



Faculty of Electrical and Electronic Engineering Technology



**DESIGN OF AN ANDROID-BASED DOMESTIC ELECTRICAL
APPLIANCE CONTROLLER**

AHMAD BIN MOHD AZMI

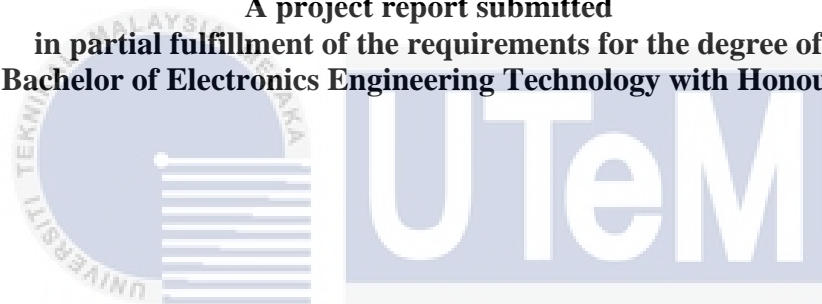
Bachelor of Electrical Engineering Technology with Honours

2021

**DESIGN OF AN ANDROID-BASED DOMESTIC ELECTRICAL APPLIANCE
CONTROLLER**

AHMAD BIN MOHD AZMI

**A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology with Honours**



اونيورسيتي تيكنيكل مليسيا ملاك
Faculty of Electrical and Electronic Engineering Technology
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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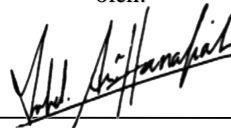
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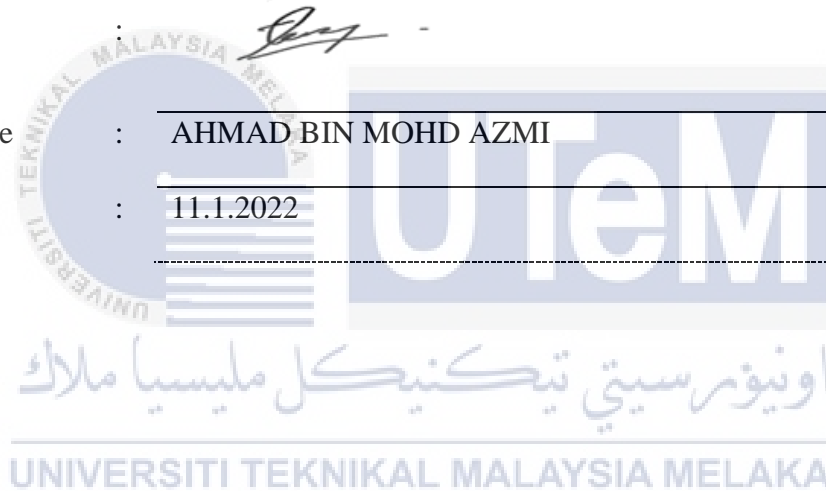
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DEDICATION

To my cherished parents, Thank you very much for all of your help. I am grateful to you for your support and for giving me the strength to persevere during the duration of my project's completion.

Thank you for your advice, wisdom, and support, Profesor Madya Mohd Ariff Bin Mat Hanafiah. Your comments and patience offer me the courage I need to finish my Bachelor's Degree Project (BDP).

Thank you for all of your assistance and foresight, my friends.



ABSTRACT

Technology development has become wide and the world is moving forward. Advances in technologies significantly enhance economic growth. A lot of home electrical appliances have been created during the revolution of technology in this world. However, there are issues in conceptualizing the technology feature that suitable for the user. This project is designed and constructed a prototype for wireless home appliance control switch which implement Internet of Thing (IoT) that used to control and monitor the system. The Arduino will be connected with a Bluetooth module and Wi-Fi Module. Those modules will connect with smartphones during the work operation. Most technologies use IoT where sensors or objects interact with the internet. With this wireless control switch, the on or off operation of the electrical home appliances is easier and users will have better care of their home energy consumption by only using the mobile apps in smartphones to monitor them.

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ABSTRAK

Perkembangan teknologi telah menjadi luas dan menjadikan dunia semakin maju. Kemajuan teknologi meningkatkan pertumbuhan ekonomi dengan ketara. Banyak peralatan elektrik rumah telah dicipta semasa revolusi teknologi di dunia kini. Walau bagaimanapun, terdapat masalah dalam konsep teknologi yang sesuai untuk pengguna. Oleh itu, projek ini adalah untuk merancang dan membina suis kawalan perkakas rumah tanpa wayar yang mengintegrasikan Internet of Thing (IoT) sebagai media kawalan dan pemantauan. Sistem automasi rumah ini yang akan menggunakan Arduino sebagai otak utama untuk projek ini. Arduino akan dihubungkan dengan modul Bluetooth dan Wi-Fi. Modul tersebut akan dihubungkan terus dengan telefon pintar semasa operasi dijalankan. Sebahagian besar teknologi menggunakan IoT di mana sensor atau objek dapat berinteraksi dengan internet. Dengan suis kawalan tanpa wayar ini, operasi menghidupkan atau mematikan perkakas elektrik adalah lebih mudah dan pengguna akan dapat menjaga penggunaan tenaga kediaman mereka dengan lebih baik dengan hanya menggunakan telefon bimbit.

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TABLE OF CONTENTS

	PAGE
DECLARATION	I
APPROVAL	II
DEDICATION	III
ABTRACT	IV
ABSTRAK	V
ACKNOWLEDGEMENT	VI
LIST OF TABLES	XII
LIST OF FIGURES	XIII
CHAPTER 1 INTRODUCTION	
1.1 Background	1
1.2 Problem Statement	3
1.3 Project Objective	3
1.4 Scope of Project	3
1.5 Thesis Outline	4
CHAPTER 2 LITERATURE REVIEW	
2.1 Introduction	5
2.2 Previous Related Work	5
2.2.1 Using AT89S52 as Microcontroller	5
2.2.2 Using PIC18F4550 as Microcontroller	6
2.2.3 Using ATmega328p as Microcontroller	7
2.2.4 Using LPC2148 as Microcontroller	8
2.2.5 Using Raspberry Pi as Microcontroller	9

2.2.6 Using ESP32 as Microcontroller	10
2.2.7 Using AT89C52 as Microcontroller	10
2.2.8 Using Arduino Mega 2560 as Microcontroller	11
2.2.6 Using Arduino as Microcontroller	11
2.3 Interface Between Microcontroller	12
2.3.2 Bluetooth	13
2.4 Monitoring system	13
2.5 Summary	13
CHAPTER 3 METHODOLOGY	
3.1 Introduction	14
3.2 Methodology	15
3.3 Project Flow Chart and Diagram	15
3.4 Software Development	17
3.4.1 Proteus	17
3.4.2 Arduino Programming Language	17
3.4.3 Blynk Application	18
3.5 Equipment Use in Hardware	19
3.5.1 Arduino Uno	19
3.5.2 HC-05 Bluetooth Module	20
3.5.3 4 Channel relay	21
3.5.4 AC Fan	22
3.5.5 L.E. D	23
3.5.6 SSO	23
3.6 Circuit Design	25
3.6.1 Simulation Design	25
3.6.2 Complete Circuit	26
3.6.2 Complete Circuit	27

CHAPTER 4 RESULTS

4.1 Introduction	31
4.2 Blynk Apps	32
4.3 Results	33
4.4 Discussion	37
4.5 Summary	37

CHAPTER 5 CONCLUSION

5.1 Introduction	38
5.2 Conclusion	38
5.3 Future Work	38

REFERENCES

39

APENDIX

40



LIST OF TABLES

TABLE	TITLE	PAGE
Table 1	Pin Connection to Arduino	23



LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 1.0	IoT Application in life	2
Figure 2.1	Bock Diagram of Home	6
Figure 2.2	System Functional Block Diagram	7
Figure 2.3	The working system	8
Figure 2.4	Block Diagram of LPC2148 system	9
Figure 2.5	Raspberry Pi System layout	10
Figure 2.6	Bluetooth Module Example	11
Figure 3.1	ProjectBDP1's Flowchart	15
Figure 3.2	Project BDP2's Flowchart	16
Figure 3.3	Proteus CAD Software	17
Figure 3.4	Arduino IDE Software	18
Figure 3.5	Blynk software	18
Figure 3.6	Diagram of Arduino	19
Figure 3.7	Arduino Uno Pin Out Diagram	19
Figure 3.8	HC-05 Bluetooth	20
Figure 3.9	HC-05 Pin Out	20
Figure 3.10	4 Channel 5V Relay	20
Figure 3.11	5V Relay Pin	20
Figure 3.12	AC Fan	23
Figure 3.13	LED Bulb	23
Figure 3.14	LED Lamp	24
Figure 3.15	SSO 13A	24
Figure 3.16	Circuit Design	25
Figure 3.17	Changes Circuit Component	26
Figure 3.18	Complete Circuit for Virtual Interaction	26
Figure 3.19	All L.E.D Turn OFF	27
Figure 3.20	Blue L.E.D Turn ON	28

Figure 3.21	Green L.E.D Turn ON	28
Figure 3.22	Yellow L.E.D Turn ON	29
Figure 3.23	All the L.E.D Turn ON	29
Figure 3.24	Only Green L.E.D Turn Off	30
Figure 4.1	Circuit Design	31
Figure 4.2	Blynk Apps	32
Figure 4.3	Lighting Active (Blynk Apps “ON”)	33
Figure 4.4	Lighting Not Active Not Active (Blynk Apps “OFF”)	34
Figure 4.5	AC Fan Active (Blynk Apps “ON”)	34
Figure 4.6	AC Fan Not Active (Blynk Apps “OFF”)	35
Figure 4.7	Android TV Box Active (Blynk Apps “ON”)	35
Figure 4.8	Android TV Box Not Active (Blynk Apps “OFF”)	36
Figure 4.9	Phone Charger Active (Blynk Apps “ON”)	36
Figure 4.10	Phone Charger Active (Blynk Apps “OFF”)	37

CHAPTER 1

INTRODUCTION

1.1 Background

Technology has evolved over time to create incredible tools and resources, placing valuable knowledge at our fingertips. It also allows for more efficient communication and collaboration, including while working from a distance. People can control by creating a smart system for the home appliance by using an Internet of Things (IoT) and installing mobile applications to switch on or off from certain places.

The Internet of Things (IoT) refers to the internet-based integration of computing every device that allow to transfer data with one another. The end user standard of living while also increasing productivity and sustainability in daily tasks [1]. IoT is a modern type of creation that uses a global network to connect with one another. Aside from that, companies have been paying close attention to IoT as a key technology for the future.

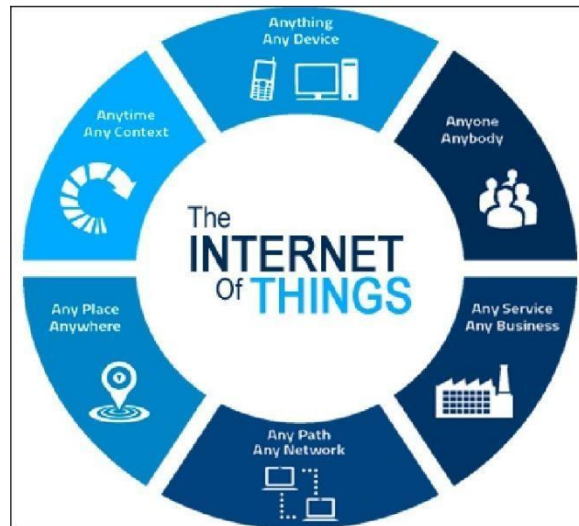


Figure 1.0 IoT Applications in life

Smart homes are gaining popularity and are quickly entering this emerging industry. However, these technologies are avoided by users because of expensive cost. Classical control systems control electrical appliances that perform functions like heating, lighting, and shading. However, rapid advancement of information modern technology systems in past few years, these main purposes are expected to be supplemented with extra features [2].

There are numerous commonly produced Home Automation Systems, which may be classified into two categories which locally owned and operated or fully automated systems. From the first section, customers can achieve home automation by a controller with stationary or wireless telecommunications. For example, Bluetooth, Zigbee, and GSM interface. Consumers in the second category can use their smart phones or desktop computers to effectively monitor their homes via Internet access. However, there are numerous difficulties to consider while developing such an automated system [3].

1.2 Problem Statement

The people need to use their strength to switch on or off with manual switch at their house. Besides, if the area of house is big, user need more time and energy to go to where the switches are placed. The major concern with the wireless controller is the standard for user to understand the operation.

1.3 Project Objective

The objective of this project is to create a systematic and effective wireless switch system to control on and off operations of electrical appliances at home. Specifically, the objectives are as follows:

- a) To design and construct a wireless home appliance controller.
- b) To develop an IoT to control the switch.
- c) To evaluate a device monitoring system using android application.

1.4 Scope of Project

The project is to construct the model of the wireless switch with a user-friendly design which can be easily used even by the disable and elderly people way faster and comfortable. This system was created by hardware (Prototype Circuit) and the software installed in the smartphones (Blynk Apps). The controller uses to control the operation turn on and turn off of the home appliances. The simulation of the circuit and the hardware will also be carried out for the success of the project.

1.5 Project Outline

The project is organized as below:

Chapter 1 is the introduction for this project which stating background of the project and the problem statement that occurs. Next, describing an obvious objective and the work scope of this project.

Chapter 2 is about literature review of the previous work of wireless switch, control system and also monitoring system for home appliances. The design and technique from previous work are shown. In order to investigate the improvements that had been achieved, the discussion is divide into some categories.

Chapter 3 is the discussion about the methodology of this project. The method and component are chosen from the references and studies. Then, the selection of the whole system is using to complete this project. Besides, flowchart of coding be explained as well.

Chapter 4 focused on shown the results of on and off operation from the circuit by the application that installed in smartphones which is Blynk Apps.

Chapter 5 is conclusion, recommendation, and future works for this project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The research and studies from various field are involved in this section. Besides, the information based on the previous work design of an android-based electrical appliance controller are taken to show the controller functions in an electrical appliance and the way of monitoring system would help to the controller.

2.2 Previous Related Work

The Home appliance is a technology that useful for people in the modern world. Over the year, there have been numerous developments in this machine technology. An electrical home appliance is necessary as to support people task in a house. However, the impact of technologies to people needs an improvement because human effort is the factor that must be reduced.

2.2.1 Using AT89S52 as Microcontroller

Develop a wireless remote control that allows elderly individuals with physical disabilities, handicapped persons, and disabled persons to manage their intended gadget without having to move around to the nearest control point. Instructions are delivered to the micro-controller AT89S52 through Bluetooth, and the application on the smartphone

controls the activity. The PIR Sensor also used to switch on and off light automatically when detecting the presence of a person within a certain range from the room [4].

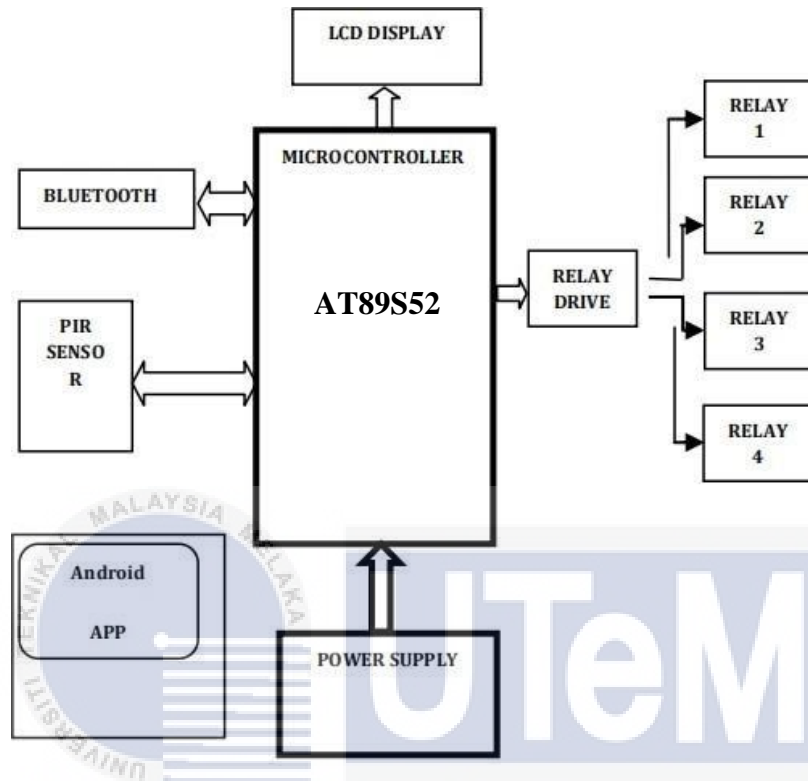


Figure 2.1 Block Diagram of Home Automation [4]

2.2.2 Using PIC18F4550 as Microcontroller

The project was proposed a wireless system to control the house lighting systems especially using an application installed on smart phone [5]. The monitoring system provided to the user that can do temperature reading and the energy consumed by the appliances in the house. This controller was developed using PIC 18F4550 microcontroller to handle processing for the system that connected by the Wi-Fi module.

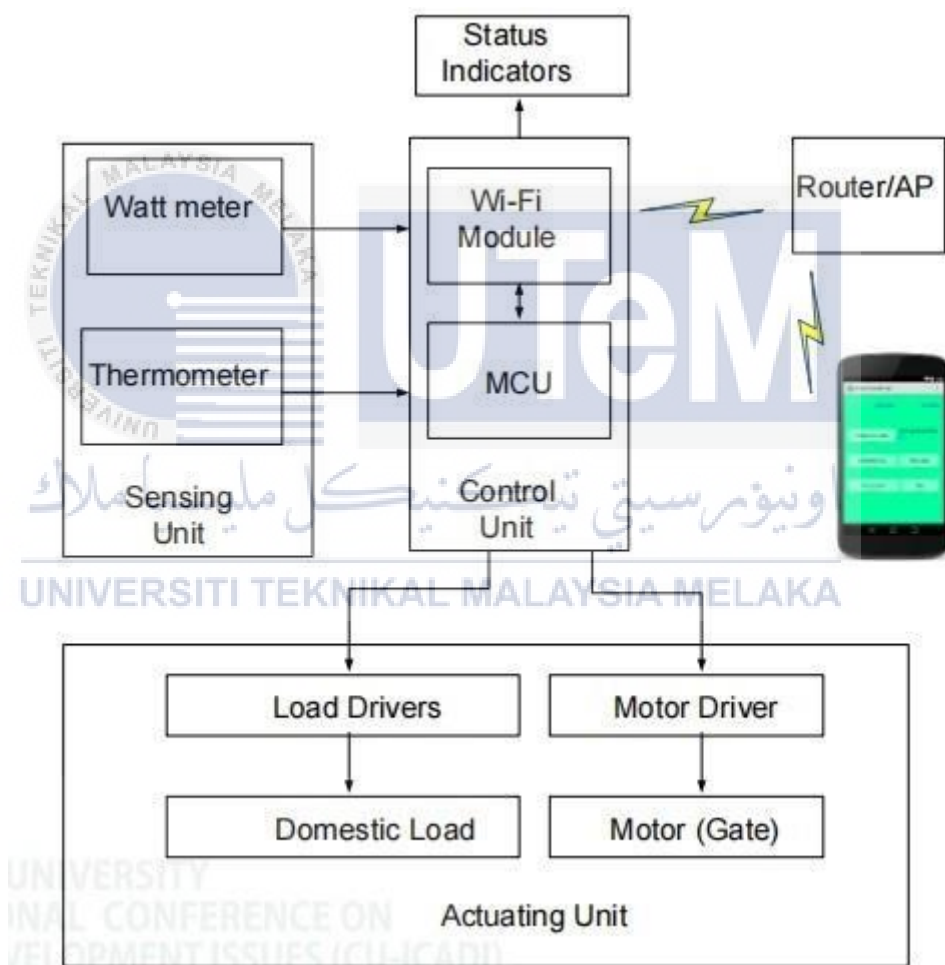


Figure 2.2 System Functional Block Diagram [5]

2.2.3 Using ATmega328p as Microcontroller

This project proposed a protected remote control by ATmega328p that operated through an android cell phone application [6]. Then, the system offers powerful protection to secure home appliances. The application is called Home Appliances Controlling Application (HACA). Wi-Fi or Bluetooth or Mobile Data is needed to connect with the app. The user can set the password and can change the password at any time in HACA. The monitor also provided the operation timing by home appliances.

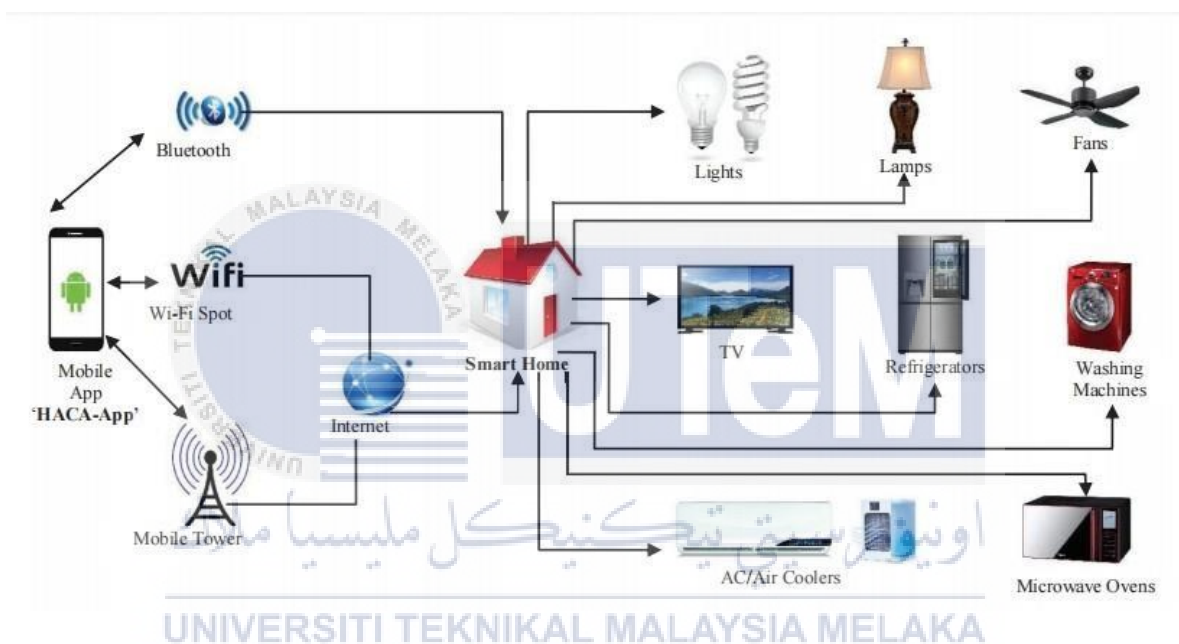


Figure 2.3 The working system concept [6]

2.2.4 Using LPC2148 as Microcontroller

The project have presented an automated way of managing household gadgets that might reduce the duties associated with the usual manner of switching them [7]. Bluetooth, the most well-known and affordable technology for short-range wireless networks, is utilized here to automate the system. The system is designed to for Android users to bring easier to every task by allowing them to manage one of many devices through the applications.

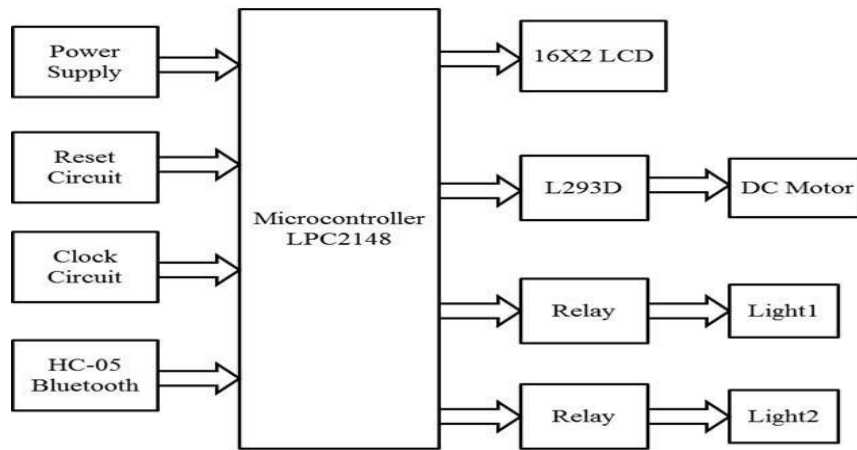


Figure 2.4 Block Diagram of LPC2148 system [7]

2.2.5 Using Raspberry Pi as Microcontroller

The project has created a wireless home security and control system AES encryption is used to ensure network security [8]. The privacy of the house is maintained by sending alerts to the user through the Internet in the situation of a trespasser, and it may sound an alarm if necessary. Home automation is used by installing appropriate sensors throughout the house. Raspberry pi is used as a server and controller. Raspberry pi has task of controlling electrical appliances at the house.

This project also proposed the home automation using Raspberry Pi. The control system, on the other hand, has two options, which are accessed from a web server or a smartphone app based on Android [9]. The http server establishes a method called Restful API as well as the ability to control Raspberry Pi GPIO an http request. Then, Android apps taking the services provided by Restful API to controlling GPIO of Raspberry Pi. Both the methods are need Restful API and included in the web interface for Android to give a suitable functionality.