AUTOMATIC LIGHTING SYSTEM (ALS) FOR TAMAN TAS ECO SHOP BY USING ARDUINO UNO

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ABSTRACT

Nowadays, many sophisticated devices have been implemented in our lives in many kinds of places for a living. The importance of this kind of devices is to ease human daily life activities and improve the performance of products. Not being left behind, a technology for automatic lighting switching system is created and has been used in building likes home especially. It is used to control and monitor devices and hardware in house to deliver some functions. However, this kind of system for ECO Shop store is unusual found yet. A project named as Automatic Lighting System (ALS) is designed for Taman Tas ECO Shop store branch that selling daily things at price RM2.10 for each. Currently, Taman Tas ECO Shop branch is using manual lamp switching control which is the management assigns Supervisor Assistant only as person-in-charge to turn on or off the lamps every day. However, this store only has two person-in-charge so both of them cannot leave the store at the same time even in any situation. Therefore, it will be problem if that person-in-charge comes late before operating hours so the other workers cannot do their job earlier than operating hours. Besides that, extra electricity consumption also can happen if person-in-charge forgot to switch off lamps after operating hours. So, Taman Tas ECO Shop store branch need enhancement in controlling the lamps utilization before and after operating hours. By using ALS project, client can make the duty of lighting switching become easier and well-controlled. The project is divided into two main components which is a system that installed in computer to control Arduino Uno, and the second component is hardware includes Arduino Uno, sensor and other extra hardware. In conclusion, hope this project can bring benefits and fulfil client requirements.

ABSTRAK

Pada masa kini, banyak peranti canggih telah digunakan dalam kehidupan kita di pelbagai jenis tempat untuk kegunaan kehidupan seharian. Kepentingan jenis peranti ini adalah untuk memudahkan aktiviti kehidupan harian manusia dan meningkatkan prestasi produk. Tidak ketinggalan, satu teknologi iaitu sistem pensuisan lampu automatik dicipta dan telah digunakan di dalam bangunan terutamanya rumah. Ia digunakan untuk mengawal dan memantau peranti dan perkakasan di dalam rumah untuk melaksanakan beberapa fungsi. Walau bagaimanapun, jenis sistem seperti ini untuk kedai ECO Shop sukar ditemukan lagi. Projek yang dinamakan sebagai Sistem Lampu Automatik (ALS) direka untuk kedai ECO Shop cawangan Taman Tas yang menjual barang harian pada harga RM2.10 setiap satu. Pada masa ini, cawangan Taman Tas ECO Shop masih menggunakan kawalan pensuisan lampu secara manual dan pihak pengurusan memberi tugas kepada Penolong Penyelia sahaja sebagai orang yang bertanggungjawab untuk menghidupkan atau mematikan lampu setiap hari. Walau bagaimanapun, kedai ini hanya mempunyai dua orang Penolong Penyelia sahaja yang akan bertanggungjawab dan kedua-dua mereka tidak boleh meninggalkan kedai pada masa yang sama walau dalam apa jua keadaan. Oleh itu, ia akan menjadi masalah jika kedua-dua Penolong Penyelia datang lewat sebelum masa kedai beroperasi dan akan menyebabkan pekerja-pekerja lain tidak boleh melakukan kerja mereka lebih awal daripada waktu operasi. Selain itu, penggunaan elektrik berlebihan juga boleh berlaku jika Penolong Penyelia terlupa untuk mematikan suis lampu selepas waktu operasi. Jadi, kedai ECO Shop cawangan Taman Tas perlu peningkatan dalam mengawal penggunaan lampu sebelum dan selepas waktu kedai beroperasi. Dengan menggunakan projek ALS, pelanggan boleh melaksanakan tugas pensuisan lampu bertukar menjadi lebih mudah dan terkawal. Projek ini dibahagikan kepada dua komponen utama iaitu sistem yang dipasang dalam komputer untuk mengawal Arduino Uno, dan komponen yang kedua ialah perkakasan termasuk Arduino Uno, sensor dan perkakasan tambahan yang lain. Kesimpulannya, diharapkan projek ini boleh membawa manfaat serta memenuhi kehendak pelanggan.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS

ALS	Autommatic Lighting System
SDLC	System Development Life Cycle

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

As technology development arise from time to time, many manuals of human daily routine and workplace has been transformed into automatic system controlled including in computer system, embedded system, or mobile applications. Most of the people can accept this kind of revolution because that inventions are intelligent. It can work for human efficiently similar as people do or even more than that. That is why this kind of technology implementation can be seen everywhere around us.

Here are a few examples of automation application in technologies that make life gets easier such as Smart thermostats, Smart Refrigerator, Ralph Lauren Polotech Shirt, and even more. Some of the automation technologies are controlled by using smartphone and some are not. These technologies also will be enhanced it functionality from time to time according to the current requirements of human needs.

Home automation tends about the automatic and electronic control of house properties, activity, and appliances. Certain components of an automated home including the control of security locks on doors and gates, windows, lighting, surveillance cameras and HVAC systems (heating, ventilation and air conditioning). However, the same concept of control the lighting likes home automation known as automatic lighting system for shop is not implemented yet for Taman Tas ECO Shop. Therefore, this project proposed to implement an Automatic Lighting System (ALS) for ECO Shop by using Arduino Uno. ECO Shop is a store that have very encouraging responses from customers because it sells any everyday products at RM2.10 only. It also has many branches in Malaysia either single or double storey store and operate at

10am to 10pm every day. For this project, double storey ECO Shop at Taman Tas branch is selected to be one of the shop that suitable to implement this project system for their easy lighting control. The shop still uses old method of lighting switching every day. So, this kind of old method should be transformed into automatic lighting system to make switching handling for ECO Shop become easier and suitable with its business nature.

This project will apply the advancement of computing technology from manual light switching in the shop to automatic lamp controlled by using system with the support of Arduino Uno and PIR sensor. Arduino is a single-board microcontroller meant to make the application more accessible which are interactive objects and its surroundings. Then, PIR sensor is a device that detects motion. Utilization of Arduino Uno and PIR sensor help system to automate switch on or off the lamps based on motion of human in the place in certain situations. Automatic Lighting System (ALS) for ECO Shop by using Arduino Uno is proposed to solve the problems of ECO Shop from manual light switching into automatic light switching. So, ECO Shop will have easy control, safe and advanced lighting switching by using appropriate system and hardware.

1.2 PROBLEM STATEMENT

There are three problem statements that tends to the development of this project.

Firstly, for the time being the store is still using the manual switching for lamps which is person-in-charge (PIC) need to turn ON/OFF light manually. This is become not really good when there are two different locations of electrical wall switches in the shop which is located at store and in office area. Taman Tas ECO Shop branch is totally still does not apply any enhancement of technology of automatic light switching. Due to this situation, it tends to waste electric consumption for ECO when PIC forgot to switch off the lamps. That is why this automation lighting project can help Taman Tas ECO Shop branch do easy control switching and save electric consumption during close time especially if the worker forgot to turn off lights.

Secondly, there is only two Supervisor Assistant as person-in-charge to turn on and off the lamps every day in that ECO Shop branch. In any case, the two Supervisor Assistant or one of them must come to work every day because only them were given the responsibility and authority of light switching. Two of them must follow that rules and cannot excuse even have other matters. This situation will give difficulties for the two Supervisor Assistant if both of them suddenly they have urgent matter in that day. By using automation, the time to turn on and off has been set up in system so that Supervisor Assistant no need to worry about their absence if something personal urgent matter happen.

Third, the use of sensor in certain situations is needed. First situation is when ECO Shop should operate until 10pm, there is still have customers in the shop that are not finish buying things and still walking around. The workers also need to stay in the shop until all customers go out from the shop. So, here the PIR sensor in this project will play roles to detect the motion and relay will make lighting alive until the shop is totally closed and there is no motion in it. The second situation is when new stock arrived at three days which are Wednesday, Saturday, and Sunday, all workers must come earlier than usual they come at other day. The sensor will detect motion in the shop so it will give the output for lamps turn on automatically. This automatic lighting system that connecting with PIR sensor can help improved the functionality

of lighting when the lamps can turn on or off with help of sensor on certain situation that has been set up in the schedule.

1.3 OBJECTIVES

The objectives will be achieved in this project:

i. To study the current practice of switching in shop and convert it into automatic controlled system.

ii. To design and develop Automatic Lighting System (ALS) for ECO Shop by connecting to Arduino Uno and PIR sensor.

iii. To evaluate the effectiveness of Automatic Lighting System (ALS) by using Arduino Uno in ECO Shop.

1.4 SCOPES

There are three scopes used to do the project which are:

ii. Automatic Lighting System (ALS) is designed for Taman Tas ECO Shop branch that will be handled by Supervisor Assistant.

iii. Arduino Uno board and PIR sensor, detect the motion when human is in moving state.

iv. Automatic Lighting System using programming language of HTML, PHP, Javascript, and Arduino IDE to develop the project.

1.5 REPORT ORGANIZATION

This document consists of five (5) chapters. In the first chapter of introduction consists of introduction, problem statement, objective and scope of the system.

For Chapter Two, in this chapter the existing studies are examined. This chapter discuss about the methodologies and approaches that used in previous existing studies. The comparison existing studies can be used as the reference to build an automatic lighting system. Own suggestion for this system also proposed and supported with evidence in this chapter.

Methodology is about general approach that is discussed in Chapter Three. The discussion includes method that already used to design and implement the project. This chapter explains rationalization of method or approach used and the needed requirement of hardware and software.

In Chapter Four, it discusses about development and testing of that system. All the development process records of software and hardware are carried on in this process.

In Chapter Five, the content of conclusion incorporates in this report, it examines the summarization on the developed project includes future works and project constraints.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The light bulb was invented to enable people to be fully accessible at any point in their lives. With the light-bulb, people are able to see things better in gloomy or dark conditions. They also can see things better and can do something at night.

An incandescent light-bulb need to take enough electric current to make the metal inside the glass heat up hot enough to glow. For example, it glows brightly enough to make the light visible around in a place, but does not make the filament so hot that it can breaks down. Manually, people need to use installed switches on the wall to turn on or off the light-bulb as they want to. Yet, in Malaysia it still has wider utilization among citizens especially in home (Jefferson, 2012).

New enhancement is developed for light-bulb control. Automatic Lighting Systems (ALS) was introduced to simplify and enhance the lighting of a place. Replace the large banks of switches on walls with a system that can control every light in the place (Automated Lighting Control Solutions, n.d.).

Lighting control system also used to save energy from lighting system at maximum level. Lighting control systems are often referred to under the term Smart Lighting (Lighting control system, 2018).

2.2 SYSTEM

Besides code in Arduino IDE, this project will use GUI system of web-based development to enable administrator communicate with the hardware easily and efficiently. This Automatic Lighting System (ALS) will be controlled by web-based system to send instructions to Arduino. The purpose of this system is to ease the administrator control and set up the hardware involved in this project. For instance, GUI system will provide several options to set up time for bulb to light, choose which bulb to light, show lighting history if necessary, and other options.

2.3 ARDUINO OVERVIEW

Arduino is an open-source platform that can be used to build electronics projects. Arduino consists of a physical programmable circuit board and a software, or known as IDE (Integrated Development Environment) that runs on computer that used to write and upload programming code to the physical board (What is Arduino?, 2018).

There are many other microcontroller platforms available for physical computing. For instances are Parallax Basic Stamp, Netmedia's BX-24, Phidgets, MIT's Handyboard, and many others provide same functionality. All of the tools take the untidy details of microcontroller programming and make it in an easy-to-use package (What is Arduino?, 2018). Arduino also makes simpler the working process of microcontroller but it provides some benefits for students and teachers over other systems:

- Inexpensive - Arduino boards are inexpensive if compared to other microcontroller platforms. So, developer will not have problems to choose suitable Arduino board since it is not too costly (What is Arduino?, 2018).
- Cross-platform - The Arduino Software (IDE) be able to run on Windows, Macintosh OSX, and Linux operating systems(What is Arduino?, 2018).

- Simple, clear programming environment - The Arduino Software (IDE) is easy to use and understandable for beginners, besides is flexible for advanced users to take it benefits as well. For teachers, it is seemly based on the Processing programming environment, so students that learn to program in that environment will be comfortable and familiar with how the Arduino IDE usually works (What is Arduino?, 2018).

2.3.1 Difference Types of Arduino

1) Arduino Uno board

The board which is based on ATmega328 MCU that have some features of 14 digital input and output pins and 6 of them will be used as PWM outputs, 6 analog inputs, USB connection, power jack, a 16 MHz ceramic resonator, a reset button, and an ICSP header. The Uno is not used the FTDI USB-to-serial driver chip since it features the ATmega16U2(ATmega8U2 up to version R2) programmed as a USB-to-serial converter (Staff, 2015). Figure 2.1 below shows picture of Arduino Uno.

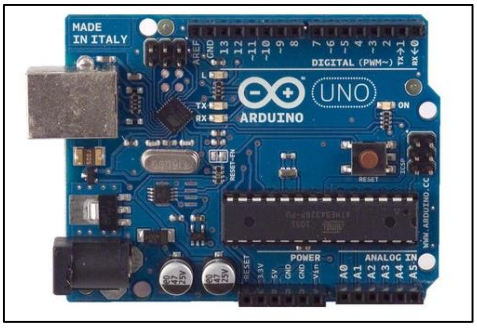


Figure 2.1 Arduino Uno Board

However, Revision 3 of the Uno can provide these new features:

- 1.0 pinout: added SDA and SCL pins that are near to the AREF pin and two other new pins placed near to the RESET pin, the IOREF that allow the shields to adapt to the voltage provided from the board. Note: The second is not a connected pin.

- Stronger RESET circuit.
- ATmega16U2 replace the 8U2.

2) Arduino Leonardo board

The Arduino Leonardo is built from the versatile ATmega32U4. This board can provide 20 digital input or output pins which 7 can be used as PWM outputs and 12 as analog inputs, a 16 MHz crystal oscillator, power jack, microUSB connection, a reset button and an ICSP header. The Leonardo consists all needed things to support the microcontroller. Just attach to a computer with a USB cable use an AC-to-DC adapter or battery to get started. Besides that, the ATmega32U4 also can provide built-in USB communication, removing the need for a secondary processor. So, this make it to act as a mouse and keyboard, in order to make it being known as a virtual (CDC) serial / COM port (Staff, 2015). Figure 2.2 below shows picture of Arduino Leonardo board.

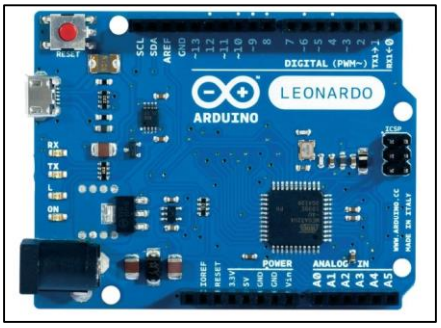


Figure 2.2 Arduino Leonardo board

3) Arduino Mega (2560) board

The Arduino Mega features an ATmega2560 at its heart. It is packed with 54 digital input or output pins which 15 can be used as PWM outputs, 16 analog inputs, 4 UARTs (hardware serial ports), USB connection, a 16 MHz crystal oscillator, a power jack, a reset button, and an ICSP header. Just connect it to a computer with a USB cable or power it with an AC-to-DC adapter or

battery to get started. The Mega is suitable with most shields designed for the Arduino Duemilanove or Diecimila (Staff, 2015). Figure 2.3 below shows picture of Arduino Mega board.

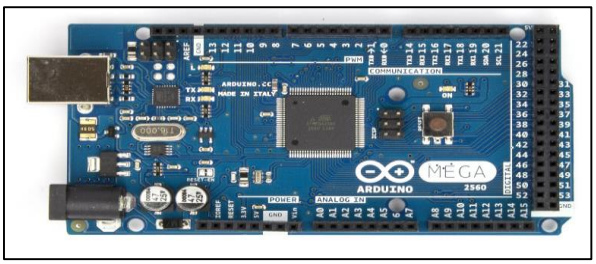


Figure 2.3 Arduino Mega (2560)

2.4 SENSOR OVERVIEW

The definition of sensor is a device that detects and react back to the type of input from the surrounded environment. The environment input would be pressure, motion, moisture, light, heat, or any one of a great number of other environmental phenomena. In order to support ALS functionality, a sensor is used to help bulb to light on or off based on certain situations.

2.4.1 Difference Types of Sensor

1) Omron's D6T (Thermal sensor)

Figure 2.4 Omron's D6T

Omron Electronics D6T Series MEMS Thermal Sensors as above in Figure 2.4 are super-sensitive infrared temperature sensors that make full use of Omron's proprietary MEMS sensing technology. Not same like pyroelectric human presence sensors that is only rely on motion detection, the D6T thermal sensor can detect the presence of humans when it detects body heat, and so that can be used to automatically switch off or switch on the unnecessary lighting, air conditioning, and many others when there is no people presence detected. Besides that, D6T sensor also be able to monitor the room temperature, so it can be used to continue maintains room temperature levels, quickly sense weird changes in temperature, so that can detecting factory line stoppages, or discover areas of overheating for early prevention of fire outbreaks (Omron Electronics D6T Series MEMS Thermal Sensors, n.d.).

Below is the features Omron's D6T (Thermal sensor):

- Achieves world's highest level of SNR.
- Accurate temperature measurements with little impact from outside.
- Superior noise immunity with a digital output.
- High-precision area temperature detection with low crosstalk field of view characteristics
- RoHS compliant.
- Compact size for space savings and embedded applications.
- Converts sensor signals to digital temperature output, allowing easy use of microcontroller.

2) AK9750 (Integrated temperature sensor)

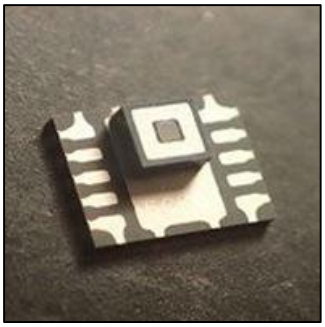


Figure 2.5 AK9750

Figure 2.5 shows a sensor named AK9750 which is an ultra-low power and compact infrared-ray (IR) sensor module. It integrates four quantum IR sensors and a signal processing IC. The four IR sensors' offset and gain variations are calibrated at shipment making system calibration not necessary by users. An integral analog-to-digital converter provides 16-bits data outputs. The AK9750 achieves human detection function easily because it employs a PIR (passive infrared ray) type infrared-ray sensor

and includes a field of view limiter as well as an optical filter in order to limit detection area. This device can detect human presence not only in motion but also not in motion because it converts an IR of human body to electrical signal directly.

The AK9750 employs an ultra-small quantum-type InSb photodiode based on AKM's Hall effect element process technology. The photodiode acts as an IR sensor element that can detect IR in high sensitivity and fast response situations. Since center points of four sensor covering areas are different with the field of view limiter, four IR sensor elements can detect space distribution of a heat source. The AK9750 has an operating voltage from 1.71 V to 3.63 V. It has an integrated temperature sensor that will detect from -10°C to 60°C all in a 10-pin SON package (AK9750 Human Detection IR Sensor Module, 2017).

Below is the features AK9750:

- Integrated 4-channnel IR sensor
- Integrated optical filter
- I^2C interface
- 16-bit digital output

3) PIR Sensor (Motion Detection)

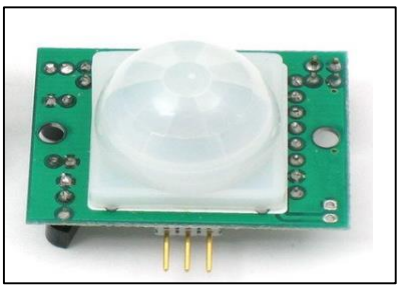


Figure 2.6 PIR Sensor

Picture in Figure 2.6 is a PIR sensor which is enable to detect motion, used to detect either human motion is in or out from the sensors range. They are small, cheap, low-power, and easy to utilize. So that, PIR sensor are usually found in appliances and gadgets used either in homes or in businesses. It is usually referred to as PIR, "Passive Infrared", "Pyroelectric", or "IR motion" sensors (Ada, 2018).

Below is the features PIR Sensor:

- Dual Element Sensor with Low Noise and High Sensitivity.
- Supply Voltage – 5V.
- Delay Time Adjustable.
- Standard TTL Output.

2.5 PROPOSED ARDUINO AND SENSOR

Below is the information of Arduino Uno specifications.

Table 1. Technical Descriptions of Arduino Uno

Microcontroller	ATmega328P
Operating Voltage	5V
Input Voltage (recommended)	7-12V
Input Voltage (limits)	6-20V
Digital I/O Pins	14 (of which 6 provide PWM output)
Analog Input Pins	6
DC Current per I/O Pin	40 mA
DC Current for 3.3V Pin	50mA
Flash Memory	32 KB of which 0.5 KB used by bootloader
SRAM	2 KB
EEPROM	1 KB
Clock Speed	16 MHz

Among three types of Arduino described in previous section, this project is suitable to use Arduino Uno because Arduino Uno is one of the most common Arduino boards available in market and it has some user-friendly features, including large 2.54mm pitched sockets for connecting to external devices, an onboard LED, inbuilt power handling (such as an extended DC power jack), and a large USB B connecter for connecting to a PC. Besides that, this is only a small project. For project concerns on cost, an Arduino Uno is a good option. Many sketches that can run on the Uno, which is allows the developer to assess Arduino and use it as a learning platform. There are many small projects before are built by using on Arduino Uno. Lastly,

Arduino Uno is open source. When developer is facing difficulties in development phase, they can refer online learning and source codes that can get on websites, books, and from learning courses.

For sensor election, this project will choose PIR sensor because of it has good sensitivity level in some distance. As described above in PIR sensor explanation that this sensor can detect motion of people so it is very suitable for Taman Tas ECO Shop store which is medium area size and the people in it must do moving. They are low cost and low power, rugged, and easy to connected with Arduino. Next, PIR sensor sensitivity range also can be adjusted from 3m to 7m based on size of the shop. Besides that, PIR sensor size is space saving design, well-suited when attached to Arduino Uno board.

2.6 EXISTING SYSTEM

The three existing systems and the comparison between these different systems will be discuss below. That three of existing system are Automatic Door System, Home Automation System Using Arduino, and Home Automation Mobile Apps.

2.6.1 Automatic Street Light System

Nowadays, human has become too busy, and is unable to find time even to switch the lights wherever not necessary. The present system of street lights will be switched on in the evening before the sun sets and they are switched off the next day morning after there is sufficient light on the roads. Inefficient lighting wastes significant financial resources every year, and poor lighting creates unsafe conditions. Energy efficient technologies and design mechanism can reduce cost of the street lighting drastically (Saad, 2013).

An automatic street light system is an automation of street light to light on and off during night which the road path invisible. In this project, there are two kinds of sensors are used which are light sensor and photoelectric sensor. The light sensor will detect darkness to activate the ON/OFF switch, so the streetlights will be ready to turn on and the photoelectric sensor will detect movement to activate the streetlights. LDR, which varies according to the amount of light falling on its surface, this gives an induction for whether it is a day-night time, the photoelectric sensors are placed on the side of the road, which can be controlled by microcontroller PIC16f877A. The photoelectric will be activated only on the night time. If any object crosses the photoelectric beam, a particular light will be automatically ON. By using the LDR we can operate the lights, for example, when the light is available, then it will be in the OFF state and when it is dark the light will be in ON state, it means LDR is inversely proportional to light. When the light falls on the LDR it sends the commands to the microcontroller that it should be in the OFF state then it switch OFF the light, the photoelectric sensor will be used to turn ON or OFF the light according to the presence or absent of the object. All these commands are sent to the controller then according to that the device operates. We use a relay to act as an ON/OFF switch (Saad, 2013). Figure 2.7 shows street light turn on when in the dark after detecting movement.

Figure 2.7 Example of street lighting during night

2.6.2 Home Automation System Using Arduino

A smart home is one of home automation system that is equipped with lighting, heating, and electronic devices that can be controlled in distances by smartphone or via the internet. This home automation system internet-based put focus to control electronic devices in home either user is outside or inside home. Home automation helps the individual ability to control things remotely or just around their home. In addition, a home appliance is a device or hardware that are created to perform it functionality, commonly they are an electrical device, such as a refrigerator, air-conditioner, television and other things for household use.

As WIFI shield can act as a Micro web server, Arduino can rid of the importance wired connections between the Arduino board and computer and that reduces expenses besides enables it to work as a standalone device. The Wi-Fi shield needs connection to the internet from a wireless router or wireless hotspot then this would act as the gateway for the Arduino to communicate with the internet (David, 2015). Figure 2.8 below shows an example Smart home Architecture system.

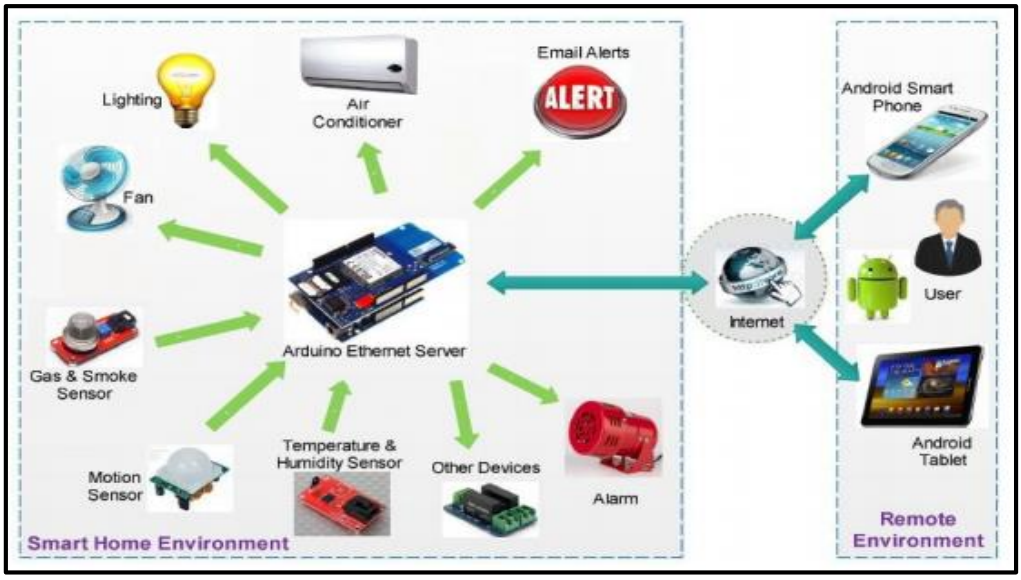


Figure 2.8 Smart home Architecture system

2.6.3 Home Automation Mobile Apps

Home automation mobile apps is an application to setting and monitor lights, fans, refrigerator, coffee maker, heater, television, air-conditioner, rooms temperature and surveillance camera in living room, bedroom 1, bedroom 2, and kitchen. Then, it will help the user to check whether that peripherals and devices are in what state either ON/OFF, check the temperature of every room spaces in house, and user also can check the camera visual in every rooms.

Figure 2.9 The initial interface of Home Automation mobile Apps

2.7 SUMMARY AND COMPARISON FEATURES FOR THREE EXISTING SYSTEM

The summary and comparison of three existing system are present in the table.

Table 2. Comparison between three existing systems

	Automatic Street Light System	**Home Automation System Using Arduino**	**Home Automation Mobile Apps**
Developer	Mustafa Saad	Nathan David, Abafor Chima, Aronu Ugochukwu, and Edoga Obinna	Teksun Inc
Sensor Used	Light sensor and Photoelectric sensor.	PIR sensor, Light sensor, Gas sensor, and Temperature sensor	PIR sensor, Light sensor, Gas sensor, and Temperature sensor
Remote Access	None	Android smart phone app or web application.	Android and iOS
Features	This system help light ON/OFF street light during night in order to reduce excessive electric consumption when there is no vehicle	Home automation gives an individual the ability to remotely or automatically control	The application make user can control Light LED strip and standard bulb, read & view home atmosphere such as temperature,

	pass through the road.	things around the home	pressure and humidity, can also control other widgets of all your rooms, and the last is customizable look and feel.

2.8 COMPARISON OF PROPOSED SYSTEM WITH THREE EXISTING SYSTEM

The proposed system named as Automatic Lighting System (ALS) is compared with three existing system to find similarity and different between them.

The first comparison is between proposed system and Automatic Street Light system. For Automatic Street Light System, the street lighting was limited to two sensors. The light sensor will detect darkness to activate the ON/OFF switch, so the streetlights will be ready to turn on and the photoelectric sensor will detect movement to activate the streetlights. While the ALS only use one sensor known as PIR sensor. PIR sensor function is to focus more on detect human motion in certain area to make the light bulb connected to Arduino Uno functions as it should behave.

Secondly, the comparison is with Home Automation System Using Arduino. Home Automation System Using Arduino is controlled by using Internet-based home so that user can use smartphone or tablet to control the functions of every devices at home near or remote. For ALS, client need to control by using a web-based system only and no internet connection to connect with Arduino Uno.

Next comparison is with Home automation Mobile Apps. Home automation Mobile Apps is a mobile-based application to transfer data from apps to Arduino to perform certain action. Different to ALS, it is web-based system that can send instruction from system to Arduino. ALS must connect to internet to make it being able setup schedule and other things in the web database.

2.9 SUMMARY

To sum up, this chapter just discussed about application in Automatic Lighting System (ALS) that will develop, why use Arduino Uno and PIR sensor are chosen in this project. Next, there is comparison of existing system in this chapter to show similarity and differentiation between them. Lastly, there is comparison between three existing systems and proposed system in this chapter to state what this project can perform different from existing systems.

CHAPTER 3

METHODOLOGY

3.1 INTRODUCTION

The software development life cycle (SDLC) is a process that the software is developed and deployed. It is a process that include every phases of software creation, from conception to maintenance after the software is delivered. There are many of SDLC methodologies, including Waterfall, Agile, V-Shaped model, Iterative, Spiral and many more. Developer select a specific methodology with the goal of producing the software as quickly and as cheaply as possible without sacrificing quality. This is achieved by choosing the right SDLC methodology for the context of software development project.

The SDLC number of phases can be various depend on the business and project goals but usually between five to seven steps. Starts from the lowest level, software is designed, developed, tested and then released. In general, the SDLC process phases are requirements gathering, analysis, plan & design, implementation, test & integration, and maintenance (Rouse, 2016-2018).

For this project, Waterfall methodology is used during project development period. This is because implement a waterfall for new system is a rather straightforward process. This methodology is divided into several phases and the output of one phase is used as the input of the next phase. Every phase has to be completed before the next phase starts and there is no overlapping of the phases.

3.2 WATERFALL

Waterfall Model is a sequential model that will divide project development into different phases. Each phase is designed to perform specific activity during in SDLC phase. Waterfall was introduced in 1970 by Winston Royce to prevent costly revisions late in a product's development (Guru99, 2018). By using this model, if any revision is needed, it will be easier and cheaper to make that revision early. Implementation of waterfall model focus is to make sure the requirements and design met the needs of the project before moving on to the next phase of development. Figure 3.1 shows the stages of waterfall model in project development.

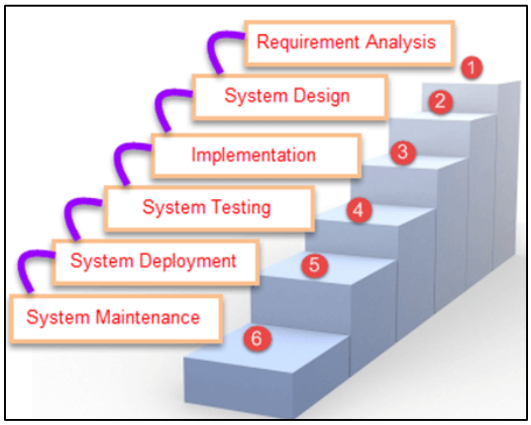


Figure 3.1 Waterfall model phases

3.2.1 Requirement analysis phase

In this phase, all the detail of possible requirements from client are collected for project development. In this proposed project, a client who works as Supervisor Assistant at ECO Shop at Taman Tas branch was interviewed to discover the constraints and improvement suggestion from him when having manual lighting switching in his workplace. During interview session, all requirements are taken to come out with solutions later. The list of questions is in Appendix A.

3.2.2 System design phase

After gathering requirements and make analysis, then the system design is prepared. This system design help developer to determine hardware and system requirements before make decision the overall system architecture. For example, plan to use the suitable programming language likes Java, PHP, C, and .net. Besides that, database will be uses like Oracle, MySQL, Excel and so on will be decided.

In this project, the specification of main hardware requirements already decided, to use microcontroller Arduino Uno, PIR sensor, and light bulb. For system development programming language would be PHP, Javascript, and Arduino IDE.

3.2.3 Implementation phase

For implementation phase, this system is developed part by part according to the most prior functionality. Started with installation and wiring of electronic components such Arduino Uno, PIR sensor, jumper wires, sensor shield, relay, bulbs, and power supply. Once finished, IDE code is running to ensure all the following hardware works correctly. Next, webpage interface and some function are designed by using Bootstrap template and PHP programming language. Realtime Firebase database is chosen to catch and store inputs from the website form. After that, the communication between Arduino Uno and website to read data in the database were established to make Arduino Uno be able deliver task it should do for bulb lighting schedule.

3.2.4 System testing phase

In this phase, hardware, website system, and Firebase are combined together to run and test the wholly system functionality. It started with user login into the system website, checking personal profile and do update. Then, validated lighting scheduling form to ensure input are recorded into Firebase successfully. The recorded schedule will be display in the table beside

schedule form to ease user check recent submission and delete if necessary. User tried to key in data in the form, see data display, and do deletion. Besides that, testing on Arduino Uno to control bulb lighting based on scheduling in the Firebase also was carried. Bulb must be succeeded light on during schedule time and off when time is out of schedule. When PIR sensor detect motion in the shop during time not in the schedule, bulb will light on for five minutes until there is no any motion detected.

3.2.5 System deployment phase

Once system testing phase has been done successfully, the whole system will be used by the client for automatic lighting switching in their shop.

3.2.6 System maintenance phase

After delivering the system to client, developer also need to do maintenance to solve any ALS issues might come out in shop environment. Not just that, maintenance also is delivered to upgrade whole system functionality into better version.

3.3 PRELIMINARY DESIGN

This section will discuss the proposal of the proposed system with the flow of the project, software and hardware involved to complete this project.

3.3.1 System Description

This project is using web-based system as a GUI between user and Arduino Uno microcontroller. The system will use internet as a medium to connect with Arduino Uno when deliver setting and monitor lighting.

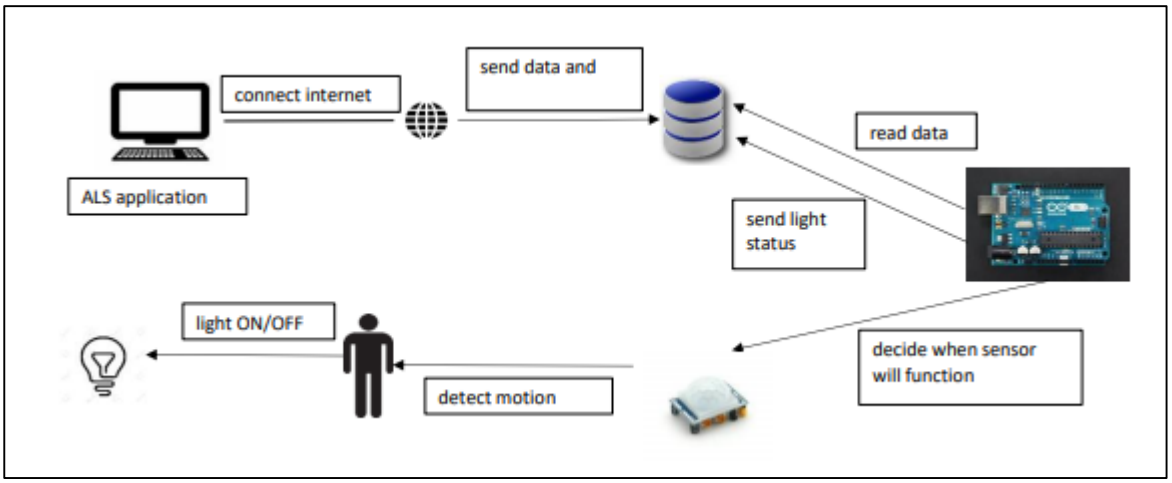


Figure 3.2.1 System flow of ALS

From Figure 3.2.1 above, user must connect to internet to access ALS. User can set schedule lighting data into database so that the Arduino can read data and be able to make decision when and what situation sensor will do functioning. Out of scheduled period, sensor will sense human motion and light ON/OFF the bulbs. Arduino will send lighting status to database so the user can monitor lighting status of beyond operating hours.

3.3.2 Printed System Description

The printed system description for connectivity of Arduino Uno, bulbs, and motion sensor are shown below in Figure 3.2.2 and Figure 3.2.3.

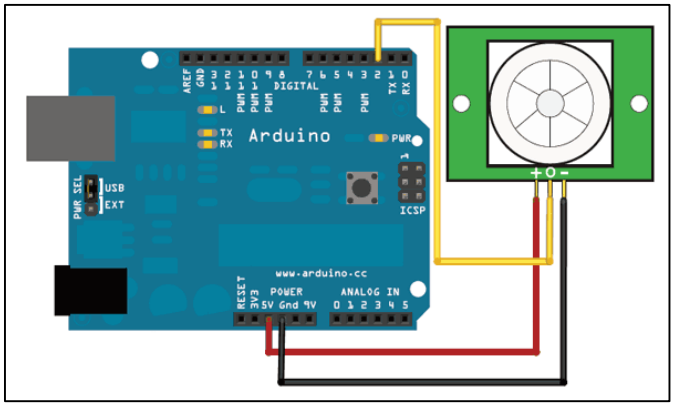


Figure 3.2.2 Wired board between Arduino Uno and PIR sensor

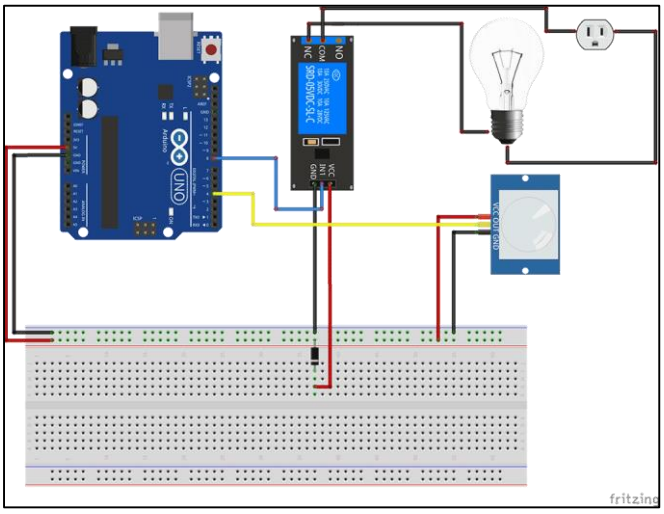


Figure 3.2.3 Full connection of hardware

3.3.3 Context Diagram

Below in Figure 3.2.4 is the flow of context diagram in the project between Supervisor Assistant, Chief, and sensor.

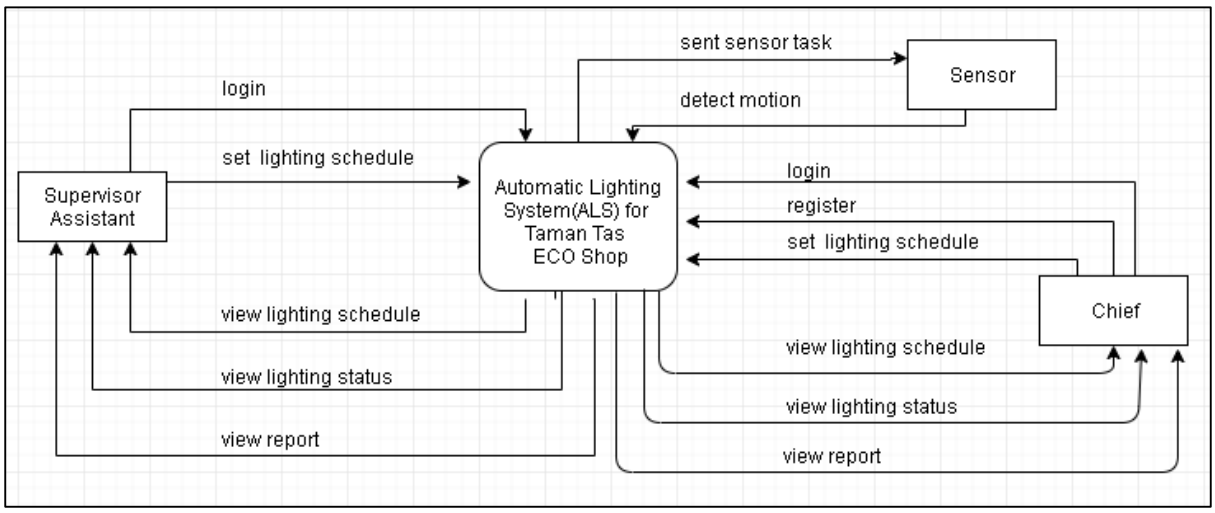


Figure 3.2.4 Context Diagram for ALS

3.3.4 Use case Diagram

Figure 3.3 shows the use case diagram among that entities.

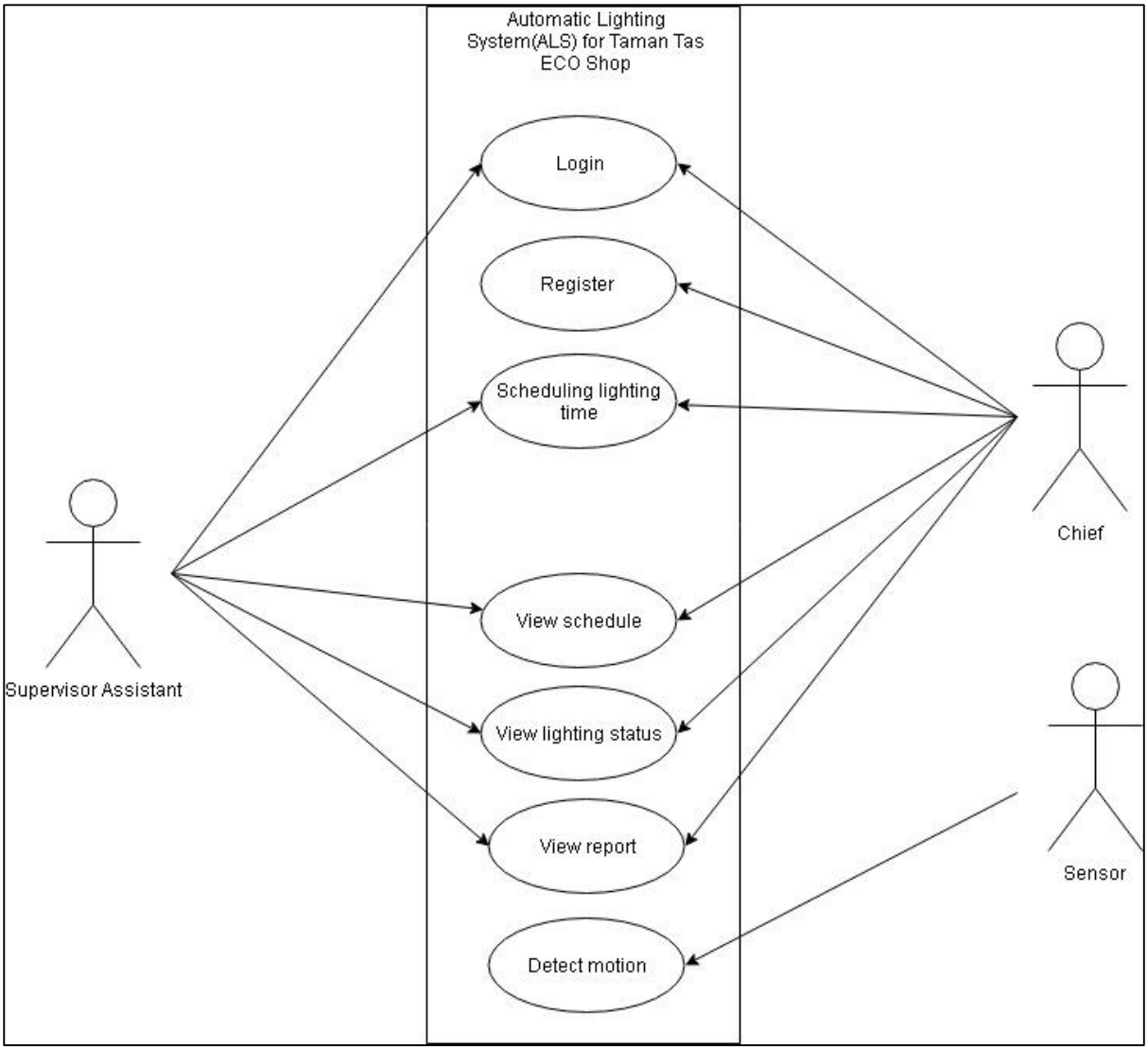


Figure 3.3 Use case diagram for ALS

3.3.5 Dialogue Diagram

The Figure 3.4 below shows dialogue diagram of system flow.

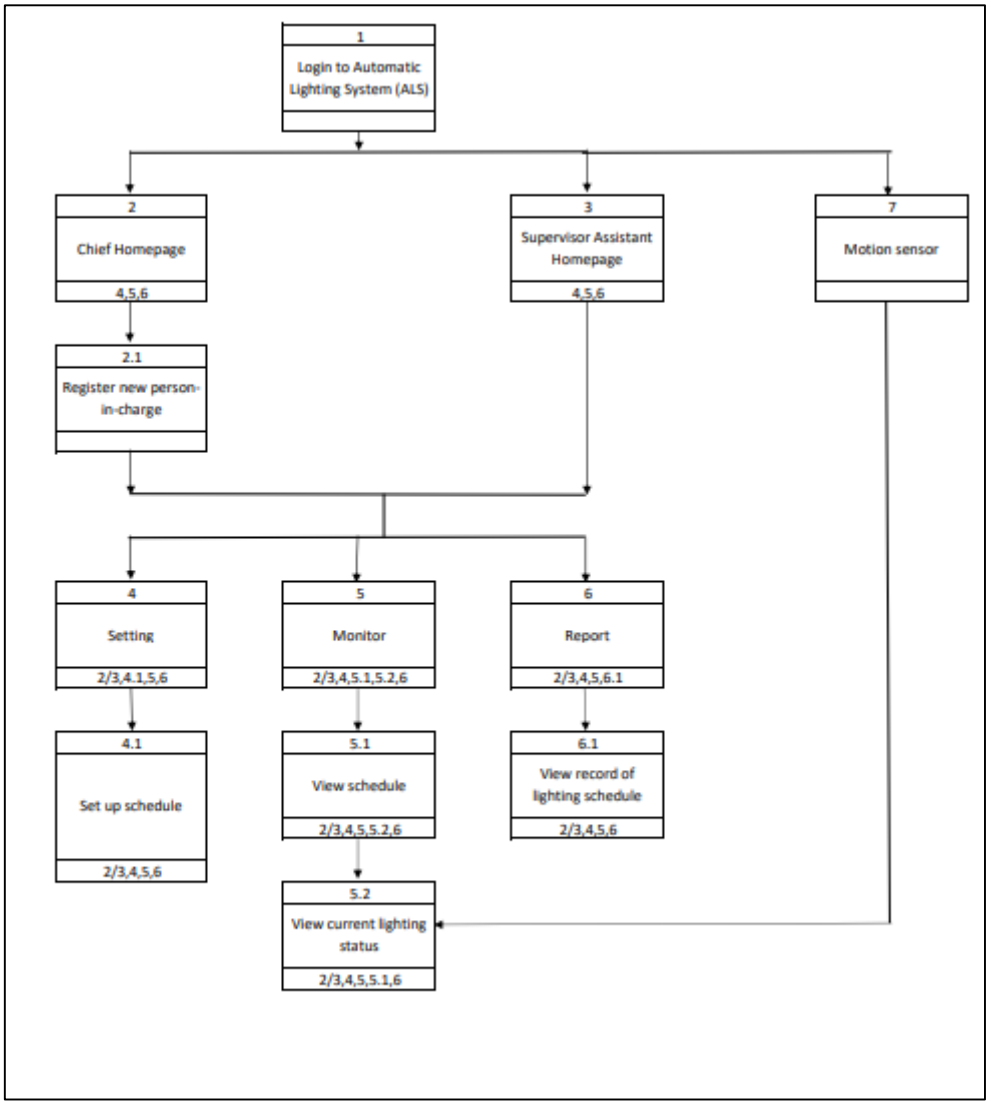


Figure 3.4 Dialogue diagram for ALS

3.4 MODULES

Below will discuss further about each of modules from dialogue diagram above in details.

a. Login (Module 1)

All authorized Supervisor Assistant and Chief can log in to use and monitor the lighting system.

b. Chief Homepage (Module 2)

Homepage shows simple view such as current time and name of developer.

a. Register (Module 2.1)

This registration part only chief can do that. The link for register will appear in Home interface after chief log in. Registration only need three input such as name, username, and ID. The ID will be used as a first password for Supervisor Assistant to log in. After that, they can change with the new password on their own.

c. Supervisor Assistant Homepage (Module 3)

Homepage shows simple view such as current time and name of developer only.

d. Setting (Module 4)

Setting is an interface to set up schedule and make activation for lamps and to work.

e. Monitor (Module 5)

Monitor consists two parts of information which is schedule and current light status.

f. View Schedule (Module 5.1)

Schedule module displays date to light up the lamps based on time that has been set up. If Supervisor Assistant want to cancel the light time, they can delete the selected date on that schedule table.

e. View current Lighting Status (Module 5.2)

All lamps will show their status either in yellow color if turn on, or in white if turn off. The table below shows some conditions to make light ON/OFF. During operating hours, lamps will keep on as scheduled by PIC. Beyond operating hours sensor will takes place to decide light ON/OFF lamps based on condition has been set during it detects human motion. Table 3 below shows several conditions that function of sensor will detect human motion and make light to on.

Table 3. List of conditions

Condition		**Lighting**
After operating hours		Lamps will ON along operating hours
After and before operating hours	Morning	Sensor will detect human motion
	Night	Sensor will detect human motion

f. Report (Module 6)

Report will display all records of lighting schedule from previous to the latest date.

g. Motion Sensor (Module 7)

Motion sensor will do detecting human presence by referring schedule and conditions has been set up. It also will decide lighting status either ON/OFF beyond store operating hours.

3.5 PROPOSED GRAPHICAL USER INTERFACES

User interface for system is important to enable client set and deliver instruction to the lamps and sensor on what it need to do. Figure 3.6 to Figure 4.1 below shows the proposed graphical user interfaces for this whole system.

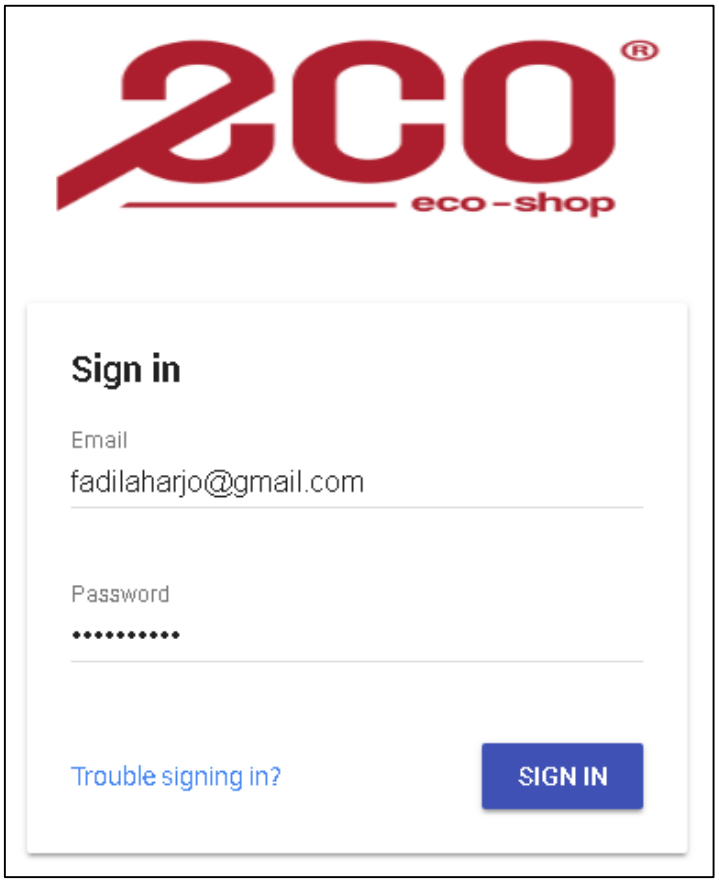


Figure 3.6 Login page for Supervisor Assistant and Chief

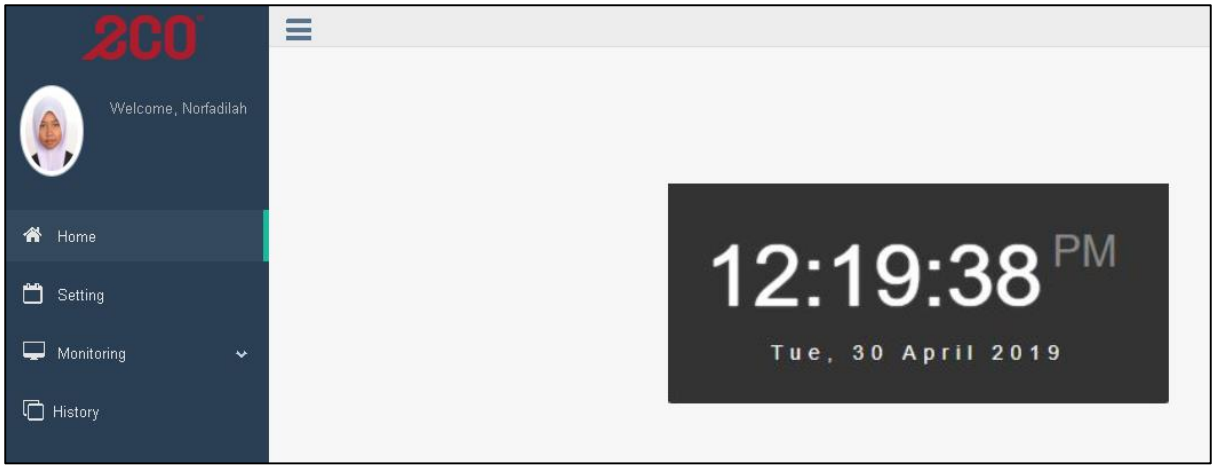


Figure 3.7 Home page for Supervisor Assistant

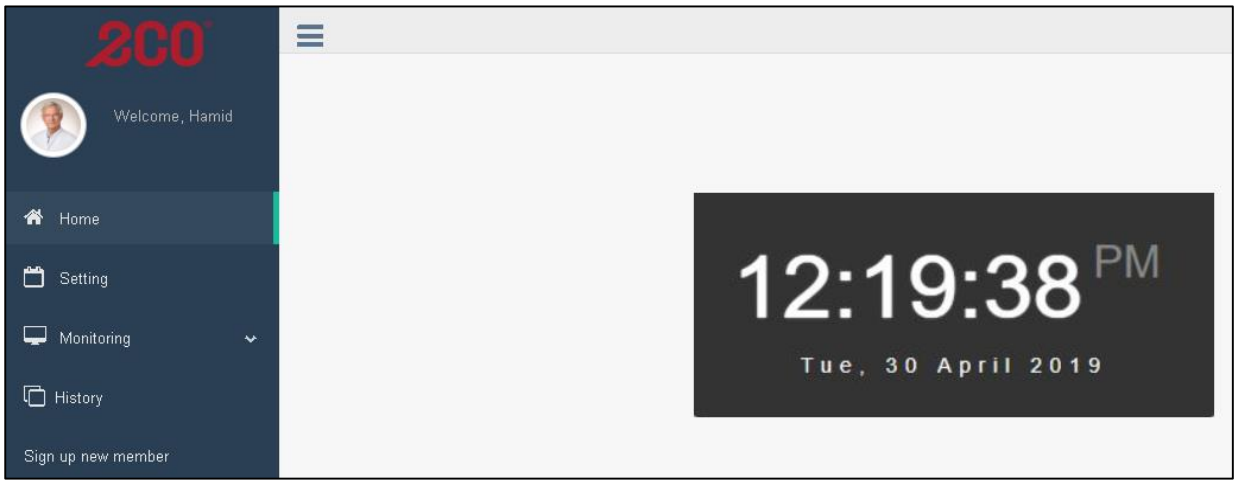


Figure 3.8 Home page for Chief with register link application

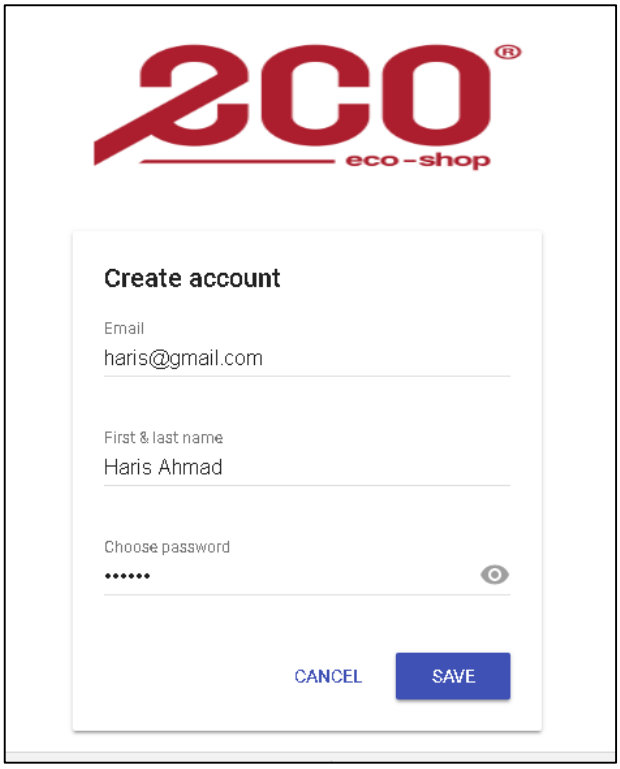


Figure 3.9 Only Chief can use registration page

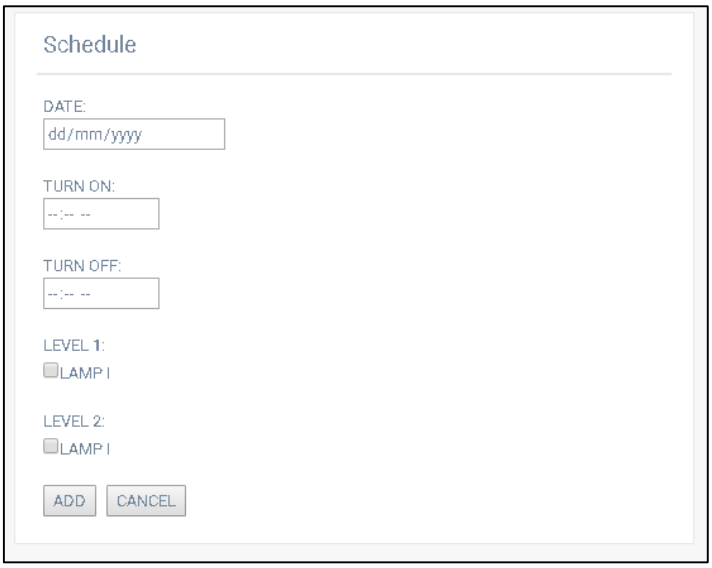
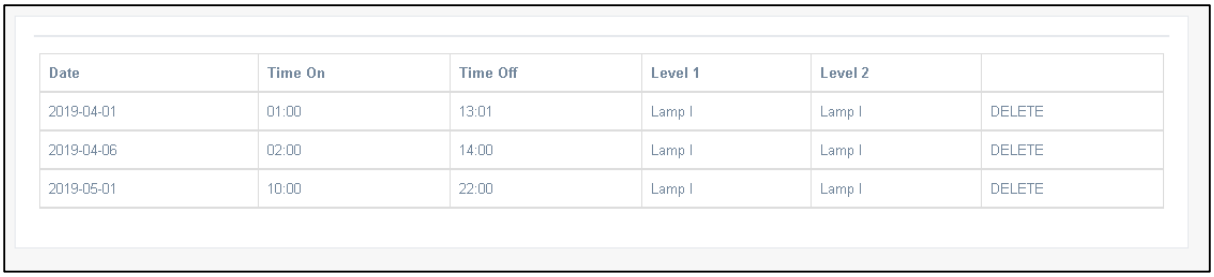


Figure 4.0 Setting page to set schedule and lamps to light



Date	Time On	Time Off	Level 1	Level 2	
2019-04-01	01:00	13:01	Lamp I	Lamp I	DELETE
2019-04-06	02:00	14:00	Lamp I	Lamp I	DELETE
2019-05-01	10:00	22:00	Lamp I	Lamp I	DELETE

Figure 4.1 Monitor page on schedule tab to view light schedule after has been set up

3.6 HARDWARE AND SOFTWARE

This section will discuss further about software and hardware that used in this project development.

3.6.1 Documentation phase software

Table 4. List of software used for documentation

SOFTWARE	IMPORTANCE	FUNCTION
Microsoft Office Word (2016)	One of available software to provide easiness on documentation	To prepare project documentation.
Microsoft Office Project (2016)	A software to make a Gantt Chart.	To prepare project planning schedule from start until finish.

3.6.2 Development phase software

Table 5. List of software used for development stage

SOFTWARE	IMPORTANCE	FUNCTION
Microsoft Windows 10 (x64) Operating System	Every computer needs operating system to communicate between user with computer.	To help view every application in the computer to complete the project.
Arduino software the Integrate Development Environment (IDE).	As a platform to deliver commands in codes to Arduino Uno board.	To code for Arduino Uno and compile it in Arduino Uno.
Google Chrome web engine	A web application to access to Internet to find information of project.	Find reference to gain idea and guides to finish documentation and project itself.
Notepad++	A software to write codes in PHP, HTML, Javascript, and CSS format.	Develop codes in this software to make it being able to design webpage and make it functions.

3.6.3 Hardware use throughout the project

Table 6. List of hardware used for project development

HARDWARE	IMPORTANCE	FUNCTION
Arduino Uno	As a medium to be able connecting computer system with input and output hardware.	Arduino Uno board is connected to system so that every instruction and setting from computer software can be delivered to output and input hardware that attached to it.
PIR sensor	Recognize the motion of human in limited area.	Act as input hardware that can detect human motion in the selected area and deliver that input to Arduino either should lights on/off.
Small bulbs	To indicate the successful of project output when produce light.	Produce lighting when get instructed by the developed system in the computer.
WiFi module	The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor.	It makes Arduino can read input and send output to Firebase database.

3.7 GANTT CHART

Gantt chart shows the schedule to develop the project in early phase to the last phase within given period. That Gantt chart is attached to the APPENDIX B.

3.8 SUMMARY

To quickly sum up, the objectives for in Automatic lighting System (ALS) is to design a system for Taman Tas ECO Shop branch to make lighting switching control run independently with minimum monitoring by using Arduino Uno and controlling module using a web-based system. The interface implemented with desirable properties and specifically standardization. These interface function will be demonstrable by the completed system.

CHAPTER 4

IMPLEMENTATION, RESULT, AND DISCUSSION

4.1 INTRODUCTION

In this chapter, it will discuss about the result of the finding based on experiment that have been done includes hardware and software part. The purpose of discussion is to describe the current problem that has been tried to improve. It is also to give understanding on how the system works.

4.2 IMPLEMENTATION

The entire implementation of this project could be divided into two parts, which are hardware and software installation. The project requires a proper hardware installation and software configuration to make sure the system run smoothly. In order to implement the prototype of this system, all hardware must be installed correctly with the right configuration. A few mistakes may cause the malfunction to the system. All precautions must be taken before started the installation to avoid any problems in the future.

This subtopic will explain briefly the implementation of hardware development and software development. It also provides the graphical user interfaces, database interfaces and some important programming code used throughout the development of the system.

4.2.1 Hardware Implementation

In order to start develop Automatic Lighting System (ALS), Arduino is configured. The hardware that required in ALS are Arduino Uno, PIR sensor, WiFi module ESP8266-01, sensor shield, relay modules, DC adapter, jumper wires, light bulbs holder and bulbs. Firstly, Arduino Uno and all the hardware must be attached together before connected to laptop. If Arduino Uno is blinking, it means the condition of the board is good. ALS project used 2- channel relay modules to light up two bulbs. Relay module is an electrically operated switch of mains voltage. It means that it can be turned on or off, letting the current go through or not. Besides that, DC adapter used to give additional electricity to the bulbs since Arduino board provided 5V only. Laptop also gives some currents to Arduino to be functioning well. Arduino must be able to connect with internet by using Wifi module, so Arduino can read and send data from Firebase database. Figure 4.2 show the hardware used to implement this project.

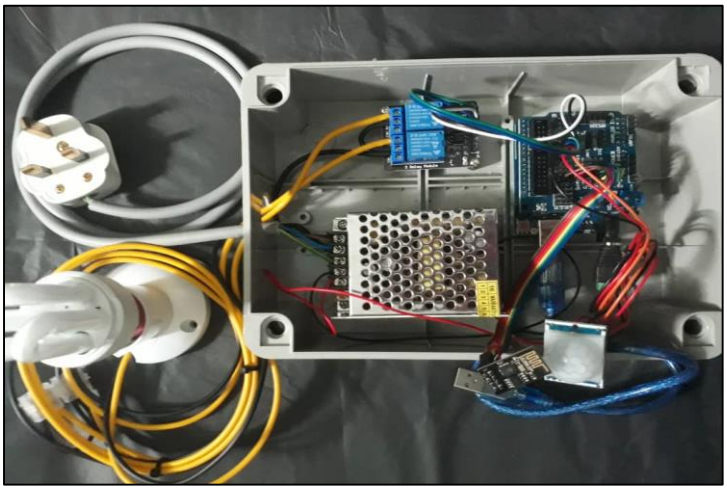


Figure 4.2 Hardware used to implement this project

4.2.2 Software Implementation

To control the light, the Arduino need to be programmed using their own software. Arduino has its own platform to build the program, which is Arduino IDE (Integrated Development Environment). This compiler used to activate Arduino Uno board thus it can receive the instructions from web-based application. Essentially, Arduino board must be connected to laptop by plugging USB cable to get started using this IDE. The language used to develop the code is PHP programming language. When uploading a sketch, actually Arduino bootloader is used, which is a small program that has been loaded into the microcontroller. To enable the lights can connect with Arduino, connect the computer with USB cable.

To develop the web-based, this project used Notepad++. Notepad++ is available to download from internet and it is free to use it using our own computer. The language used to develop the system is PHP language. Next, to store the detail of user and schedule, the system needs to connect with the Real-time Firebase database. Firebase is a freely available open source, easy and flexibility to use it.

Below are the descriptions of each software used in this project.

1. Arduino Software

   The open source Arduino environment makes it easy to write code and upload it to the I/O board. It runs on Windows, Mac OS X, and Linux. The language used to develop the code is C++ and C programming language. Arduino IDE contains text editor for code sketching, a message area, a text console, a toolbar with buttons for common functions, and a series of menus. Before uploading the sketch, the right Arduino boards and serial port have been selected. When uploading a sketch, actually Arduino bootloader is used, which is a small program that has been loaded into the microcontroller. To enable the lights can connect with Arduino, connect the computer with USB cable. Figure 4.3 show the command in the Arduino IDE.

Figure 4.3 Command in the Arduino IDE

2. Notepad++ software

To develop the system that can use to control the lights, this project will use Notepad++ to create web-based application prototype that can run directly in browser. In this software, we can create PHP, HTML, CSS, and Javascript files. All these files are the main for creating web interfaces and its functionality. Figure 4.4 show the codes in the Notepad++.

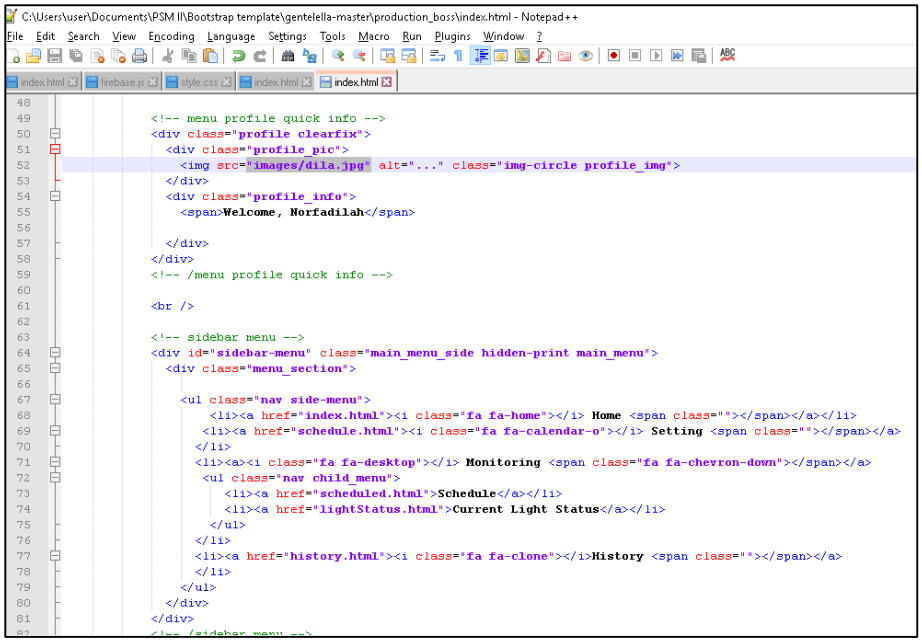


Figure 4.4 Codes run in the Notepad++

4.3 RESULT

In this project, the interfaces for will be described in details for Supervisor Assistant and Chief.

4.3.1 Login Page

Figure 4.5 shows login page for ALS system. User need to login by using their email and password to enable go into the webpage content.

Figure 4.5 Supervisor Assistant and Chief login

4.3.2 Home Page

Figure 4.6 shows homepage page for ALS system. Homepage will view date and time only.

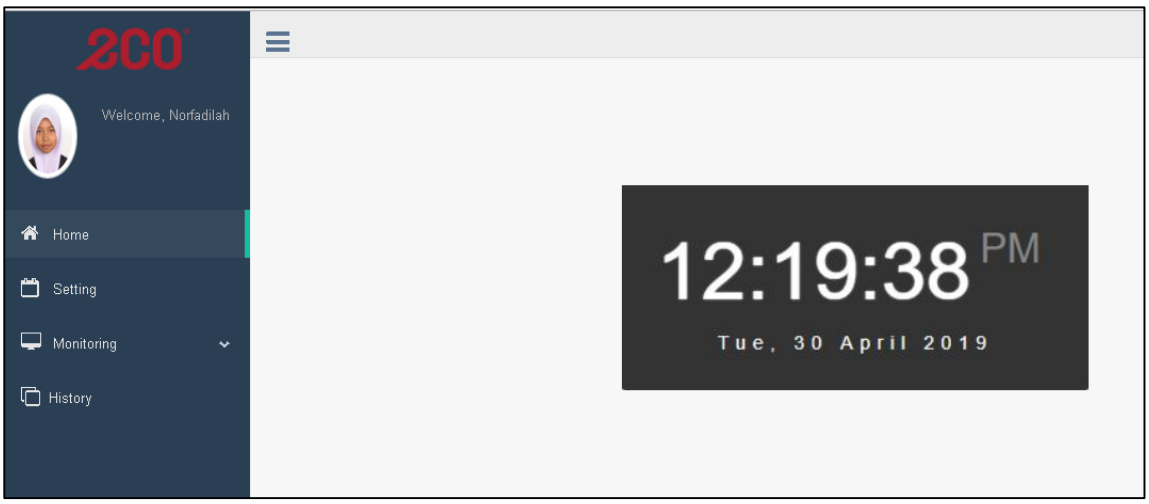


Figure 4.6 Homepage for Supervisor Assistant

4.3.3 Home Page

Figure 4.7 shows homepage page for ALS system. Homepage will view date and time only. The difference between Supervisor Assistant and Chief page is at bottom tab which Chief has a link to register new member to have authority control the lighting.

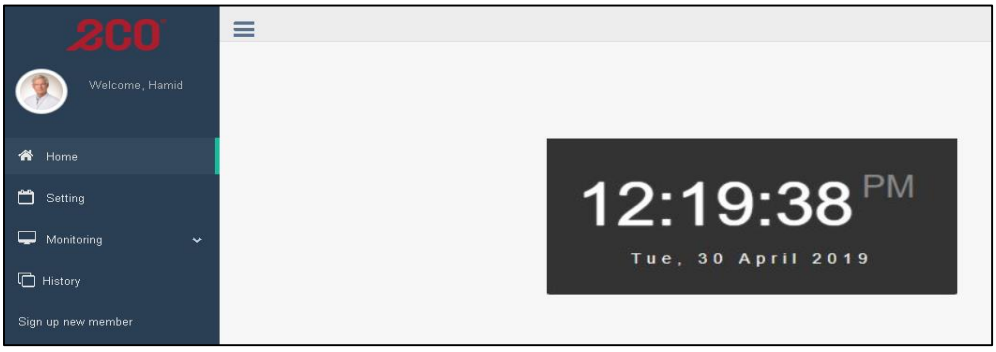


Figure 4.7 Homepage for Chief

4.3.4 Setting Page

Figure 4.8 shows setting page for ALS system for both Supervisor Assistant and Chief. Setting page will display schedule form to make user can key in data to set up time for bulb to light.

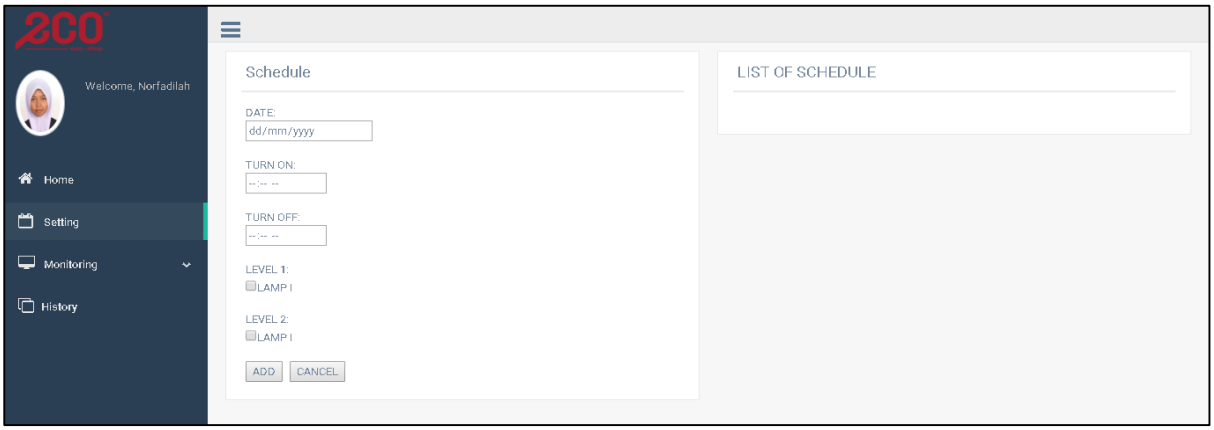


Figure 4.8 Setting schedule to light the bulb

4.3.5 View Schedule Page

Figure 4.9 shows schedule page for ALS system for both Supervisor Assistant and Chief. This page will display schedule table to display list of schedules time has been inserted in the database.

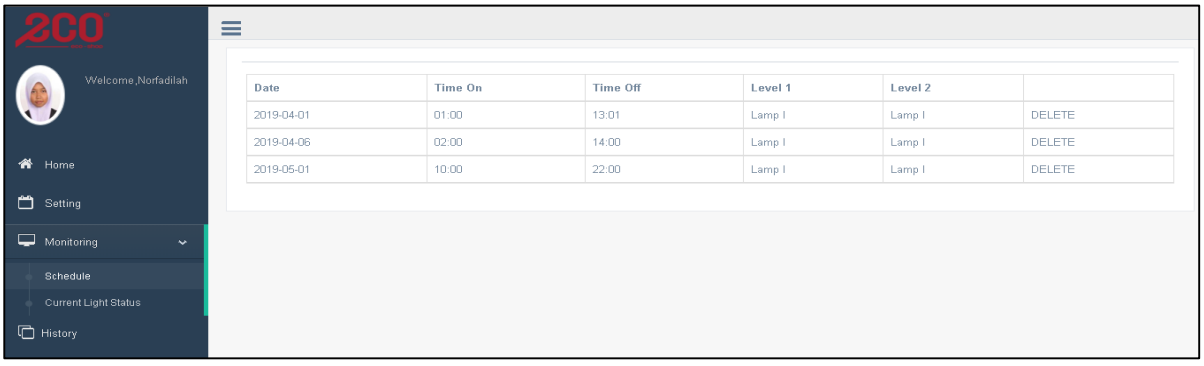


Figure 4.9 View schedule page

4.3.6 View Current Light Status Page

Figure 5.0 shows current light status page for ALS system for both Supervisor Assistant and Chief. Current light status page will display bulb lighting status either ON/OFF for every shop floor level.

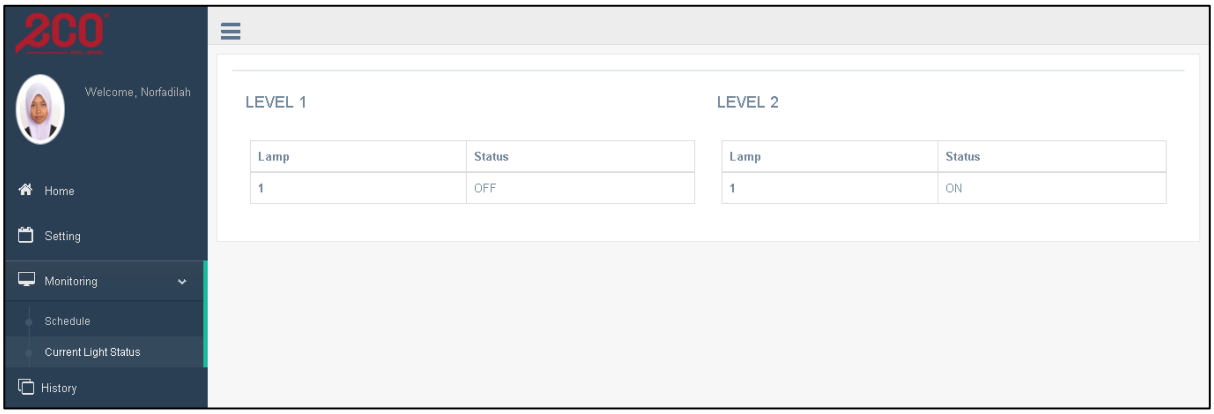


Figure 5.0 Current light status show lighting status for every bulb

4.3.7 History Page

Figure 5.1 shows history page for ALS system for both Supervisor Assistant and Chief. History page will display the full record of schedule from database with name of person-in-charge (PIC) that fill the schedule form.

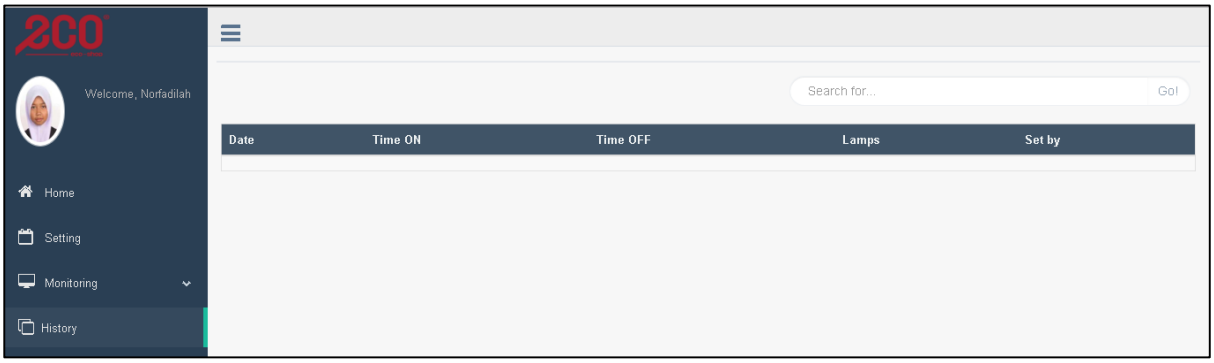


Figure 5.1 History page with the name of PIC in the table

4.4 TESTING

Quality of the project are very important to came out with a well product and system that are meaningful for the uses of the product. The system needs to be ensured is well working and have no error in achieving the objective that has been setup. The database will have tested to confirm either the data is stored and passing correctly from the device that integrate with the system to the database. Therefore, a few tests need to be test to ensure the robustness of the system. For ALS, there is only one person did the system testing.

User Acceptance Test (UAT) form will be attached in Appendix C as clarification of the prototype development prove.

4.5 USER MANUAL

User manual is a technical communication document designed to help the user use a specific system. See Appendix D for the user manual specification.

4.6 CONCLUSION

This main topic of this chapter provides a brief explanation of the project development and implementation. The results show every detail about the interfaces and functions of the application. The results are very important in showing how user- friendly the application is and how reliable it is. Regardless of how great the features and function in the application are, it is too complicated to use, the user may not prefer to use it, and in the worst case, the user has no attraction to use the application.

CHAPTER 5

CONCLUSION

5.1 INTRODUCTION

The purpose of this chapter is to summarize the findings of Automatic Lighting System (ALS) for Taman Tas ECO Shop by using Arduino Uno in order to achieve goals and solve the problems stated in Chapter 1. This project is designed to ensure that user can use the system efficiently with satisfactory. The problem during using the manual lighting switching can be avoided.

ALS is using waterfall methodology. The flow of the development process can be run smoothly by using this methodology. The methodology selected also plays an important role for the developer to complete their task in this project. The goal, statement of problems, and scope of the project set out in Chapter 1 can be achieved.

This project has fulfill the objectives as below:

i. The current practice of switching in shop is studied and converted into automatic controlled version.

ii. Automatic Lighting System (ALS) for ECO Shop by using Arduino Uno and PIR sensor is designed and developed.

iii. Evaluated the effectiveness of Automatic Lighting System (ALS) by using Arduino Uno in ECO Shop.

5.2 PROJECT CONSTRAINT

This section will elaborate about the project constraint. While building up this project, a few limitations were discovered which is the PIR sensor detect motion about one minute to get the bulb to light. So, it makes the developer get the output in longer than it should be.

Apart from that, in earlier development of this project, there is some difficulties in configuring the Arduino with PIR sensor because of the wrong connection of port in Arduino. PIR sensor also need to be configured properly to the right port of Arduino to make sure it can function well.

Furthermore, in the early stages of development, the system application has failure connection with Arduino to make it be able communicate well. Developer needs to find hard solutions to fix the error to make them run smoothly.

Besides that, time constraint also is challenging since to make one function works well it will take a long of period to commit. Because of that, there are several ALS functions are failed to run and give unsuccessful output during evaluation the effectiveness of ALS by a system tester.

5.3 FUTURE WORK

There are several improvements that can be suggested for ALS for the future to make it better functions.

i. Develop mobile application version for ALS in order to make user get more portable application.

ii. Improve the sensitivity of sensor to detect human presence instead of motion detection.

iii. Do database backup if any damage happens to the Firebase data or during loss internet connection.

iv. Send notification or alert to user if any failure happens.

5.4 CONCLUSION

To conclude, Automatic Lighting System (ALS) has met the goals and can be a solution for ECO Shop to convert their manual lighting system into automation system. This system can act as new open source and ideas for new developer to improve the existing system and make it in better version. This is absolutely a perfect alternative solution because the system offers beneficial lighting control for the user itself. Despite the completion of this project, there is still need for more improvement and a lot of future enhancement to make ALS be number one choice for automation lighting system.

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APPENDIX A

An interview session was held at Taman Tas ECO Shop branch with a client representative named Low Yee Xian who is in position of Supervisor Assistant. From the interview session, problems and requirement are collected based on questions and answers as below.

a) Do you use manual or automatic lighting switching?
   We use manual lighting switching.

b) Who is the person-in-charge to control lamps switching in this store?
   Worker wearing yellow shirt which is Supervisor Assistant.

c) Where is the location of the lamp switch? Located in one place or more?
   It is located at two places which is at store and office.

d) What is the time of operating hours of store?
   It is open at 10am until 10pm during weekdays, weekend, and public holiday.

e) ECO Shop store provides overtime working hours for worker?
   Yes, it has. The normal working hours for worker actually start at 10am until 7pm. So, besides that period is assumed as worker works overtime.

f) What is the time for worker to enter store earlier before operating hours?
   Usually before real operating hours begin, worker will come earlier at 9am to make preparation. However, on Wednesday, Saturday, and Sunday worker must arrive at ECO Shop at 8.15am to prepare for new stock that will arrived.

g) What is the last time for worker to be in store?
   If by 10pm customers still in the store, they will close the store at 10.30pm or 11pm.

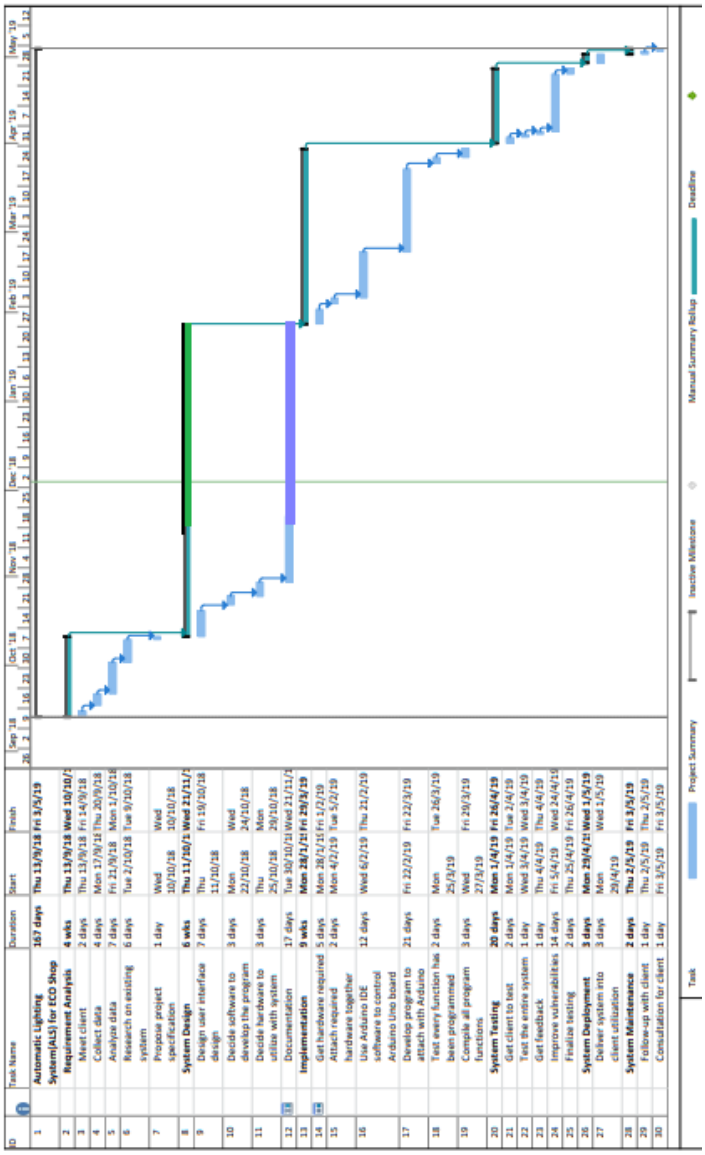
h) Do you use ceiling fan or an air conditioner? What is your air conditioner temperature used?

We used ceiling fan for first level and air conditioner for upper level with temperature of 16 °C.

i) Give me problems that you face during using manual lighting switching in this store.

Sometimes, I forgot to turn off lamps during in rush situation. So, it will make CCTV can report that incident to the management about that. The second problem might the location of switch in two different places. It will be better if located in one place only.

APPENDIX B


ID
Task Name
Duration
Start
Finish
Sep '18
Oct '18
Nov '18
Dec '18
Jan '19
Feb '19
Mar '19
Apr '19
May '19
1 Automatic Lighting System(ALS) for ECO Shop 167 days Thu 13/9/18 Fri 3/5/19
2 Requirement Analysis 4 wks Thu 13/9/18 Wed 10/10/1
3 Meet client 2 days Thu 13/9/18 Fri 14/9/18
4 Collect data 4 days Mon 17/9/18 Thu 20/9/18
5 Analyze data 7 days Fri 21/9/18 Mon 1/10/18
6 Research on existing system 6 days Tue 2/10/18 Tue 9/10/18
7 Propose project specification 1 day Wed 10/10/18 Wed 10/10/18
8 System Design 6 wks Thu 11/10/1 Wed 21/11/1
9 Design user interface design 7 days Thu 11/10/18 Fri 19/10/18
10 Decide software to develop the program 3 days Mon 22/10/18 Wed 24/10/18
11 Decide hardware to utilize with system 3 days Thu 25/10/18 Mon 29/10/18
12 Documentation 17 days Tue 30/10/1 Wed 21/11/1
13 Implementation 9 wks Mon 28/1/19 Fri 29/3/19
14 Get hardware required 5 days Mon 28/1/19 Fri 1/2/19
15 Attach required hardware together 2 days Mon 4/2/19 Tue 5/2/19
16 Use Arduino IDE software to control Arduino Uno board 12 days Wed 6/2/19 Thu 21/2/19
17 Develop program to attach with Arduino 21 days Fri 22/2/19 Fri 22/3/19
18 Test every function has been programmed 2 days Mon 25/3/19 Tue 26/3/19
19 Compile all program functions 3 days Wed 27/3/19 Fri 29/3/19
20 System Testing 20 days Mon 1/4/19 Fri 26/4/19
21 Get client to test 2 days Mon 1/4/19 Tue 2/4/19
22 Test the entire system 1 day Wed 3/4/19 Wed 3/4/19
23 Get feedback 1 day Thu 4/4/19 Thu 4/4/19
24 Improve vulnerabilities 14 days Fri 5/4/19 Wed 24/4/19
25 Finalize testing 2 days Thu 25/4/19 Fri 26/4/19
26 System Deployment 3 days Mon 29/4/1 Wed 1/5/19
27 Deliver system into client utilization 3 days Mon 29/4/19 Wed 1/5/19
28 System Maintenance 2 days Thu 2/5/19 Fri 3/5/19
29 Follow-up with client 1 day Thu 2/5/19 Thu 2/5/19
30 Consultation for client 1 day Fri 3/5/19 Fri 3/5/19
Task
Project Summary
Inactive Milestone
Manual Summary Rollup
Deadline

APPENDIX C

USER ACCAPTANCE TEST (UAT)

User type: Supervisor Assistant

Event	Test Data	Expected Result	Actual Result	Pass/Fail	Comment
Login with incorrect account	User fills the login form with incorrect detail	User redirect to login page again	Same as expected result	PASS	
Login with correct username and password	User fills the login form with correct detail	Success to login the home page	Same as expected result	PASS	
Forgot password	User key in their email address	Successfully insert new password	Same as expected result	PASS	
View home page	User view the home page	Able to view the main page	Same as expected result	PASS	
View profile page	User click the profile tab	User will successfully view the profile page	Same as expected result	FAIL	
Add new schedule	User fills the schedule form with the correct detail	Success to create new and store the data	Same as expected result	PASS	
View schedule list	User go to schedule listing page	Successfully view the schedule list	Same as expected result	PASS	
View current light status detail	User click the current light status	Successfully view the page	Same as expected result	FAIL	

View history	User click the history	Successfully view the page	Same as expected result	FAIL	

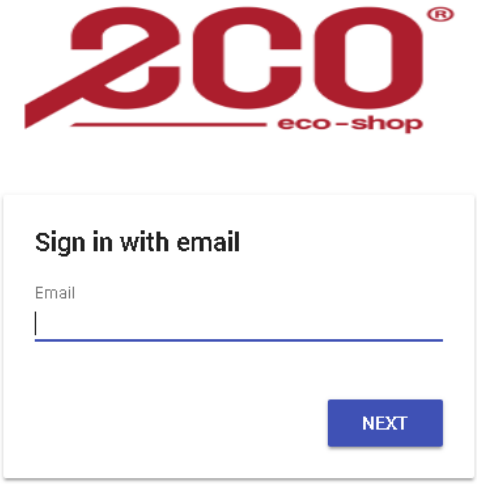
User type: Chief

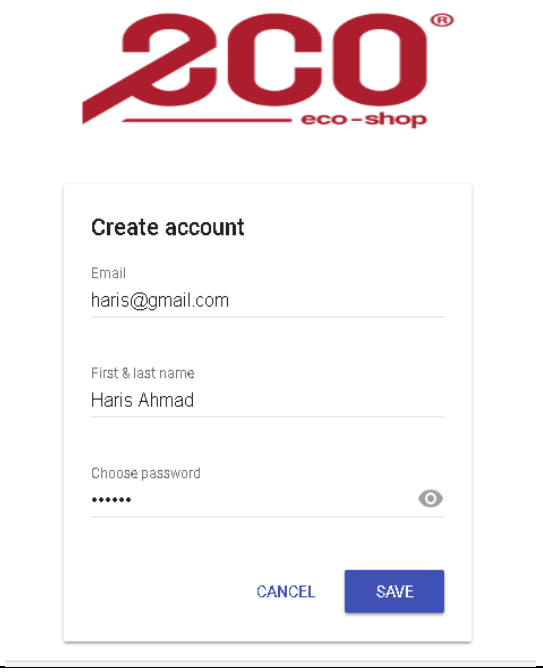
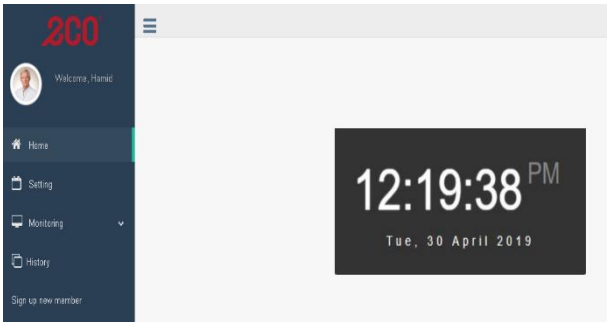
Event	Test Data	Expected Result	Actual Result	Pass/Fail	Comment
Login with incorrect account	Chief fills the login form with incorrect detail	Chief redirect to login page again	Same as expected result	PASS	
Login with correct username and password	Chief fills the login form with correct detail	Success to login the home page	Same as expected result	PASS	
Forgot password	Chief key in their email address	Successfully insert new password	Same as expected result	PASS	
View home page	Chief view the home page	Able to view the main page	Same as expected result	PASS	
Register new user	Chief insert their detail such email, name, and password	Successfully register	Same as expected result	PASS	
View profile page	Chief click the profile tab	Chief will successfully view the profile page	Same as expected result	FAIL	
Add new schedule	Chief fills the schedule form with the correct detail	Success to create new and store the data	Same as expected result	PASS	

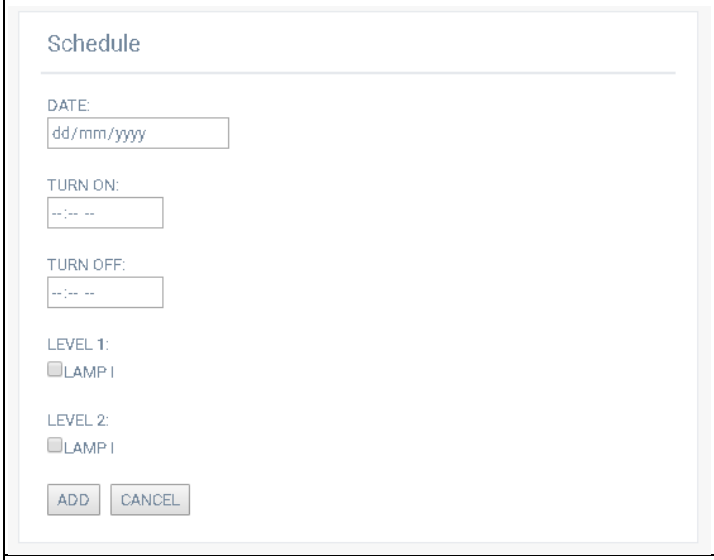
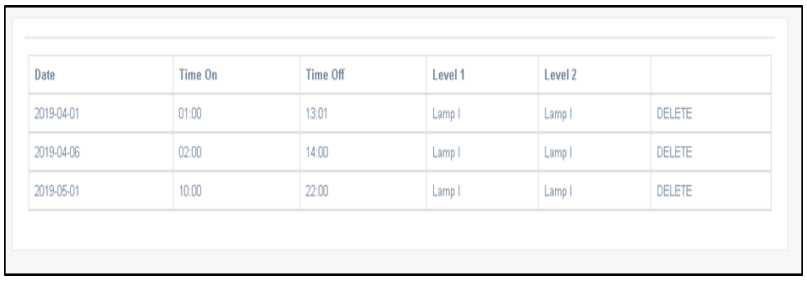
View schedule list	Chief go to schedule listing page	Successfully view the schedule list	Same as expected result	PASS	
View current light status detail	Chief click the current light status	Successfully view the page	Same as expected result	FAIL	
View history	Chief click the history	Successfully view the page	Same as expected result	FAIL	

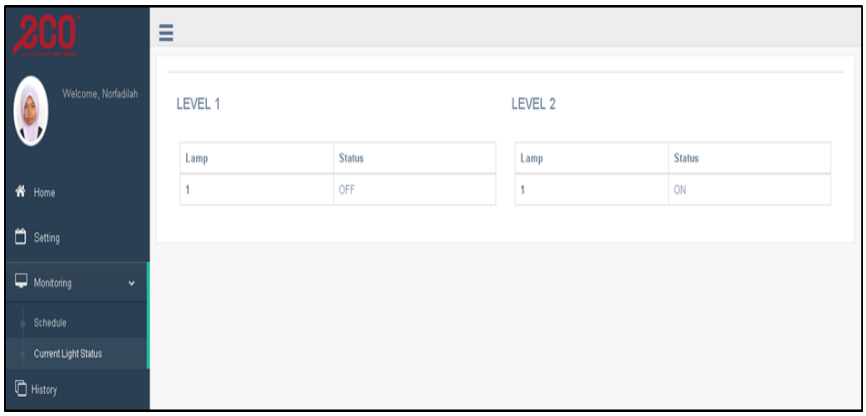
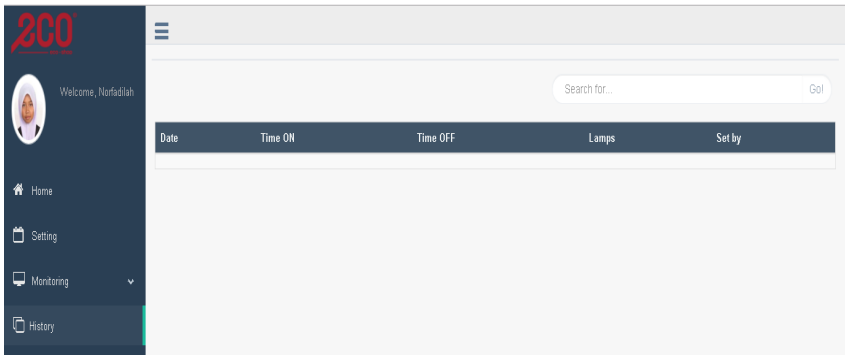
APPENDIX D

USER MANUAL

Interface	Step
	**Login Page** 1. This screen displays the login page interface. 2. There are login provided for user that had already register. 3. User must input their email and password correctly to login. 4. If user forget the password, they can follow the recovery way provided on that page.

	**Register Page** 1. This screen displays the register page interface. 2. This registration is provided for Chief only. 3. Click on submit button to continue the registration
	**Main Menu Page** 1. This screen displays the home page interface for Chief. 2. For Supervisor Assistant, they only do not has register link at the bottom left tab.

	**Schedule Page** 1. This screen displays form of schedule. 2. User must key in date, time to turn on and off, and which bulb to light on based on schedule.
	**Schedule Page** 1. This screen displays list of schedule has been submitted. 2. User can delete by click the delete link at the last column for each row if necessary.

	**Current Light Status Page** 1. This screen displays list of lamps at each level with status on or off.
	**History Page** 1. This screen displays list of schedule has been submitted with name of person set it up.