CHAPTER I

INTRODUCTION

1.1 Background

Technological developments in a short period have progressed very rapidly, such as a technology which will recently be developed in various aspects of life, namely the Internet of Things, or also known as the abbreviation IoT, it is a concept that aims to expand the benefits of internet connectivity, continuously connected. As for capabilities such as data sharing, remote control, and so on, including objects in the real world. For example, foodstuffs, electronics, collectibles, any equipment, including living things connected to local and global networks through embedded sensors and are always active. Nurhakim et al (2015).

Internet of Things technology is created and developed by humans to facilitate every job and business in various aspects of life. One of them can be applied in everyday life, namely controlling household electrical equipment to turn off - on remotely using internet communication via an android smartphone.

To make this device, a wemos ESP 8266 device is needed as an intermediary tool to connect the device to the internet network to be connected to an android smartphone. Thus, the title **"Design of Internet of Things-Based Household Electrical Controller using a Microcontroller** was taken".

1.2 Problem Formulation

In the description above, it can be formulated a problem that will be discussed in this Final Project, namely:

1. How to apply the concept of the Internet of Things to Household Electrical Controller Device using a Microcontroller.
2. How android controls on/off household electrical appliances using an internet connection.

1.3 Problem Limitation

There are several limitations of the problem of this Final Project, among others:

1. The tool designed is in the form of a wemos ESP8266 microcontroller circuit that uses a relay
2. The microcontroller used is Wemos ESP 8266.
3. Display of interface and control using android.

1.4 Research Objectives & Research Benefits

1.4.1 Research Objectives

1. Designing a Household Electrical Equipment Controller Device using Wemos ESP 8266 is carried out remotely using an android smartphone with the internet.
2. Implementing the Internet of Things concept using Wemos ESP 8266 to connect the device to the internet, and implementing Arduino as its programming language.

1.4.2 Research Benefits

The benefit of this research is that it can apply the knowledge gained during education in lectures. By utilizing internet connectivity in the Internet of Things use concept, we may monitor and control household electrical appliances remotely using an android smartphone with an internet connection.

1.5 Systematics of Writing

To give a clear picture of the composition of the material discussed in this Final Project, the systematics are made as follows:

Chapter I contains an introduction that discussed the discussion formed the basis for making this final project, included the background of the problem, problem formulation, problem boundaries, research objectives, research benefits, and writing systematics. While Chapter II contains a literature review that discussed theories, findings, and research materials from various references, which were used as the basis for conducting the proposed research. The theoretical basis is directed to develop a framework of approaches or concepts applied in research. The methodology section for making a device that discussed the place and schedule of research, data collection methods, ongoing system analysis, and research design was shown in chapter III.

Chapter IV includes the results and discussion that discussed the results of making and testing household electrical equipment controller were using an

internet connection. And Chapter V contains conclusions (answers to the problem formulation as contained in Chapter I).

REFERENCES

APPENDIX

CHAPTER II

LITERATURE REVIEW

2.1 Literature Review

In the current era of globalization, the development of science and technology is very rapid, especially the development of the internet. Therefore, the world of education cannot be separated from the development of the internet, with the development of the internet of things, the internet is also commonly used for other purposes. Then it would emerge an idea to use the internet of things as a controller of household electrical appliances, namely the internet of things by using a microcontroller, where we could control household appliances remotely,

so that it will be easier and help to save electricity. To realize the above idea, the Wemos ESP8266 microcontroller is used.

The reason for using the ESP8266 microcontroller is because the price is relatively cheap and easy to use. The task of the microcontroller here is to read data from the Thingspeak.com server, which was connected via an access point that could communicate via the internet. Data can be read by turning on or off the equipment as desired by the user. The response time of the android application command to turn on or off lights or other electrical appliances ranged from 10 to 20 seconds. This is affected by the network used.

2.2 Internet of Things

According to the McKinsy Global Institute analysis, the internet of things is a technology that allowed us to connect machines, equipment, and other physical objects with networked sensors to acquire data and to manage their own performance, thus enabling devices to collaborate and even acting based on new information that was obtained independently. A publication on the Internet of things in 2020 explains that the internet of things is a situation when objects have an identity, can operate intelligently, and can communicate with social, environmental, and users. Thus, we can conclude that the internet of things allowed us to make a connection between machines and machines, so that these machines could interact and work independently according to the data was obtained and processed separately. The goal is to make humans interact with objects more easily, so that objects can also communicate with other entities. The

Internet of things is a technological revolution that represented the future of computing and communications, and its development depended on dynamic technical innovation in a number of critical areas, from wireless and sensors to nanotechnology. Chandra (2014:10)

2.2.1. Technology on the Internet of Things

The internet of things is originally inspired by members of the RFID community, who referred to the possibility of finding information about a tagged object by browsing internet addresses or database entries that matched with RFID close communication technology or a particular Near Field. Madakam, Ramaswamy, Tripathi (2015: 169)

1. Radio Frequency Identification (RFID).

   Radio Frequency Identification (RFID) is a system that transmitted the identity of objects or people wirelessly were using radio waves in the form of a serial number. The first use of RFID devices occurred in World War 2 in Brittan and was used to identify friend or enemy in 1948. Then RFID technology was established at the Auto-ID Center at MIT in 1999. RFID technology plays a vital role in IoT to solve objects identification problems around us in a cost-effective manner. Madakam, Ramaswamy, Tripathi (2015: 169)

2. Internet Protocol (IP)

   The Internet Protocol (IP) is the primary network protocol, which was used on the Internet, developed in the 1970s. IP is the principal communication protocol in the Internet protocol suite for conveying datagrams across network boundaries. There are two versions of Internet Protocol (IP) currently in use:

IPv4 and IPv6. Each version defines the IP address differently. Due to its prevalence, the generic term of IP address usually still refers to addresses are defined by IPv4. There are five classes of IP ranges available in IPv4: Class A, Class B, Class C, Class D and Class E, while only A, B, and C are commonly used. The actual protocol provides 4.3 billion IPv4 addresses while IPv6 will significantly increase availability to 85,000 trillion addresses. IPv6 is a 21st century Internet Protocol. It supports around 2128 addresses. Madakam, Ramaswamy, Tripathi (2015: 170)

3. Wireless Fidelity (Wi-Fi)

Wireless Fidelity (Wi-Fi) is a networking technology that allowed computers and other devices to communicate over a wireless network. Vic Hayes is named the father of Wireless Fidelity. Wi-Fi was invented in 1991 by NCR Corporation in Nieuwege Netherlands. The wireless product is first brought to the market under the name WaveLAN with a speed of 1 Mbps to 2 Mbps. Today, there is an almost pervasive Wi-Fi that presented high-speed Wireless Local Area Network (WLAN) connectivity to millions of offices, homes, and public locations such as hotels, cafes, and airports. Madakam, Ramaswamy, Tripathi (2015: 170)

4. Bluetooth

Bluetooth wireless technology is an inexpensive short range radio technology that eliminates the needs for cabling between devices such as notebook PCs, cell phones, cameras and printers with an effective range of 10 to 100 meters.

Bluetooth generally communicates at less than 1 Mbps. Madakam, Ramaswamy, Tripathi (2015: 170).

5. ZigBee

ZigBee is one of the protocols is developed to enhance the features of wireless sensor networks. ZigBee technology is created by the ZigBee Alliance which was founded in 2001. The characteristics of ZigBee are low cost, low data rate, relatively short transmission range, scalability, reliability, flexible protocol design. It is a low-power wireless network protocol based on the IEEE 802.15.4 standard. ZigBee has a range of about 100 Meters and a bandwidth of 250 kbps. The its topologies are star, cluster tree and mesh. It is very widely used in home automation, digital agriculture, industrial control and medical monitoring. Madakam, Ramaswamy, Tripathi (2015 :171)

2.3 Household electrical appliances

In everyday life, electricity has an important role to support various activities of human life. Different electrical appliances, requires electrical energy to operate or in other words, electrical applies will be able to be operated if electrical energy is available as a driving source. Almost all activities of household life, can be fulfilled because of electrical appliances, for example: for lighting, cooling water, making ice cubes, preserving food, vegetables, ironing clothes, washing clothes, cooking, baking, pumping water, drying hair, cooking, cooling or heating the room, mopping, vacuuming, massaging and many other activities that were supported by electrical

equipment. Not only that, psychological needs can also be supported and fulfilled by the presence of electrical appliances, for example: listening to music, via radio tape, compact disk, watching movies and music on television or VCD, obtaining various information through television or the internet, business transactions via the internet and so on. etc. The above devices are commonly called household electrical appliances. You must be familiar with electrical appliances are installed in your home such as switches, sockets, plugs, fuses and others. Let's learn more about the functions and uses of these household electrical appliances:

You need to know that there are considerations that might be considered in the ability of the electric power to be used, which must be adjusted to the amount of electrical power available. The more electrical power available, the more electrical appliances can be used. The electrical appliances must also be used proportionally, for example:

- The use of television must be adjusted between the size of the room and the size of the television, so that it can be viewed safely and comfortably as needed.
- The use and setting of the air conditioner temperature must be set as needed so that it is not wasted (no waste or unnecessary things).
- Uses power tools correctly and adequately according to their functions, for example: do not put freshly boiled water into the refrigerator, put too many clothes in the machine, put too many contents in the fridge, and so on.

- Uses power tools only when needed.

For safety and convenience, make sure that the electrical device to be used is in good condition and is not damaged, for example: there is a chipped cable, please check whether or not the iron/steel section contains electric current, and so on. For specific tools, for example: irons, hair dryers, blenders, rice cookers, electric stoves, ovens, microwaves and the like, when not in use, they should be unplugged from the socket. This is to avoid the possibility of the device is being used to play with children. If leaving the house empty for a long time, do not use electrical appliances, except for specific lighting.

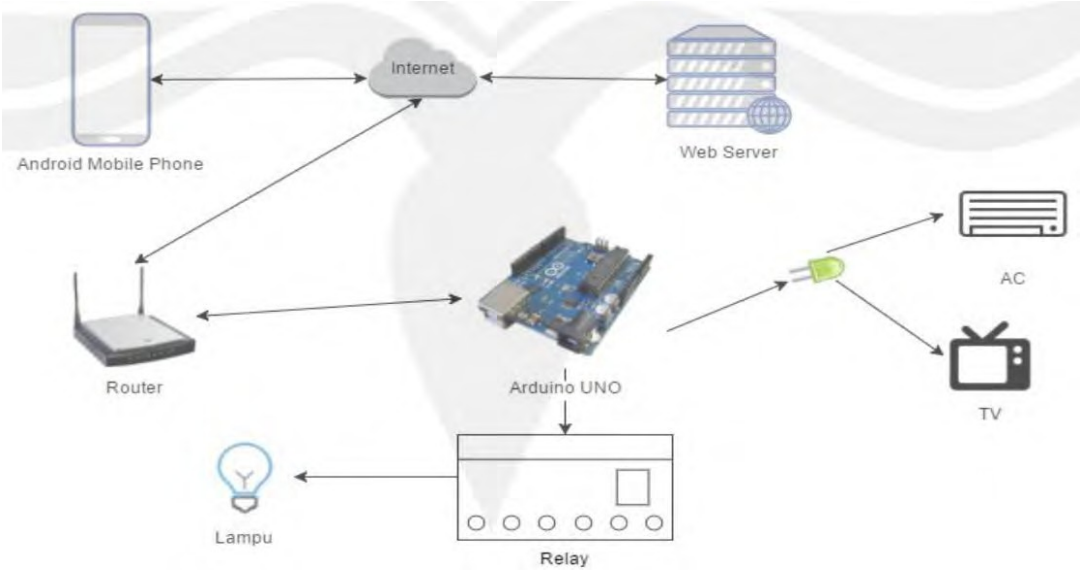

Figure 2.1 Household appliances example

Control System

The system is a combination of several components that work together to achieve a goal to be completed. The meaning of the controller itself is to command or regulate, so it can be concluded that the Control System is a

collection of components, tools or hardware that functions to control, command, or regulate the state of a system to achieve a goal.

2.4 Components to complete the use system for controlling household electrical appliances

In the manufacture of controller device those are required are as follows:

2.4.1 Microcontroller Wemos ESP8266 D1

The Microcontroller Wemos is the microcontroller developed under the ESP 8266 microcontroller module as shown in Figure 2.3. The Wemos microcontroller is created as a solution for the high cost of other microcontroller-based wireless systems. By using the Wemos microcontroller, the costs incurred to build a microcontroller-based WiFi system are very cheap, only one-tenth of the cost incurred when building a WiFi system using the microcontroller Arduino Uno and WiFi Shield. Yuliza, Hasan (2016: 188)

Figure 2.3 Wemos ESP8266
Source: Yuliza, Hasan (2016: 188)

1. How the microcontroller works

Microcontroller is a digital electronic device that owned input and output as well as program control that could be written and erased in a special way, thus, the way the microcontroller actually works is to read and write data.

2. **Microcontroller components**

- CPU (central processing unit)
- MEMORY (RAM, ROM, EEPROM)
- TIMER / COUNTER
- PRIVATE INPUT AND OUTPUT
- INTERUPT
- ADDITIONAL COMPONENTS

2.4.2 Bluetooth

Bluetooth technology is a short-range communication technology that was created to replace the cables were connecting electronic devices while maintaining a high level of security. The main features of Bluetooth technology are durability, low power and low cost. This technology ensures that the device could recognize and interacted with other devices, which used Bluetooth technology.

Bluetooth is a wireless technology that could provide data and voice communication services with a limited range. Bluetooth is a wireless (wireless) communication technology that operated in the 2.4 GHz unlicensed ISM (Industrial, Scientific and Medical) frequency band using a frequency hopping transceiver, which capable of providing voice and data communication services in real time between Bluetooth host-host with limited range of services.

Figure 2.4 Physical Form of Bluetooth Module HC-05
(Source: Ratna Dewi, Ramiati; 2011: 48)

The Bluetooth system consists of a radio transceiver, baseband link Management and Control, Baseband (processor core, SRAM, UART, PCM USB Interface), flash and voice code. a link manager. The baseband link controller connects the radio hardware to the baseband processing and physical protocol layers. The link manager performs high-level protocol activities such as link setup, authentication and configuration that could be seen in Figure 2.4

2.4.3 IDE Arduino Program

For programming the Arduino board, we need the built-in IDE (Integrated Development Environment) application from Arduino. This application is useful for creating, opening, and editing Arduino's source code. Sketch is a source code that contained logic and algorithms would be uploaded to an IC microcontroller (arduino).

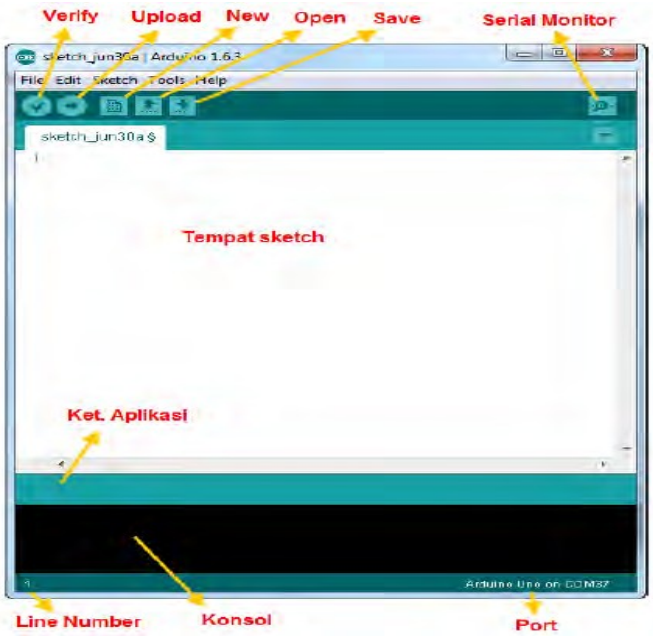

Figure 2.5 Arduino IDE Program
Source from: introduction to electronics and instrumentation (2014)

1. Verify

   In previous versions it is known as compile. Before the application is uploaded to the Arduino board, make it a habit to verify first the sketch was made. If there is an error in the illustration, an error will appear later. The verify or compile process changes the sketch to binary code to be uploaded to the microcontroller.

2. Upload

   This button is used to upload the sketch to the Arduino board. Even if we don't click the verify button, then the illustration will be compiled, then uploaded directly to the board. Unlike the verify button, which only functioned to verify the source code.

3. New Sketch

Open a window and create a new sketch.

4. Open Sketch

Open a sketch that has been made. Illustrations are created with the Arduino IDE will be saved with .ino file extension

5. Save Sketch

Saves the sketch, but it is not followed by the compile.

6. Serial Monitor

Opening the interface for serial communication, we will discuss further in the next section.

7. Application Description

Messages are made by the application will appear here, for example "Compiling" and "Done Uploading" when we compiled and uploaded the sketch to the Arduino board.

8. Console

Messages that the application works on and messages about the sketch will appear in this section. For example, when the compile application or when there is an error in the illustration that we make, then error and line information would be informed in this section.

9. Sketch Line

This section will show the current cursor line position in the sketch.

10. Port Information

This section informs the port used by the Arduino board.

11. Baud Rate

Baud rate is the number of times per second of signal within changes in analogue communication data. For example, a thousand baud rate means that it could change a thousand times per second. Baud rate also refers to the state of the connection, for example, voltage, frequency or phase level. In straightforward terms, the baud rate is the data speed is sent. Baud rate is associated with modems, digital television, telephones and other technical devices. A higher baud rate is preferred because it sends a faster transmission.

Baud rate indicates how fast data was sent via serial communication. Baud rate is usually given in bits-per-second (bps), although for special cases (e.g., for parallel communication), the bps value can be different from the baud rate. Our current assumption is that we focus on serial communication, where each clock represented a one-bit state transition. If this is met, the baud rate will be equal to the bit-per-second (bps) value. This bit per second means that how many bits of data could be transferred per second. If we invert this bps value, then we can get an idea of how long it takes to send 1 bit. The baud rate can be set by using the provided speed standards, including 1,200, 2,400, 4,800, 9600, 19,200, 38,400, 57,600, and 115,200 bps. One of the most commonly used speeds is 9,600 bps. This is a value where the speed of communication was not a critical thing to consider. For example, if we want to know the value of the temperature sensor. Obtaining temperature data from a sensor does not require a communication speed, which is too fast. To reduce errors, use the standard 9600 bps speed. The higher the baud rate, the higher the transfer speed. However, because communication involves electrical signals and data

synchronization processes are very susceptible to errors and noise, then it is recommended for not exceeding the speed of 115,200 bps for communication on the Arduino.

2.4.4 Basic 4 Android

Basic 4 android is widely recognized as the fastest, simple, and most powerful application development device are available on android. About tens of thousands of enthusiastic developers use it. Basic 4 Android runs on PCs with Windows 2000 and Windows above, including Windows 8 with 32-bit and 64-bit systems that support as shown in Figure 2.6 below.

Figure 2.6 Basic4Android Software Application Version 2.5
(Source: Wyken Seagrave, 2013: 12)

A. Installing and running

Basic 4 android requires Net Framework 3.5 if it doesn't exist on your computer machine then it will be prompted to download and install it. When you

create a new Android Basic 4 application, a sample project is already loaded, allowing you to run this simple application without any additional code. The code should have followed. if your code is different, you can copy or edit your code in order to be similar.

B. Running the application

Now you can compile your application (convert it into java) and run it on your device. There are several ways to do this. Let's start by simple way.

1. Compile and run

In the toolbar of the IDE on your pc, first make sure that debug (legacy) is selected in the compile options (dropdown list) then select [project > compile & run] or type Alt + l. basic 4 android is a rapid debugger feature, but for using it, you must install the java JDK.

2. Remote compilation

The trial version of basic 4 android includes a facility called remote compilation. It works by compiling your code over the web using your android basic 4 server, which means that you could collect your application without installing the java JDK or android SDK.

However, remote compiling has a limitation to the size of the code in collecting. If you receive an error message saying that the limit was reached, you could install the java JDK and android SDK and compile.

3. Approve the app on your device

What is meant above, when you run an application, you are required to agree to it.

C. Designing Applications

1. Fulfilling wants and needs

The success of any product must meet the specifications of what the client wants and needs. Before you start designing your app, it's wise to think about these questions and talk to potential customers who understood what they need and wanted. You should also look at other similar apps on the market and identify where there are gaps, evaluated their strengths and weaknesses and decided how your app would improve.

2. Evolving environment

One of the main problems about creating android apps is that the environment was changing rapidly. The new version of the android API comes with the usual base. Introducing new features, while many devices still have older versions. You have to decide whether you wanted to use the new features or designed your app for one of the older versions. Android 2.x is a pretty secure base from which to start if you want your app to be compatible with a wide range of devices.

3. Compatible

Android is backward compatible; you can use the latest API and it will still work on devices with previous versions. But your app will have problems if its users try to use new features that weren't available in the old API.

4. Play store compatibility check

To ensure compatibility, play store checks the user's device version and will not allow downloading of apps are built with incompatible APIs.

5. Discovering the API of the current device

How to deal with this situation? You can use at least an up-to-date SDK and then use the SDK version to find the API level of the user's device. You can then use the features according to the type of device.

6. Playing safe

If you want to be safe, you need to decide to use the old API. This prevents compilation if you try to add new features. You should tell which basic 4 android of the API base version that you wanted to use according to the criteria in “android.jar”.

7. The android screen

The screen display on which your app runs will vary depending not only on the size of the device, but the version of android. The part of the screen around your app will usually be in the status bar at the top of the screen and for android 4.x, a navigation bar at the bottom. (Wyken Seagrave, 2013).

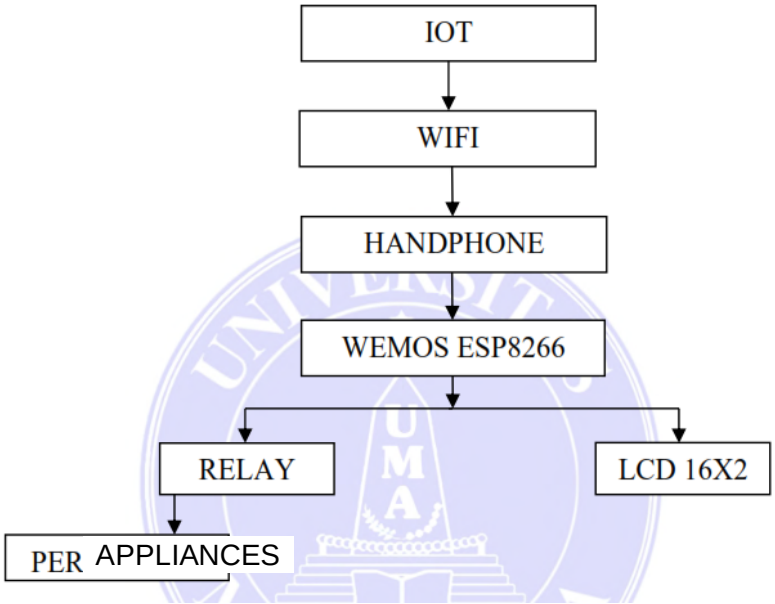

Figure 2.5 Block Diagram

2.5 Block Diagram

As for the hardware design uses a block diagram of the designed as shown in Figure 2.4 below

1. IOT (internet of thing) functions to send data to the Thing speak server and the microcontroller reads the data sent by the Thing speak.
2. Wifi which serves as a medium of communication between the microcontroller and the internet hotspot connection.
3. Mobile as a media tool and the implementation of the program is made.
4. Wemos esp8266 serves as the control center of the circuit work system that used to control the overall circuit from input to all outputs were used in the design of internet of things-based household electrical appliance controller using a microcontroller.
5. Relay serves to turn on or turn off the lights of connected electrical

equipment.

6. LCD serves to display data in the form of text and numbers which are then processed by the circuit.

CHAPTER III

RESEARCH METHODOLOGY

3.1 Research Place and Schedule

The place of research conducted by the author is at the University of Medan Area. The time needed by the author to carry out research and work on the thesis is 4 months. (Table 3.1)

Table 3.1 Schedule for making controller device

No	DESCRIPTION	MONTHS																													
		Nov-17				Dec-17				Jan-18				Feb-18				Mar-18				Apr-18				May-18				Jun-18			
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
1	Title Submission																																
2	Consultation																																
3	Proposal Seminar																																
4	Study of literature																																
5	Guidance																																
6	Results Seminar																																
7	Hearing																																
8	Graduation																																

3.2 Data Collection Method

Research plan or design in a narrow sense is defined as a process of collecting and analysing research data. In a broad meaning, it serves as a research design which included the process of planning and implementing research.

The preparation steps in the making of Internet of Things-Based Household Electrical Appliances Controller using a Microcontroller are as follows:

1. Literature Study

   The author assesses the references obtained from several scientific works such as thesis journals and from books.

2. Literature Study

   The library method, namely collecting data and information by reading references, e-books, websites, documents which include researches have been conducted, books, articles and journals related to the object of research.

3. Consultation

   It is conducted by consulting with the supervisor to solve the problems encountered during the making of software and hardware.

4. Testing Tool

   This is done by conducting experiments, testing modules and integrating these modules with programs to control the system so that it became one unified whole and obtained maximum possible results.

3.3 Research Equipment and Materials

The materials and tools used in this study are as follows:

3.3.1 Research Materials

The materials used for the making of the Menu Introduction Robot using an Android-based Arduino are as follows:

1. Wemos D1
2. Relay Module
3. Light Bulb
4. Stop Contact
5. Adapter
6. Tin.
7. Jumper Cable.
8. Pole PCB 0.5 and 1 inch.
9. Plywood Board

3.3.2 Equipment

The supporting equipment used to make Internet of Things-Based Household Electrical Appliances Controller using this Microcontroller are:

1. Multi-meter as measuring and testing components that refer to the amount of resistance, current, and voltage.
2. Drills are used to make holes in PCBs and plywood boards.
3. Solder to melt the tin.
4. Attractor solder as a lead suction tool.
5. Wood drill with 3 mm and 6 mm diameter bits.
6. Ruler for measuring PCB and plywood boards.

7. Pliers are used to cut or peel off cables or cut component legs.
8. Cutter knife to cut PCB plates and plywood boards according to size.

3.4 Current System Analysis

This chapter discusses the working principle of the circuit that is arranged to realize the device system, namely Wemos D1, a 4-channel relay module and a lamp circuit that functions to regulate light on or off and electrical appliances.
The device system is made and designed according to the block diagram below. The discussion focuses on the design of tools that were made based on the author's thoughts referring to reference sources related to the device.

3.4.1 Block Diagram System

The hardware design uses a block diagram of the designed system as shown in Figure 3.1 below.

Figure 3.1 Device System Block Diagram

The explanation and function of each block is as follows:

1. Wemos D1 functions as the control centre of the circuit work system that used to control the whole circuit from sensor input to all outputs was used in the Design of Internet of Things-Based Household Electrical Appliances Controller using a Microcontroller.
2. ESP 8266 Wi-Fi module which functions as a communication medium between the microcontroller and the internet hotspot connection.
3. Relay module, serves to turn on or turn off the lights and the connected electrical appliances.

3.5 System Design

3.5.1 Mechanical Design of Device

In the mechanical design of the device, using a plywood board to put the components are used such as Wemos D1 ESP8266, Relay Modules, Lights and Sockets. The entire circuits used is installed using iron spacers to make it neater and the circuit does not directly intersect with the plywood board used.

3.5.2 Device Hardware Design

In the process of making hardware design for Internet of Things-Based Household Electrical Appliances Controller using this Microcontroller, Wemos D1 ESP 8266 is used as the main control system. In order to communicate with an Android Smartphone, an access point in the form of a hotspot that has an internet connection is required. To control the lights and electrical equipment are used, an application using an Android smartphone was made.

3.5.2.1 Design for Minimum System I/O Wemos D1 ESP8266

The controller used in the designed Internet of Things-Based Household Electrical Appliance Controller System using a Microcontroller, namely Wemos ESP 8266, which was an Arduino Uno clone board equipped with an ESP8266 Wi-Fi module. This board has 11 digital input/output pins, an analogue input pin (3.2 Volt maximum input), a micro-USB connection, a power jack with 9-24 Volt input. The cross section of this board is as shown in Figure 3.2

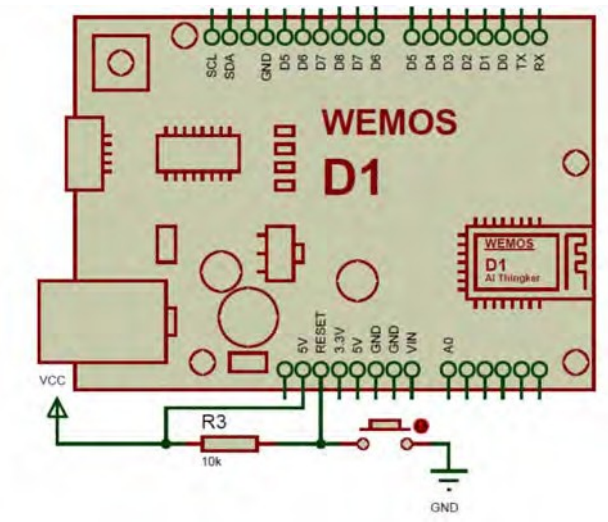

Figure 3.2 Wemos ESP 8266 circuit

The specifications of the Wemos ESP 8266 are shown in table 3.2 below:

Table 3.2 Wemos ESP 8266. Specifications

Parameter	Nilai
Operating Voltage	3.3 V
Digital I/O Pins	11
Analog Input Pins	1(Max Input 3.2V)
Clock Speed	80MHz/160MHz
Flash	4M b*ytes*
Length	68.6 mm
Width	53.4 mm
Weight	25 g

3.5.2.2 Power Supply Circuit

This circuit serves to supply voltage to the entire existing circuit. The circuit made consists of one output, which is 5 volts from the input voltage ranging from 9 volts to 12 volts DC. This 5-volt output is used to supply voltage to all circuits. The power supply circuit is shown in Figure 3.3:

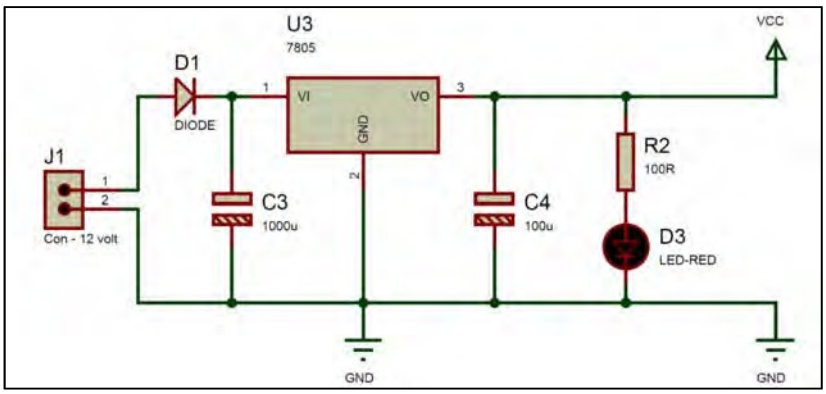

Figure 3.3 Schematic of the Power Supply Circuit

The supply of voltage comes from an adapter or you can also use a large battery whose voltage ranges from 9 volts DC to 12 volts DC. Then the voltage will be levelled by a 470 µF capacitor. A 5-volt voltage regulator (7805) is used so that the output resulted remaining 5 volts even though there is a change in the input voltage. The LED is only an indicator when the circuit is turned on.

3.5.2.3 Design of Relay Module Circuit

Relay is a component used to connect or disconnect a circuit. The principle works like a switch, but the relay is controlled by applying an input

voltage to the coil. In this device, the relay module is used to control electrical equipment, can turn it off and on. As Figure 3.4 follows:

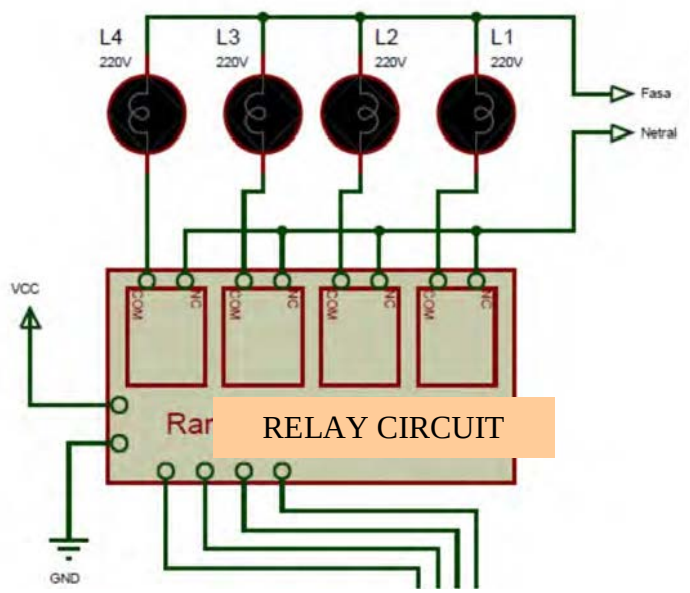

Figure 3.4. Relay Module Circuit

3.5.2.4 Overall Circuit

The circuit as a whole is a combination of the circuits of each block that have been discussed previously. As the control centre of the Wemos D1 ESP 8266, which processed input data and provided a response to the output. The overall circuit is as shown in Figure 3.5.

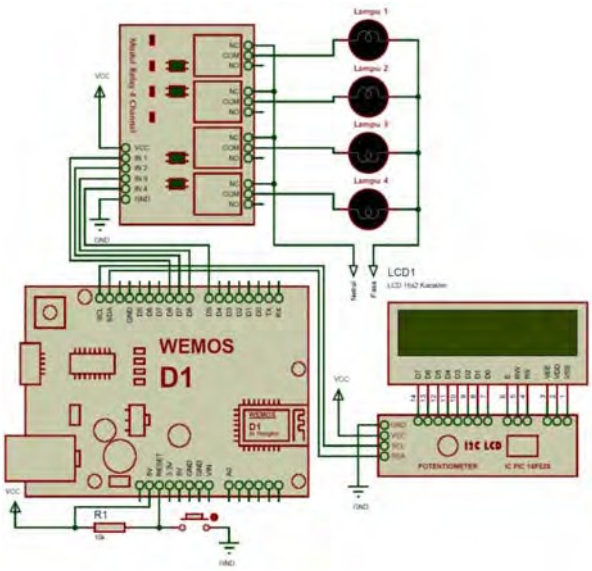

Figure 3.5 Device Overall Circuit

3.5.3 Software Design

Software design is important, for translating data sent from the Android Smartphone to Arduino which was used as a command to turn on and off lights, fans or other electrical appliances. In this study, the software used in the making of Internet of Things-Based Household Electrical Appliances Controller using a Microcontroller includes:

1. Proteus 8.1

   This software is used to draw circuit schematics.

2. Arduino IDE 1.6.5

   This software is used for writing programs.

3. Basic4Android

   This software application is used to create an android application for controlling the movement of the robot.

3.5.4 Flowchart

In making the program, the workflow for Internet of Things-Based Household Electrical Appliances Controller using a Microcontroller is firstly made, so that it is more organized in making programs and understanding the program. For more details, you can see the flowchart of device work as in Figure 3.6 below.

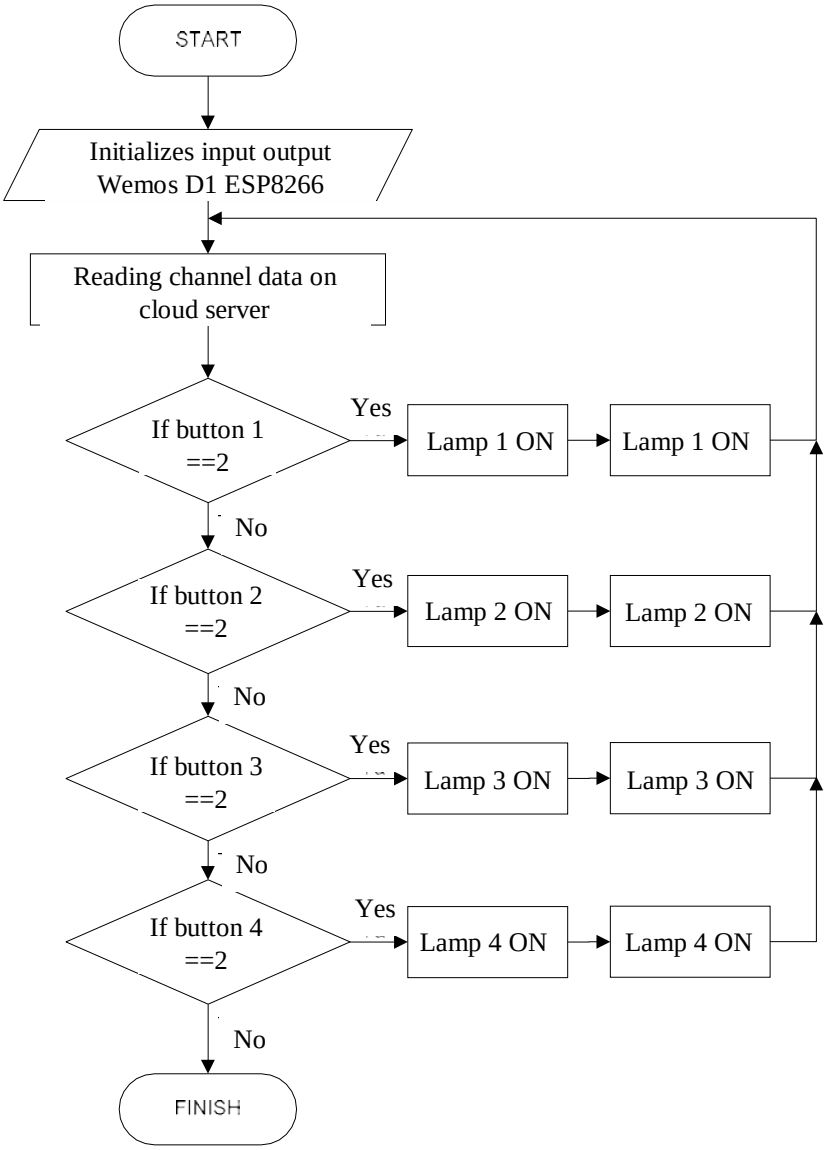

Figure 3.6 Flowchart of Device Work System

Wemos D1 ESP8266 . Input Output Initialization	Set the output of each relay connected to Wemos on pins D5, D6, D7, D8.
Read Channel Data On Cloud Server	The used Thingspeak.com cloudserver is using 4 channels that represented each relay. channel 1 for lamp relay 1 and so on.
If Button 1 == 2	That is checking the value of the button variable 1 which represents channel 1 on the thingspeak.com cloud server. if the value of variable = 2 then the relay is active and the light is ON.
If Button 1 != 2	This means that the variable value is not equal to 2, which can be 0 or 1 or other values, then the relay is not active and the light is OFF
Button on normal android click	With a single press of the button, this command is used to turn on the light or in other words assign a variable value to the button 1 = 2.
Button on android long click	By pressing the button long enough (approximately 3 seconds) this command is used to turn off the lights or in other words give the button variable value 1 = 1
Buttons 2 to 4	Explanation is the same as button 1.

CHAPTER V

CONCLUSIONS AND SUGGESTIONS

5.1 Conclusion

Based on the results of the research in chapter IV, several conclusions can be drawn including the following:

1. Design of Internet of Things-Based Household Electrical Appliance Controller using Wemos ESP8256 as the control centre of the devices were connected to the access point and as a connector between the device and the android application via internet media.
2. The Wemos ESP8266 microcontroller reads data from the Thingspeak.com server which was connected to an access point that could communicate via the internet. The data read is a command to turn on or turn off electrical appliances as desired by the user.
3. The response time of the Android Application command to turn on or off the lamps or other electrical appliances ranging from 10 seconds to 20 seconds. This is influenced by the condition of the internet network used.
4. The smoother or faster the internet network used by the User (android smartphone) and on the Wemos ESP8266 microcontrollers are used, the faster the response between the commands and the execution of the device are made.

5.2 Suggestions

Based on the results of the research and discussion as well as the conclusions that have been put forward, here are some suggestions that were expected to be input and consideration:

1. Using a fast and stable internet network to gain maximum results.
2. Able to be developed by adding sensors to monitor the status of electrical appliances.
3. The concept of internet of things (IoT) in the future can be used as a reference concept to facilitate the process of solving problems that often occur in Indonesia.

PROOFREADING

1.	a short period of time have progressed	:	a short period have progressed
2.	including living things which are all connected	:	including living things connected
3.	Internet of Things technology is basically created	:	Internet of Things technology is created
4.	internet network so that the device can be connected	:	internet network to be connected
5.	Wemos ESP 8266 which is carried	:	Wemos ESP 8266 is carried
6.	Wemos ESP 8266 so that the device can be connected to the internet,	:	Wemos ESP 8266 to connect the device to the internet
7.	findings, research materials were obtained from various references	:	findings, and research materials from various references
8.	research, then the methodology	:	research. The methodology
9.	concepts that would be applied	:	concepts applied
10.	thus enabling machines to collaborate	:	thus enabling devices to collaborate
11.	processed independently	:	processed separately
12.	with other objects	:	with other entities
13.	a number of important areas	:	a number of critical areas
14.	RFID technology plays an important role	:	RFID technology plays a vital role
15.	Various electrical appliances	:	Different electrical appliances
16.	properly and correctly	:	correctly and adequately
17.	put too many contents in the refrigerator, and so on	:	put too many contents in the fridge, and so on
18.	For certain tools	:	For specific tools
19.	do not use electrical devices,	:	do not use electrical appliances,
20.	except for certain lighting	:	except for specific lighting
21.	to be achieved	:	to be completed
22.	the sketch	:	the illustration
23.	In very simple terms		In straightforward terms
24.	that you could compile your application		that you could collect your application

25.	the code in compiling		the code in collecting