1.1 Introduction

4.1.1.1 Purpose

The purpose of the project is to design and construct a home automation system that will remotely (within the house.) switch on or off any household appliances connected to it, using a microcontroller Wi-Fi based web application. This project is to implement a low cost , reliable and scalable home automation system that can be used to switch on or off any household appliance , using a microcontroller to achieve hardware simplicity.

4.1.1.2 Scope

This project work is complete on its own in automatically switching on or off of electrical appliances limited to household appliances. Raspberry PI based home automation project helps the user to control any electronic device using Device Control app on their Android Smartphone.

4.1.1.3 Intended Audience

Everybody wants to save time as much as they can. New technologies are being introduced to save our time. To save people's time we are introducing Home Automation system using Wi-Fi module.

Even people with physical disability will be able to control the household devices.

4.1.1. Definition, Acronyms and Abbreviations

Notation	Full Form
NO	Normally Open
NC	Normally Closed
COM	Common
GPIO	General Purpose Input Output
HDMI	High Definition Multimedia Interface
SD	Secure Digital

Following abbreviations have been used throughout his document.

4.1.2 Overall Description

This project is one of the important Raspberry PI Projects. Raspberry PI based home automation using Wi-Fi project helps the user to control any electronic device using website. The website sends commands to the controller – Raspberry PI, through wireless communication, namely, Wi-Fi. The Raspberry PI is connected to the main PCB which has four relays as shown in the block diagram. These relays can be connected to different electronic devices. As per the block diagram, Device 1 – Buzzer, Device 2- Fan, Device 3 – Lights,etc. When the user presses on the 'On' button displayed on the webpage for the device 1, the Buzzer is switched on. This Buzzer can be switched off, by pressing the same button again. Similarly, when the user presses on the 'On' button displayed on the webpage for the device 2, the fan is switched on. The fan can be switched off, by pressing the same button again. This project of home automation using Raspberry PI can be used for controlling any AC or DC devices. In the demonstration, we have used DC Fan and DC Bulb. To drive this DC Fan and Light, a 9V battery is connected.

4.1.3 External Interface Requirements

4.1.3.1 User Interfaces

The Human Link to a Home Automation System. Automation occurs when the state of a device, product or system changes without any human interaction. It happens when your home environment is able to adapt to your needs all by itself—no tap of a button or a flip of a switch is required.

4.1.3.2 Hardware Interface

i. Raspberry Pi 3 Model B
ii. Relay Modules as per the requirements – One relay module can replace one switch, so we need one relay module for each ON/OFF switch
iii. Connecting wires – As per the requirement
iv. Electronic devices Light bulbs,Fan,Mobile charger,etc (any electronic device)

4.1.3.3 Website Interface

I. Front End: Visual Studio (asp.net, C#)
ii. Any web browser.(Chrome, Internet Explorer, Opera. etc)

4.1.4 System Features

- ❏ CPU speed ranges from 700 MHz to 1.2GHz
- ❏ On board memory range from 256MB to 1GB RAM
- ❏ CPU: Quad-core 64-bit ARM Cortex A53
- ❏ GPU: 400MHz VideoCore IV multimedia
- ❏ Memory: 1GB LPDDR2-900 SDRAM (i.e. 900MHz)
- ❏ USB ports: 4
- ❏ Video outputs: HDMI, composite video (PAL and NTSC) via 3.5 mm jack
- ❏ Network: 10/100Mbps Ethernet and 802.11n Wireless LAN

4.1.5 Other Non-Functional Requirements

4.1.5.1 Performance Requirements

i. A good network provider must be subscribed
ii. Components must be in good working condition

4.1.5.2 Safety Requirements

i. Connect to power
ii. Connect to the internet.
iii. Go on website
iv. Create an account.
v. Add smart devices to the hub or central monitor
vi. Setup scenes, triggers and schedules
vii. Setup alerts

4.1.5.3 Security Requirements

i. Avoid Unauthorized access.
ii. Should be able to prevent most types of intrusion
iii. Even if the system is broken into, it should be able to send signals to the user and the nearest police station

4.1.5.4 Software Quality Attributes

i. Portability
ii. Reliability
iii. Testability
iv. Usability

CHAPTER 5
PROJECT DESIGN

Project Design

5.1 Block Diagram

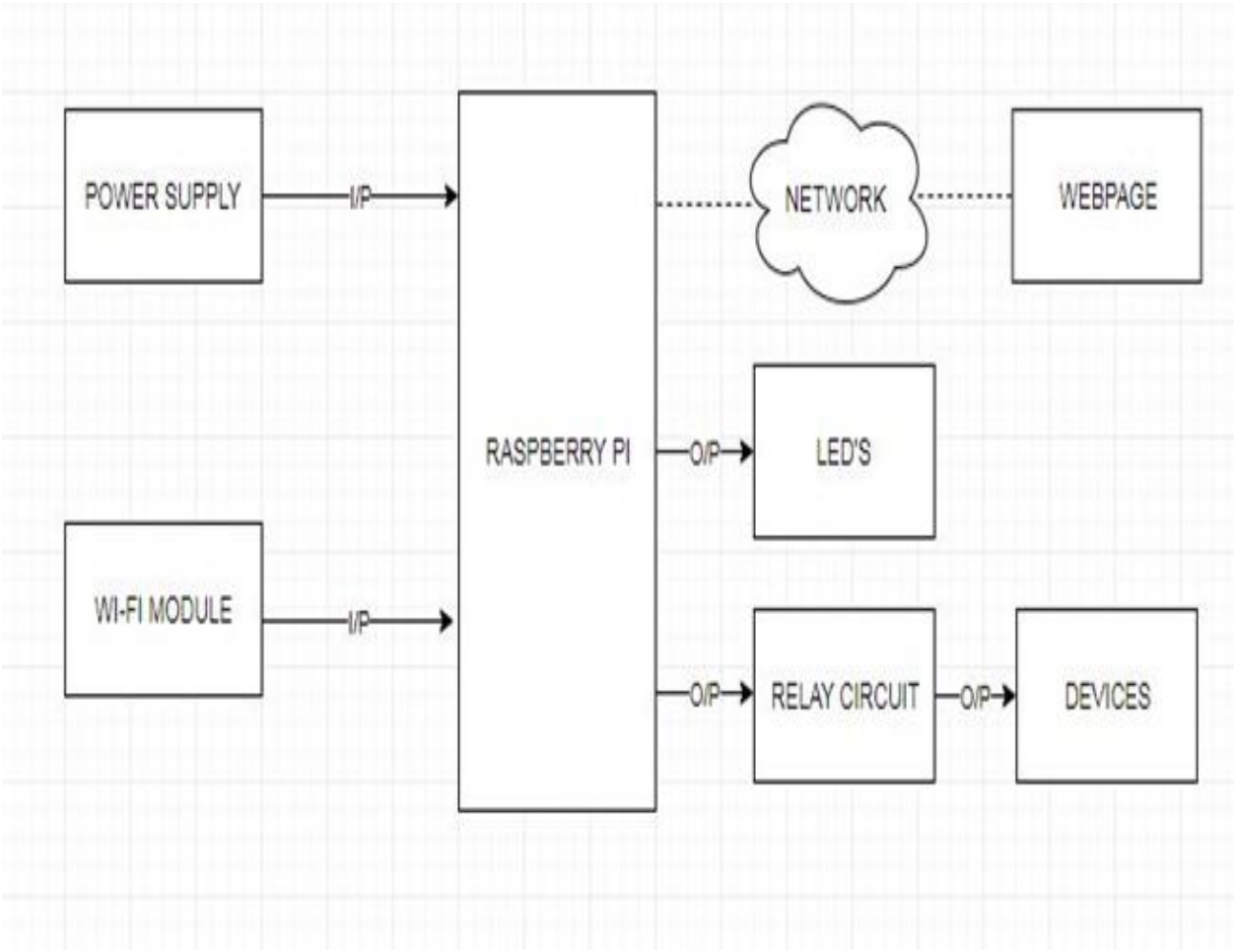

Figure 5.1 Block Diagram for Raspberry Pi Based Home Automation.

5.2 Sequence Diagram

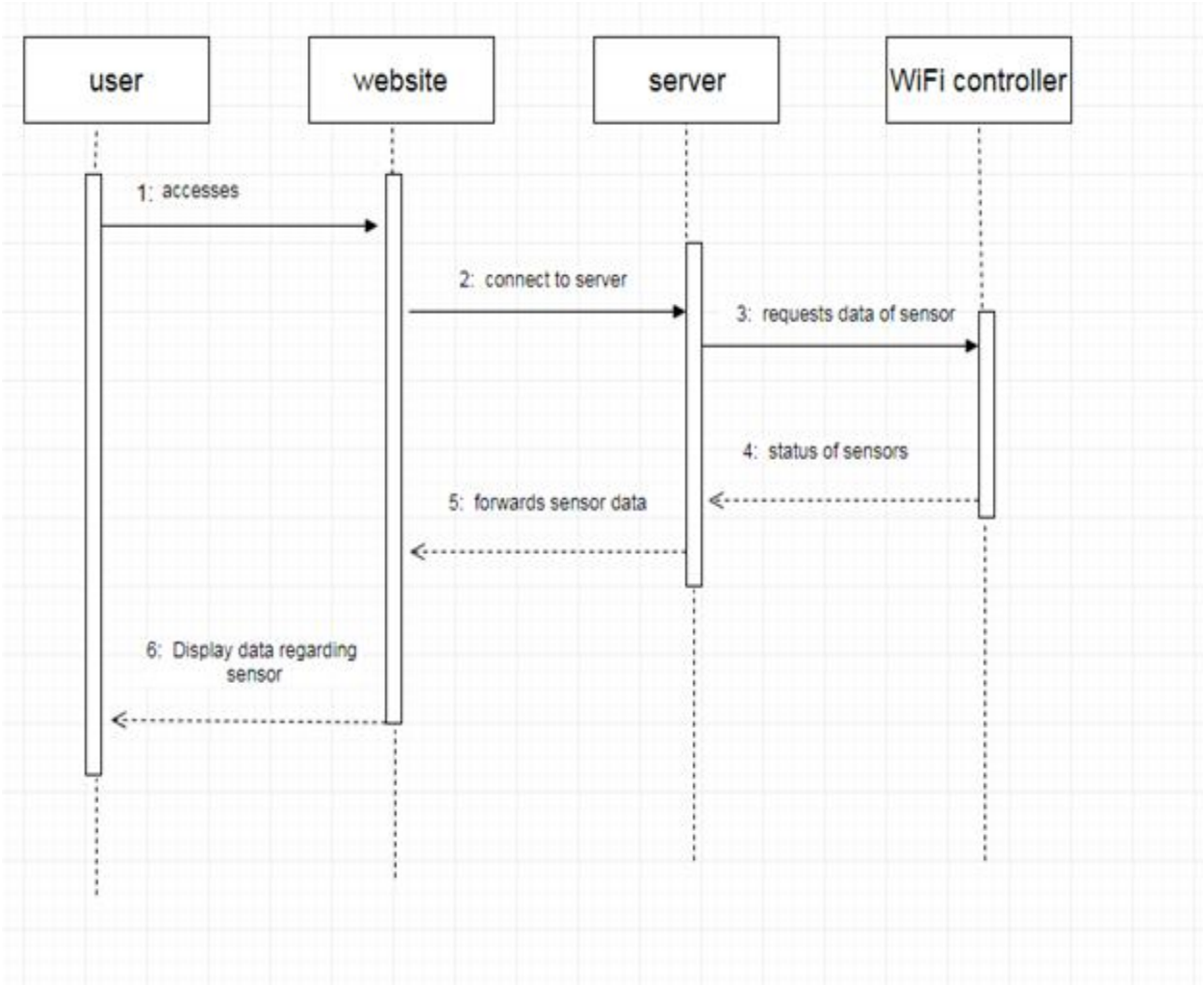

Figure 5.2 Sequence Diagram for Raspberry Pi Based Home Automation.

5.3 Use Case Diagram

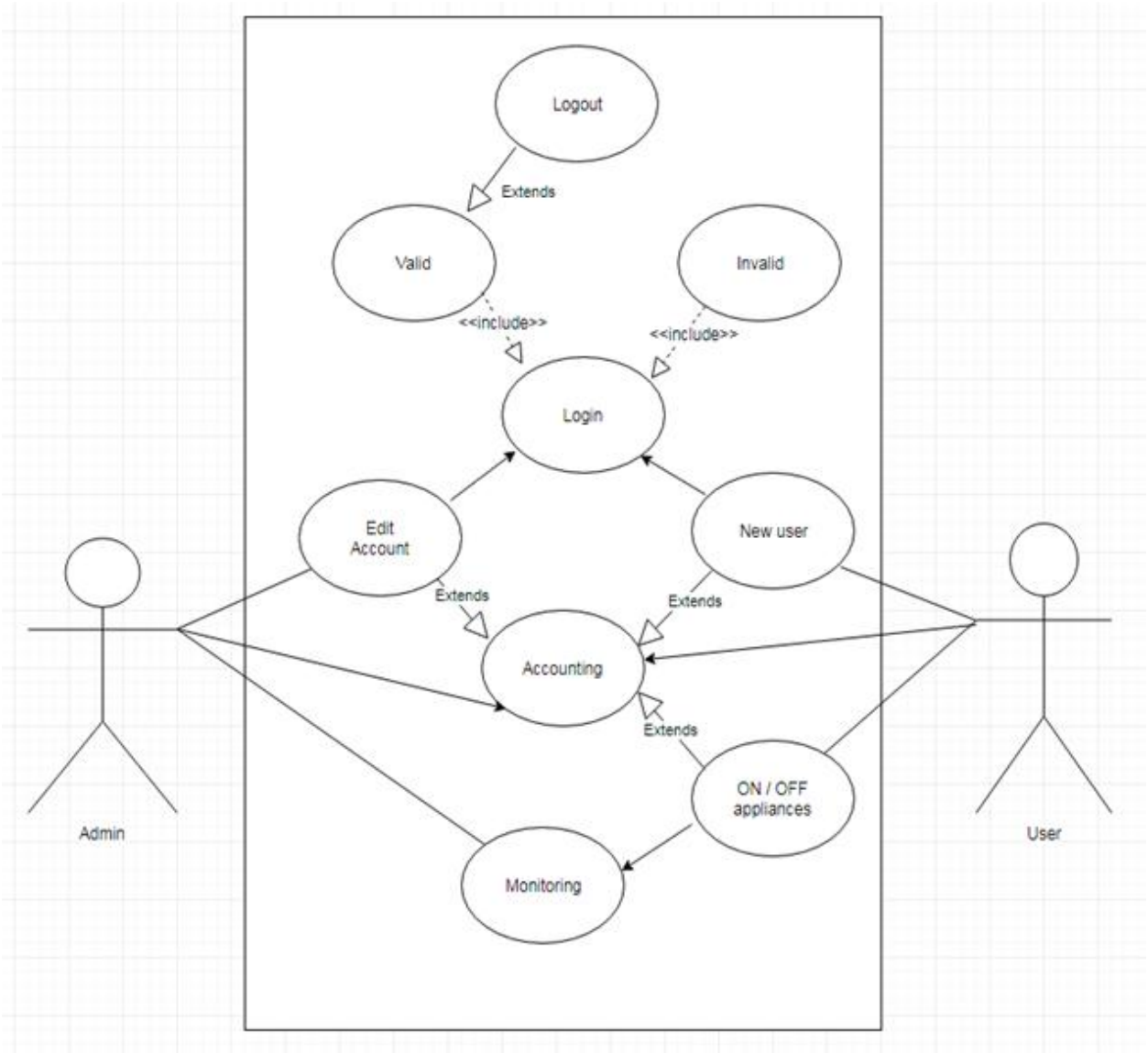

Figure 5.3 Use Case Diagram for Raspberry Pi Based Home Automation.

5.4 Class Diagram

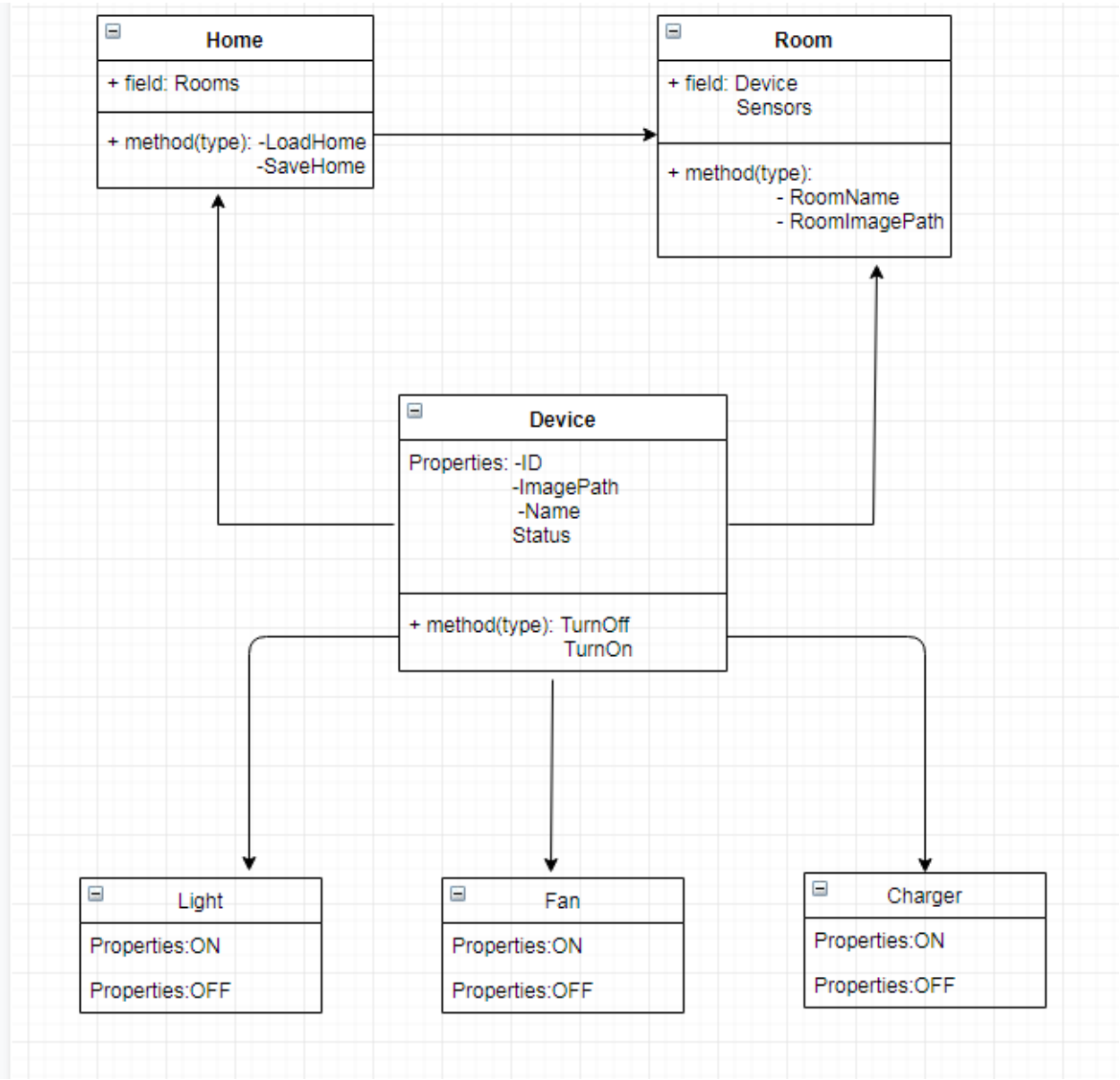

Figure 5.4 Class Diagram for Raspberry Pi Based Home Automation.

5.5 Circuit Design

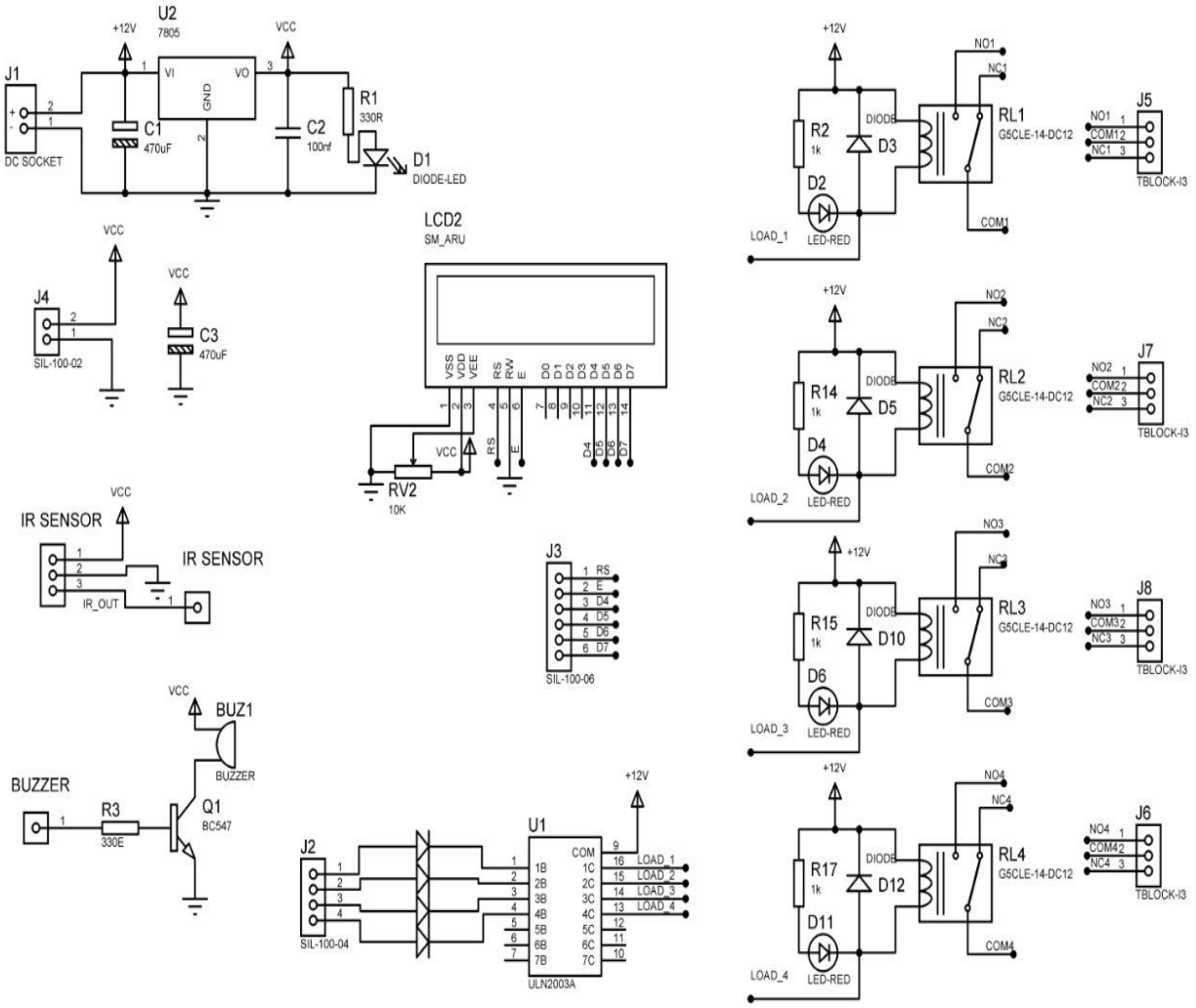

Fig 5.5 Circuit Diagram for Raspberry Pi Based Home Automation.

CHAPTER 6

IMPLEMENTATION RESULTS

Fig. 6.1 PCB Board consisting LCD Display, Replay Modules.

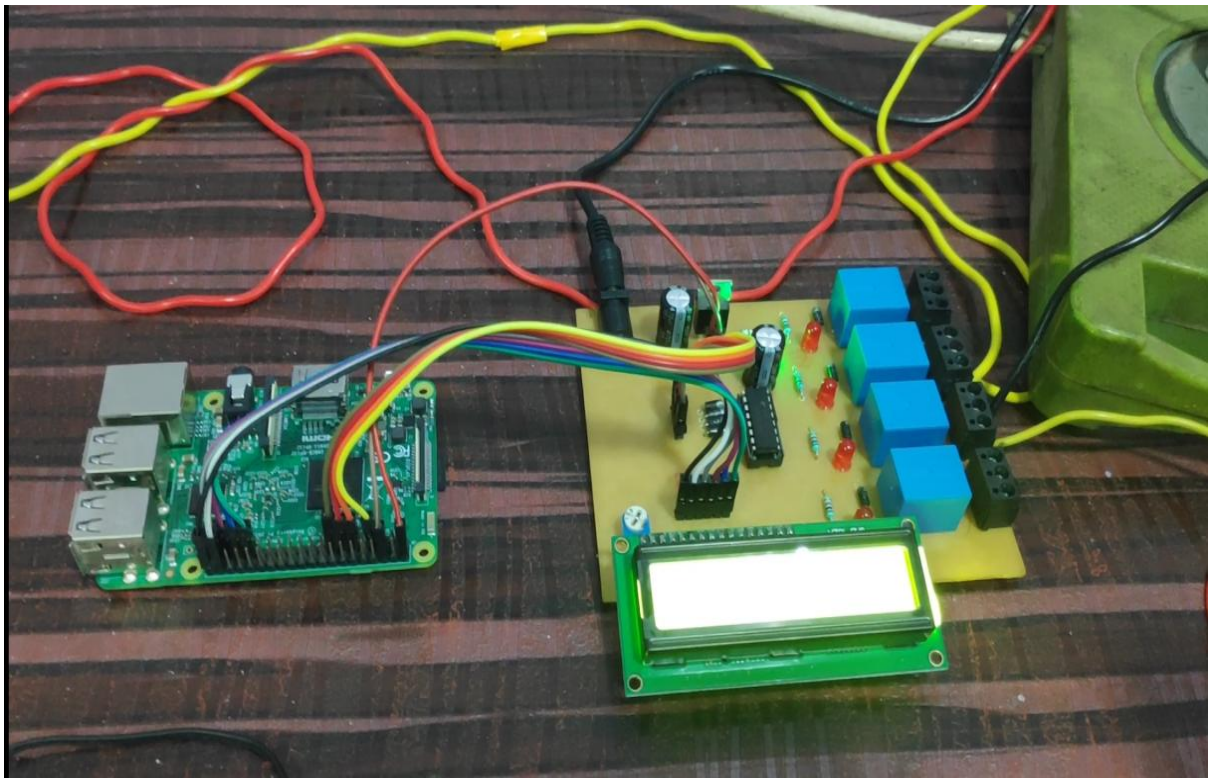

Fig. 6.2 Raspberry Pi3 connection with output PCB Board.

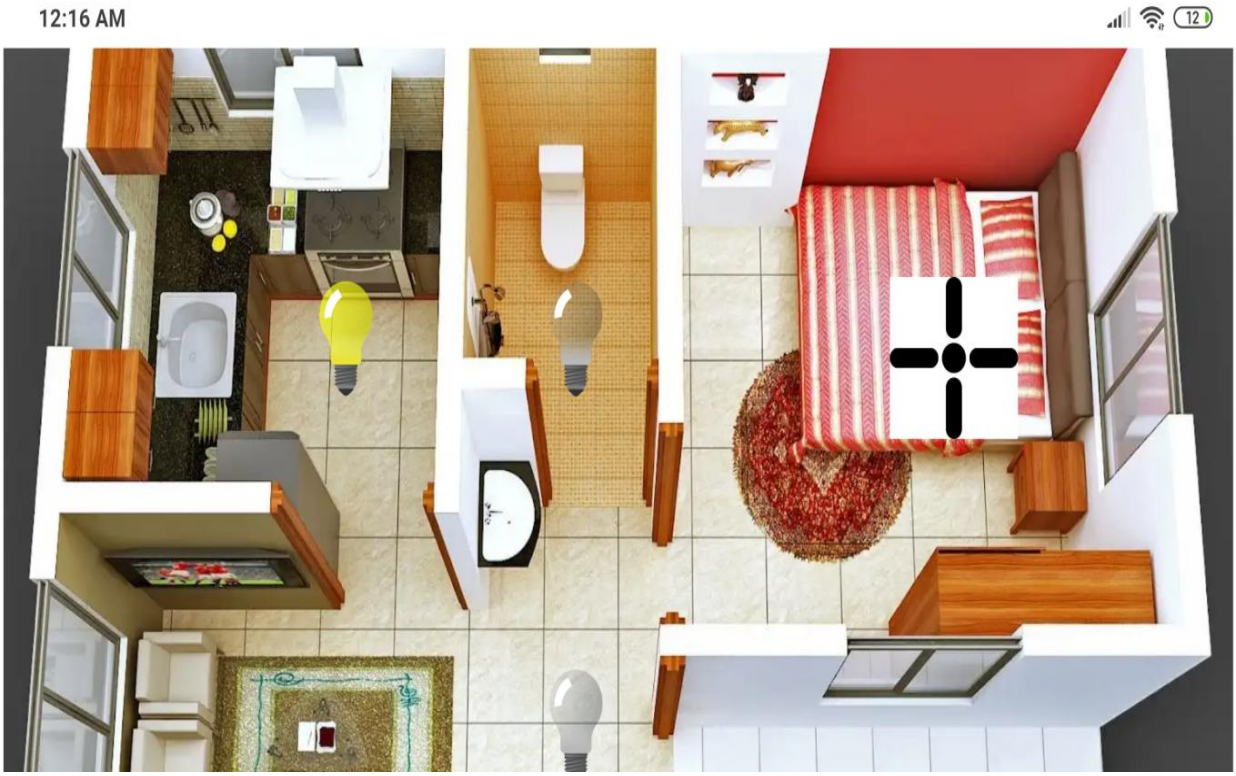

Fig. 6.3 User Interface to the website.

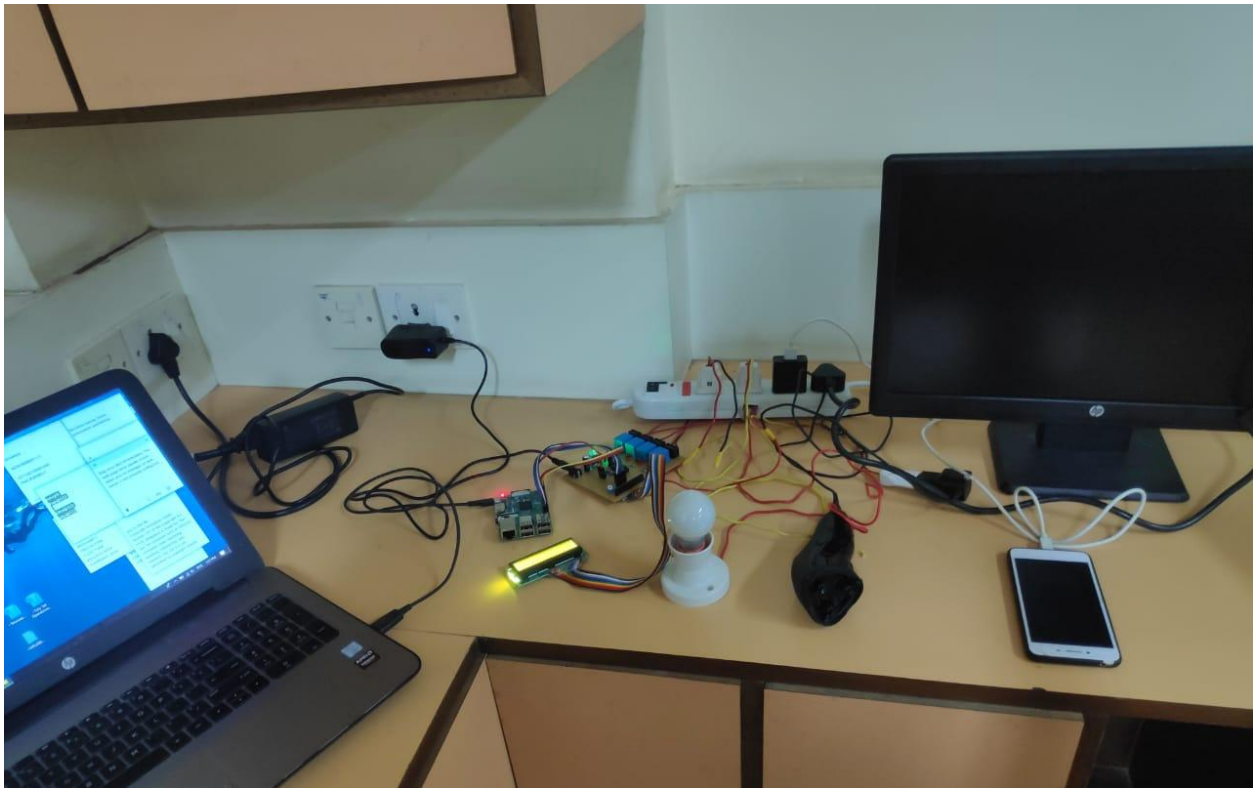

Fig. 6.4 Multiple Home Appliance being operated with a Smart System.

CHAPTER 7

TESTING

Testing

A test case, in software engineering, is a set of conditions of variables under which the testing process will determine whether an application, software system or every one of its features is working as it was originally established for it to do. The mechanism for determining whether a software program or system has passed or failed such a test is known as a test oracle. It may take many test cases to determine that a software program or system is considered saliently scrutinized to be released. The testing process is an efficient way of ensuring all the processes are working efficiently and whether or not the project is ready for the public. The testing process helps in Test cases are often referred to as test scripts, particularly when written - when they are usually collected into test suites.

Test case id_1

Priority: High

Objective: Test Case for internet connectivity.

Sr.No	Input	Expected Output	Actual Output	Results
1	No Internet Connection	Not Connected	Not Connected	Pass
2	Wifi module detected	Webpage displayed	Webpage should be displayed	Pass

Test case id_2

Priority: High

Objective: connectivity of wifi with Raspberry pi module

Sr.No	Input	Expected Output	Actual Output	Results
1	Switch the webpage	Opens webpage Desktop	Site display	Pass
2	switch the buttons(on-off)	Components turning on-off.	Light bulb turning on	Pass

CHAPTER 8

RESULT AND ANALYSIS

RESULT AND ANALYSIS

8.1: Result

Existing system is time consuming process which requires more efforts. Our proposed system is overcomes all the drawbacks of existing system. As a result of proposed system it is able to allow us to access multiple home electrical appliances at a go. Also it should be able to allow multiple user of a particular family to access their home appliances.

8.2: Analysis

On analysis of the project we had interpretations regarding the ease of bridging the interface between User and the electric appliances, provision of minimum efforts to access the devices by far have satisfied most of the test cases and the requirements. It provided the first opportunity to see what we have actually achieved and at this point, the use of individual separate appliances button/switch on website has prominently contributed to achieve the easy usage with less time and efforts.

CHAPTER 9

CONCLUSION AND FUTURE SCOPE

CONCLUSION AND FUTURE SCOPE

9.1 Conclusion:

Every technology has good aspect as well as bad aspect the important thing is ,how we are using it.

Our project presents a mobile controlled and user-friendly approach to the available home automation system.

This system can easily be implemented because of its

Wireless communication standards.

Home Automation is undeniably a resource which can make a home environment automated. People can control their electrical devices via these Home Automation Devices and set up controlling actions through Mobile.

In future this product may have high potential for marketing.

9.2 Future Scope :

Hence, this application can have a long life and several advancement can be done for further development like:

1. We can add more security towards overall module.

2. For detecting intruder we can also add IR sensor or biometric system in the security module.

4. Now, web application has to provide with usage time and name of the user so we can also have record of device running for how long.

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Rishi Gupta _____

Netra Phatak _____

Narendra Rawal _____

Karan Mamaniya _____

Date: