UNIVERSITI TEKNIKAL MALAYSIA MELAKA

FTK EMERGENCY LIGHT MONITORING SYSTEM USING WIFI

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours.

By

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FACULTY OF ENGINEERING TECHNOLOGY

2016

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAORAN PROJEK SARJANA MUDA

TAJUK: **FTK EMERGENCY LIGHT MONITORING SYSTEM USING WIFI**

SESI PENGAJIAN: **2016/17 Semester 1**

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Electronics Engineering Technology (Industrial Electronics) with honours. The member of the supervisory is as follow:

……..

(**EN MOHD SAAD BIN HAMID)**

ABSTRAK

Kemudahan lampu kecemasan kebiasanya dipasang di kawasan awam seperti pejabat,industri dan lain-lain. Berdasarkan peraturan kebakaran di kebanyakan negara kemudahan seperti ini perlu dipasang dan diperiksa secara berkala untuk memastikan lampu dalam keadaan normal. Pada asasnya, tugas pemeriksaan dan penyelenggaraan yang dijalankan oleh manusia dan mengambil masa lebih kurang 30 minit untuk setiap peranti. Dalam sistem lampu kecemasan yang sebelum ini, kerosakan dalaman lampu kecemasan biasa mesti dikesan dan dibaiki oleh pekerja-pekerja penyelenggaraan. Sebagai contoh cas bateri berlebihan,masalah lampu atau mentol tidak berfungsi dan sebagainya kerosakan. Dalam usaha untuk memastikan thap lampu kecemasan dalam keadaan baik, sistem kecemasan perlu keadaan operasi dan kebolahcayaan yang tinggi. Sistem ini boleh beroperasi dengan sendiri dan boleh memeriksa keadaan lampu tersebut. Dengan peningkatan ciri-ciri baru dalam dalam sistem keselamatan, dalam masa yang sama kos penyelenggaraan dapat dikurangkan. Dengan menggunakan modul Wi-Fi daripada NodeMCU ESP8266, yang membolehkan peranti elektronik untuk bertukar-tukar data atau menghubungkan dengan Arduino melalui pin komunikasi bersiri (Tx dan Rx).Lampu kecemasan berfungsi untuk memantau dan memberi keadaan status lampu semasa penyelenggaraan menggunakan peranti wifi dan mudah untuk memantau untuk keselamatan atau bilik kawalan. Modul NodeMCU akan menghantar data-data yang diberikan oleh lampu kecemasan. Konsep sistem ini, pengguna boleh memeriksa keadaan lampu bila-bila masa jika mempunyai masalah atau tidak dengan menggunakan komputer dan telefon pintar.Node MCU akan mengeluarkan alamat Internet Protokol (IP Address) bagi setiap lampu sebagai nombor identiti untuk di paparkan di paparan pelayar internet melalui protocol HTTP.Jadi ia boleh menjimatkan wang, tenaga dan masa. Tambahan pula, penyelenggaraan sistem ini akan menjadi lebih sistematik.

ABSTRACT

The Emergency lighting facilities are usually installed in public areas such as offices, industrial, etc. Based on building safety regulations contained in the nation, this facility should be installed and checked regularly to make sure the lights under normal conditions. Basically, the task of checking and maintenance undertaken by human only and usually takes around 30 minutes for each device. In the traditional emergency light systems, the common internal damage an effect and repaired by maintenance workers. For example battery overcharging, lighting problem or led not function and so on damage. In order to ensure the emergency light level in good condition, the emergency system needs to operate with high reliability. This system needs to be independent or capable to test themselves, display internal damages and check their functional state. With the improvement of the new features in security systems, at the same time, maintenance costs will be reduced. The hardware section consists of smart phones as the controlling device, the power supply module and the control module. By using the Wi-Fi module of node mcu, which is allowing an electronic device to exchange data or connects with Arduino through transmit and received a pin (Tx and Rx). An emergency light functioning to monitor and give status condition of lamp during maintenances using the wifi device and easy to monitor for security or server room. The transmitter of Node MCU Wi-Fi module and transmit the data given by the emergency light. This system concept, the user can check anytime the conditions of emergency light if have a problem or not by using computer and smart phone. The node MCU will display IP Address for every light as identity part number and then display at webserver (HTTP). So that can save money, energy and time. Furthermore, this system maintenance became more systematic.

DEDICATION

Dedicated to my beloved mother, Hamisah binti Imas who always there for me, my respectful father, Jamaludin bin Ismail and my beloved siblings for whom after all might ALLAH I owe my success, always praying for me, encouraging me and always being there for me. To my lecturer and supervisor, for his guidance and encouragement, Mr. Saad bin Hamid. To all my friends, for their unconditionally support. From my heart I say THANK YOU.

ACKNOWLEDGMENTS

Alhamdulillah, I praise The Almighty, Allah for giving me the chance to finish up this Projek Sarjana Muda 2 report. I would like I would like to thanks and express my deepest appreciation to my supervisor, Mr. Mohd Saad Bin Hamid. He helped me a lot during this two semesters, gave supported, guided and cheering me up to complete this final year project. I would also like to acknowledge to our panel during presentation to give suggestion and improvement the project in future.

I love to say thank you to my family for continuous support given to me morally or technically especially to my parents, Jamaludin Bin Ismail and Hamisah Binti Imas for nonstop support.

Next, thank you to all my beloved friends for their cooperation and good luck to all of you too. For important people, the technicians, Mr. Arif. He helped me a lot. Lastly, thank you for all the people who helped me directly and indirectly.

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LIST ABBREVIATIONS, SYMBOLS AND NOMENCLATURES

Tx	Transmit
Rx	Received
IP	Internet Protocol
RFID	Radio Frequency Identification
IDE	Integrated Development Environment
HTTP	Hypertext Transfer Protocol
LDR	Light Diode Resistor
USB	Universal Serial Bus
I/O	Input Output
DC	Direct Current
AC	Alternate Current
IrDA	Infrared Data Association
Adc	Analog Digital Converter
PCB	Printed Circuit Diode
GND	Ground
V	Voltage
mV	Milivolt

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter will describe the project background, objectives, problem statement, and scope of the project, general flowchart and project outlines in order to give an overall view of the project.

1.1 Background

In the traditional emergency light systems, the common internal device broken or damages will be repaired by maintenance workers and check it using manual method such as go through one by one and press the button to check. By using this method doesn't relevant and efficient and have certain company not maintenance it properly because need spend many costing for a session. In order to ensure the emergency light level in good condition, the emergency light must be checked and tested at least two times per month to make sure zero problem that will happened and the emergency system also needs to operate with high reliability. This system needs to be independent or capable to test themselves, display internal damages, for example battery overcharging, lighting problem or LED not function and check their functional state. With the improvement of the new features in security systems or emergency system at the same time, maintenance costs will be reduced. This system concept, the user can check anytime the conditions of emergency light have a problem or not by using a computer. So that can save money, energy and time.

1.2 Objective

The objective of the project can be outlined as follow:

- To study the function and operation of emergency light for diagnostic purpose.
- To design an emergency light monitoring system based on WIFI.
- To develop a prototype device that can be connected between emergency light and WIFI.

1.3 Problem Statement

This project is about to create a new system for the emergency light. Firstly, this system needs to be changed because the previous system is hard to properly maintain and other features is there are too many emergency lights to be checked. The old system also exposed to high risk if there is any fire if it is not maintain properly. Other than that, much cost to spend to maintain at all buildings and must spend long time when performing the maintenance activity. The emergency light monitoring system using WIFI can solve that problem. This project develops for saving the cost when needs the maintenance and can check. This system can monitor all emergency light from the centre maintained building.

1.4 Scope of project

This system is built based on the previous model and in order to build this we use hardware and software. The important part that we use is computer, from computer we get to know whether the light functioning or not. From computer we control and monitor all emergency light at all departments and building. When something happens at emergency light the system detectthe error and signal or data will be processed in Arduino and then transmit the signal using a WIFI module to computer monitoring. In hardware part we use the WIFI module to transmit the

signal to a computer. This is for monitoring the emergency light and to determine whether it is functioning or not.Without having to check all the emergency lights physically. In the software part we use the Arduino software to program the circuit to detect the condition of emergency light have a failure and need to be maintenance.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

In this chapter, the literature review will be explained and focused about the ideas or some information to completing the project. The resource that will refer such as books, journal or website and all source included the operation of the circuit in term of hardware and software. Other than that, in this chapter also make a study about several projects that related to make some improvement or take some idea from the other project. It is useful to complete a project that has created and we compared this project from the previous project to make this project more efficient and systematic.

2.1 Research from Previous Project

Based on the previous project was needed to complete this project successfully. The project must be upgrade and modified the system that has been demonstrated before. Other than that, according to current developments, the latest technology used in this project to solve the problems faced at present.

One for system is a development of cloud based light intensity monitoring system using Raspberry Pi by (Jatoth, 2015). The system was implemented by using Raspberry Pi for monitoring the light intensity compare, then this project we use the Arduino to save the cost and easy to develop. Other than that, the Raspberry Pi program more complex compare than Arduino because the Arduino had already specific program and just to modify the program to build another program. For

example, by using the WIFI connection to import the coding, need to search it from the library which is easy to modify compared to Raspberry which is it need to build it manually. The next project is emergency lighting control by DALI (Patil, 2012). DALI stands for Digital Addressable Lighting Interface protocol has enabled the development of centralized assessment of all emergency lighting fitting. The wiring connects each emergency light back to a DALI bridge connected using USB, RS232 or Ethernet port to a resident computer. The concept of this project, there uses cable to communicate all the system. The disadvantage of this project is the connection using a cable This concept using a lot of money because uses the cable and the costing of maintenance more expensive.

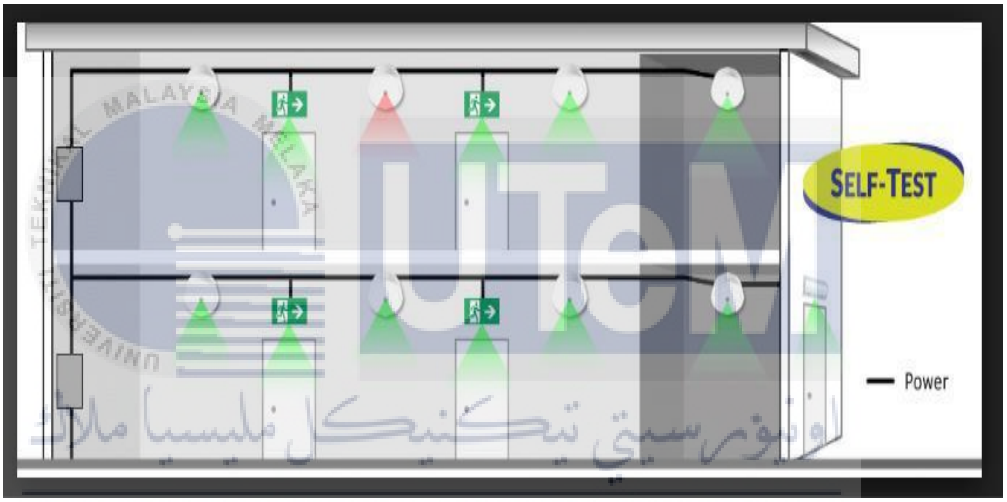


Figure 2.1: Example Concept of Design Emergency Light (Emergency Light Product, 2016)

From the previous project a smart lighting, emergency system for fluorescent lamps (Alonso, 1993) there are methods to detect and checking the functional state and displaying an internal damages. This project uses the microcontroller to control the performance of emergency light. The output of this project is LED when the microcontroller will detect the functioning of the lamp the data will process directly and display output. There are several failures can be detected using microcontroller such as overcharges, inverter and lamp.

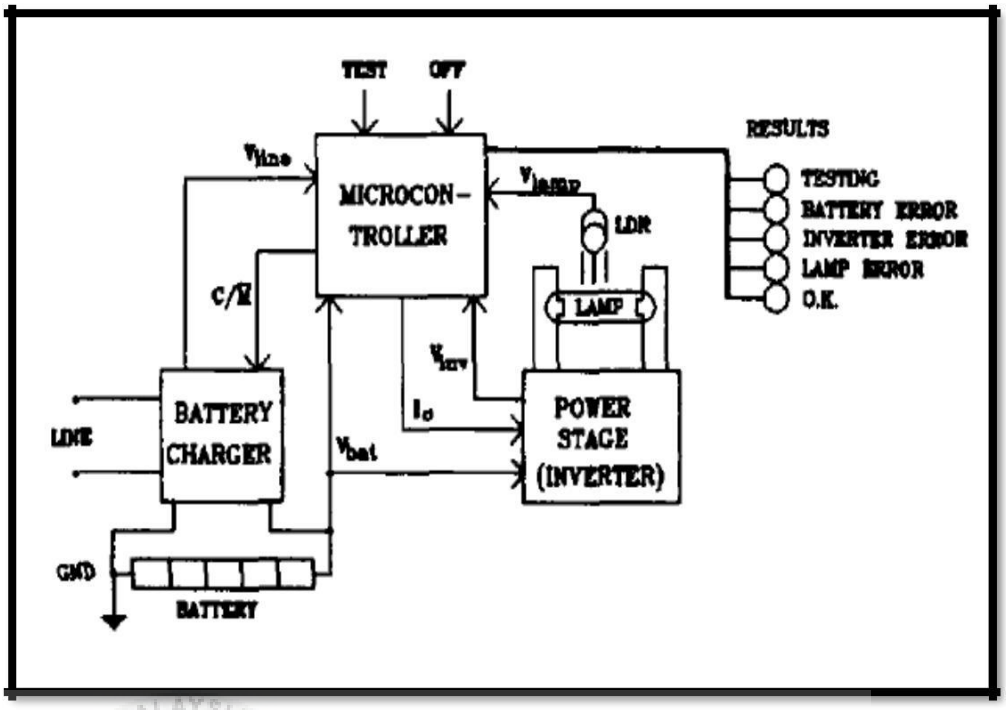


Figure 2.2: Example Concept from Previous Project (Alonso,1993).

2.2 Hardware and Software Review

In this part is to review the hardware and software equipment that is used in this project. Some explanation about functioning and information regarding parts and components for the hardware to observe the difference between the specifications to develop this project.

2.2.1 Wireless Networking

Currently, the wireless communication technology is the important part of our life to communicate with each other. Many advantages of development technology because users can handle all of things with the same time. The example of device that used technology wireless to communicate with each other for example cordless telephones, mobiles, and many more part in computer wireless. Technology of wireless communication can be

describe such as transferred signal or data between two or more device means that not an electrical conductor. Example of wireless technologies commonly used is at radio. The user can hear the voice from anywhere, even millions, of kilometres because the signal that transfers using the satellite. There are many advantages comparatively then the disadvantages of using wireless technology because wireless is the important things that must have for everyone to communicate. One of them is enhancing of technology in conveying the information quickly to the consumer from anywhere and can save the time. Other than that, in this time working people and professionals communicate with each other using internet because internet can connect that person anywhere and anytime without cables. There also helps to increase some person in side their performance of work and improves the productivity or systematic (Kumar, 2014).

Figure 2.3 shown a few types of wireless technologies that uses which is widely spread all spaces without limitation, allowing users to communicate with each other.

Figure 2.3: Types of Wireless Communication Technologies.

2.2.1.1 The Advantage of Using WIFI

The advantages of using WIFI are further elaborated as follows:

- Connect easier.

  The wireless technology of such as network allows users to access network resources from anywhere and can save the time.

- Mobility

  With the emergence of public wireless networks, user can access and serve the internet even anywhere and the services can communicate faster.

2.2.2 WIFI Module NodeMCU ESP8266

NodeMCU ESP8266 is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266.

The NodeMCU ESP8266 is an open-source firmware and development kit that helps you to Prototype your IOT product within a few Lua script lines. Features:

- Open-source
- Interactive
- Programmable
- Low cost
- Simple

- Smart
- WI-FI enabled
- Arduino-like hardware IO: Advanced API for hardware IO, which can dramatically reduce the redundant work for configuring and manipulating hardware. Code like Arduino, but interactively in Lua script.
- Nodes style network API: Event-driven API for network applicaitons, which facilitates developers writing code running on a 5mm*5mm sized MCU in Nodes style. Greatly speed up IOT application development process.

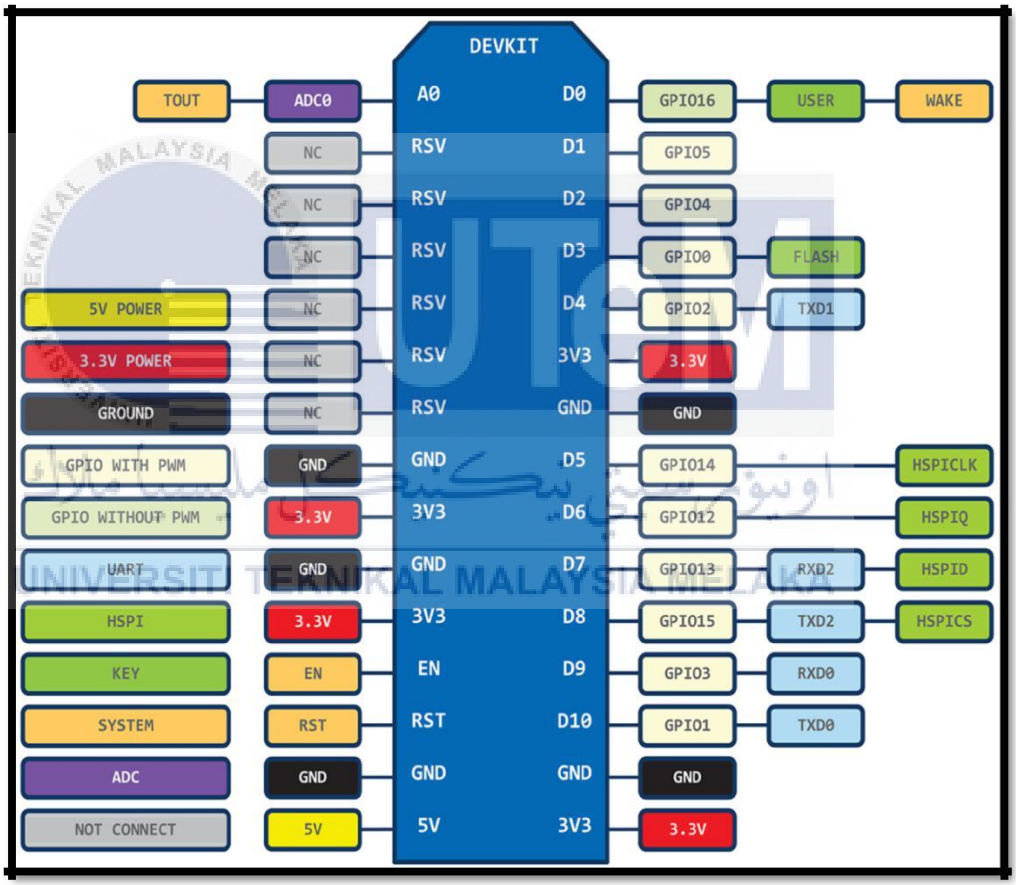


Figure 2.4: NodeMCU ESP8266 WIFI.

2.2.3 Arduino Controller

Arduino is a project and user community that designs and manufactures computer, open-source hardware and software. The microcontroller based kits for building digital devices and interactive objects that can sense and control physical devices. The task is based on microcontroller board designs, made by various vendors, using various microcontrollers. These systems provide sets of digital and analog I/O pins that can interface to various expansion boards (shields) and other circuits. The boards feature serial communication interfaces, including Universal Serial Bus (USB) on some models, for loading programs for personal information processing systems. For programming the microcontrollers, the Arduino project provides an integrated development environment (IDE) based on a programming language on processing which also supports the languages C and C++.

2.2.3.1 Arduino Nano

The Arduino Nano is a small, complete and breadboard friendly board based on the AT mega 328 (Arduino Nano) or AT mega 168 (Arduino Nano). It has more or less the same functionality of the Arduino Duemilanove, but in a different package. It lacks only a DC power jack, and works with a Mini-B USB cable instead of a standard one. The Nano was designed and is being produced by Gravitech.

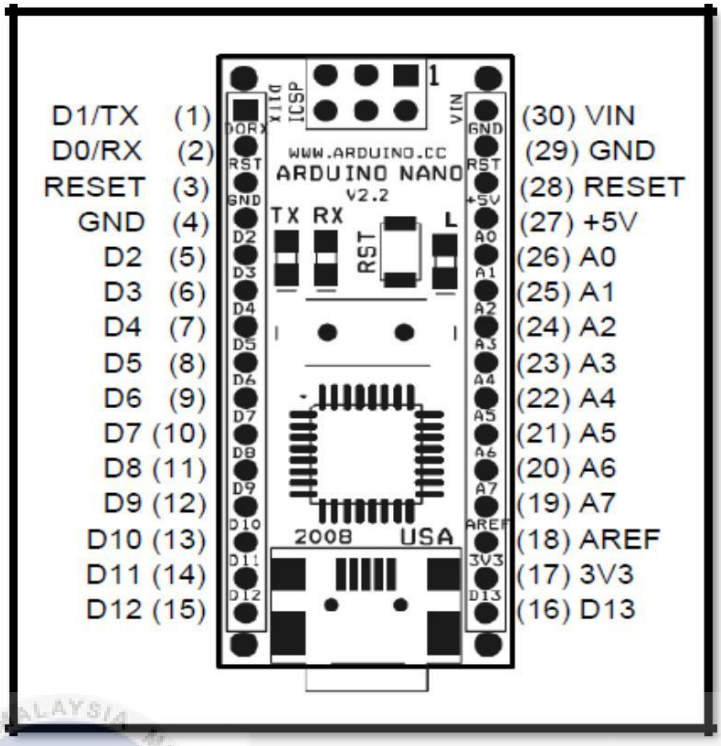


Figure 2.5: The Pin Configuration of Arduino Nano

2.2.3.2 Advantage Arduino Nano

i. Ready to Use:

Arduino comes in a complete package form which includes the 5V regulator, a burner, an oscillator, a micro-controller, serial communication interface, LED and headers for the connections.

ii. Contains more ADC pin:

There are many example on Arduino IDE. For example to measure voltage using ATmega8 micro-controller and to display the output on computer screen. The process will start from learning the ADC's of micro-controller for measurement, went through the learning of serial communication for display and will end at USB – Serial converters.

iii. Effortless functions:

The automatic unit conversion capability. During debugging do not have to worry about the units' conversions just use the main parts of projects.

2.3 Wireless Technology

2.3.1 Bluetooth Technology

Bluetooth is a networking technology aimed at low-powered, short range applications. Bluetooth is a recently proposed standard for short range, low power wireless communication. Initially, it is being envisioned simply as a wire replacement technology. It is most commonly described application is that of a "cordless computer" consisting of several devices, including such as personal computer, possibly a laptop, keyboard, mouse, joystick, printer, scanner each equipped with a Bluetooth card. There are no cable connections between these devices, and Bluetooth is to enable seamless communication between all them, essentially replacing what is today achieved through a combination of serial and parallel cables, and infrared links. Besides that, Bluetooth has the potential for being much more than a wire replacement technology and the Bluetooth standard was indeed drafted in such a more ambitious goal in mind. Bluetooth holds the promise of becoming the technology of choice for adhoc networks of the future. This is in part because its low power consumption and potential low cost make it an attractive solution for the typical mobile devices used in adhoc networks. Bluetooth is a specification for Wireless Personal Area. It is a way to connect and exchange information and data between mobile phones, laptops, digital cameras and video games. The communication is wireless and has the range of up to 10 meters (Singh, 2011).

Booting up and then transfer the data to desktop computer this around process takes around 10-15 minutes, depending upon the speed of our notebook. The Bluetooth comes in with a wireless headset and it comes free with the mobile phone or computer, the wireless headset also useful for people who like to be on the go or while driving the car, as they are hands free.

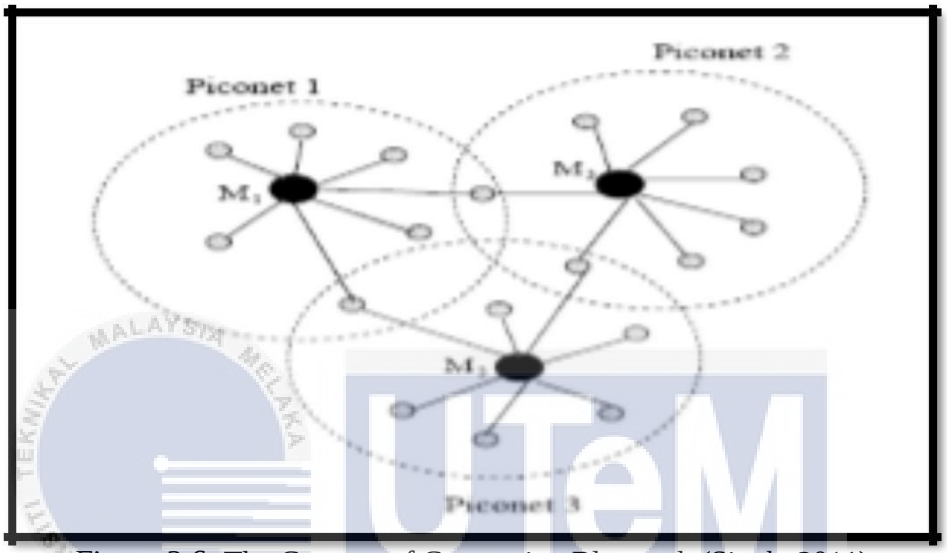


Figure 2.6: The Concept of Connection Bluetooth (Singh, 2011).

2.3.2 Infrared Technology.

Infrared Data Association (IrDA) is used to provide wireless connectivity for devices that would normally use cables to connect. IrDA is a point-to-point, narrow angle (30° cone), ad-hoc data transmission standard designed to operate over a distance of 0 to 1 meter and at speeds of 9600 bps to 16 Mbps. IrDA is not able to penetrate solid objects and has limited data exchange applications compared to other wireless technologies. IrDA is mainly used in payment systems, in remote control scenarios or when synchronizing two PDAs with each other. The newly developed technology converts USB 2.0 electrical signals to infrared signals and wirelessly transmits them by using the "USB-infrared converter" attached to a USB host and a USB device. The converter is mounted with an infrared communication

module whose transmission speed is 1Gbps. According to the USB 2.0 specifications, response signals must be sent back within 1.5μs after data is transmitted between a USB host and a USB device. Because it normally takes more than 1.5μs to convert electrical signals to infrared signals, it is impossible to transmit data just by converting signals (Ali, 2014).

Figure 2.7: The Concept Connection of Infrared.

2.3.3 RFID Technology.

Radio frequency identification (RFID) is a generic term that is used to describe a system that transmits the identity (in the form of a unique serial number) of an object or person wirelessly, using radio waves. It is grouped under the broad category of automatic identification technologies. Auto-ID technologies include bar codes, optical character readers and some biometric technologies, such as retinal scans. The auto-ID technologies have been used to reduce the amount of time and labour needed to input data manually and to improve data accuracy. Some auto-ID technologies, such as bar code systems, often require a person to manually scan a label or tag to capture the data. RFID is designed to enable readers to capture data on tags and transmit it to a computer system without needing a person to be involved. There are over 140 different ISO standards for RFID for a broad range of applications. With RFID, a passive or unpowered tag can be powered at a distance by a

reader device. The receiver, which must be within a few feet, pulls information off the 'tag,' and then looks up more information from a database. Alternatively, some tags are self-powered, 'active' tags that can be read from a greater distance. RFID can operate in low frequency (less than 100 MHz), high frequency (more than 100 MHz), and UHF (868 to 954 MHz). Uses include tracking inventory both in shipment and on retail shelves (Mark, 2005).

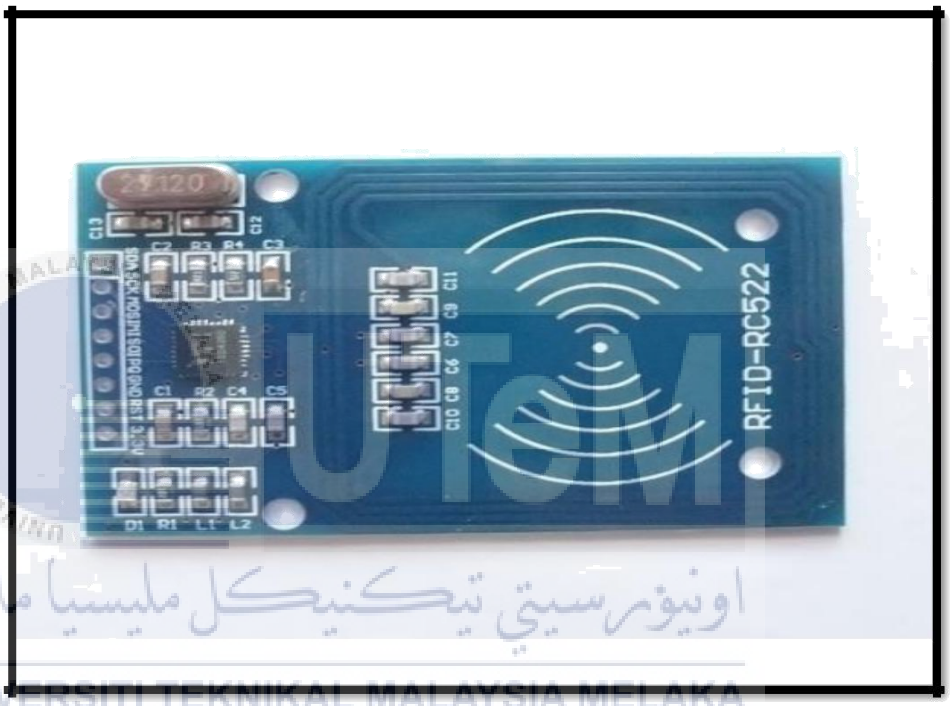


Figure 2.8: The RFID Module.

2.3.4 WIFI Technology

Wi-Fi technology is a wireless local area network that enables portable computing devices to connect easily to the Internet. The standardized as IEEE 802.11 Wi-Fi approaches speeds of some types of wired Ethernet. It’s become the de factor standard for access in private homes, within offices, and at public hotspots. Some businesses charge

customers a monthly fee for service, while others have begun offering it for free in an effort to increase the sales of their goods (Timo, 2015).

2.3.4.1 Advantages of WIFI

- The communication has enhanced to convey the information quickly to the consumers and no limitation.
- Working professionals can work and access Internet anywhere and anytime without carrying cables or wires wherever they go. This also helps to complete the work anywhere on time and improves the productivity.
- Doctors or workers and other professionals working in remote areas can be in touch with medical centers through wireless communication.
- The urgent situation can be alerted through wireless communication. The affected regions can be provided help and support with the help of these alerts through wireless communication.
- Wireless networks are cheaper to install and easy to maintain.

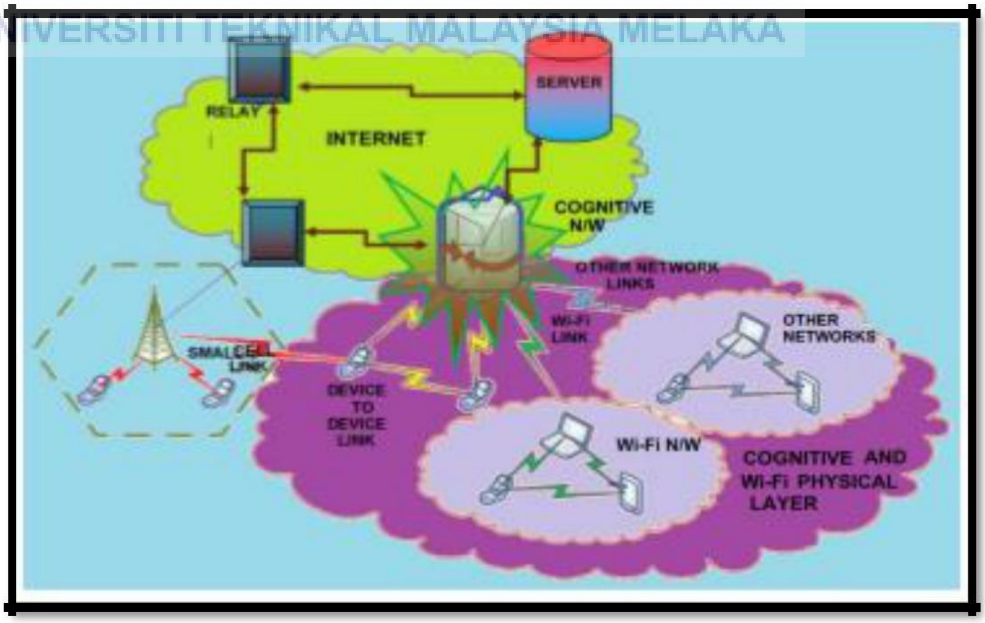


Figure 2.9: The Connectivity Interfaces of Cognitive Network With WIFI

2.4 Comparison the Wireless Technology

Table 2.4: The Comparison Specification of Wireless Techonology.

Specifications	Infrared	Rfid	Bluetooth	Wifi
Maximum coverage range	10 cm	3 meter	50 meter	100 meter
Frequency of operation	13.56 MHz	varies	2.4 GHz	2.4 GHz, 5 GHz
Communication	2-way	1-way	2-way	2-way
Data rate	106, 212, 424 Kbps	varies	22 Mbps	144 Mbps
Application	Credit card related payment, e-ticket booking	EZ pass tracking items	Communication between phone and peripherals	Wireless internet

2.5 Diagnostic Method from Previous Project

Diagnostic is a process to identify at specific areas of weakness or fault in order determine a condition, disease or illness. For example, in medical operation the superior performances of cross-sectional techniques, such as Computed Tomography and Magnetic Resonance Imaging, are well known, chest radiography still remains the main diagnostic procedure for chest imaging. Its main advantages are speed, both in the acquisition and in the interpretation of data, and low cost of the whole diagnostic procedure. These reasons, several chest diseases and cardiac congestions are often ruled out by this kind of examination from a previous project of diagnostic radiography an experimental study for estimation of optimal patient dose (Cantisani, 2011).

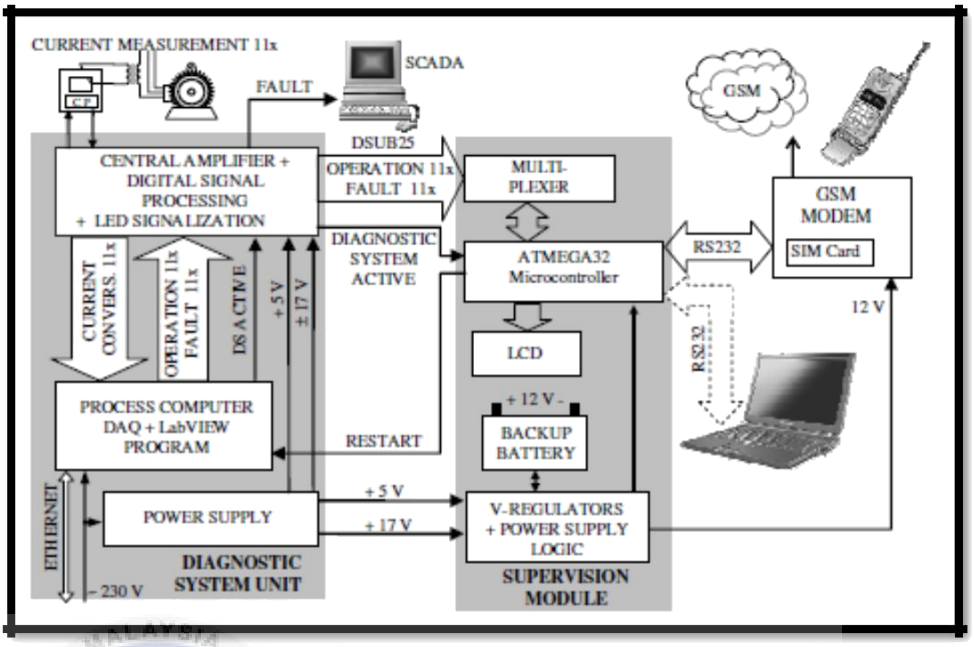


Figure 2.10: Example of Diagnostic of Medical (Cantisani, 2011).

The next project is a diagnostic system for online detection of rotor faults in induction motor drives. The main purpose is to detect the condition monitoring and diagnostic system for induction motor drives. It enables the detection of many different faults, which may arise during the lifetime of the motor and identify broken rotor bars at an early stage of the fault propagation. This method is based on the analysis of the current frequency spectrum, which can be measured motor operation without disturbing (Fiser, 2011).

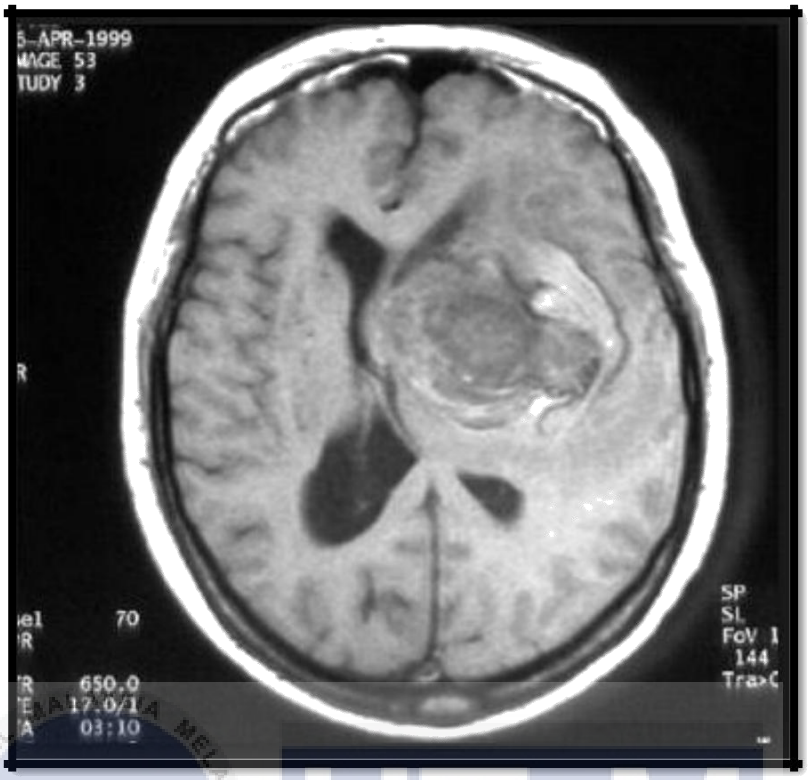


Figure 2.11: Schematic of the Monitoring and Diagnostic System Remotely Controlled via Ethernet Network or Mobile Phone (Fiser, 2011).

2.6 Main Component in Emergency Light system.

Emergency light is an integral part of household electronics nowadays. This system know Emergency light is used during the power failure to light up the home. As it is used during the power failure, it should last long, hence generally bright white LEDs are used in emergency light, because they produce more light and consume less power. Emergency light is very useful and popular project in DIY section. Then the purpose emergency light to build a simple and cost effective emergency light.In this emergency light circuit, when the Power goes OFF, the emergency light activates automatically. This system used for example four bright white LEDs, more LEDs can be added to produce more light considering that total

current consumption should not exceed the supply current. Ultra bright white LED consumes 3v and 20mA current.

2.6.1 Circuit Explaination

In emergency light system divide this LED emergency light circuit into two parts; first part is used to drop down the 220v AC voltage into 8v regulated DC, with the help of Transformer and bridge rectifier. And second part consists of Relay and rechargeable battery, which is used to lighten the LEDs during power failure.

In the first part based on Figure 2.12 below the circuit have used Transformer 9-0-9 500mA, to step down the 220 voltage into 9v. Bridge rectifier is the combination of 4 diodes which is used to remove the negative half component of AC. This process is called the Rectification. Further, 1000uF capacitor has been used for Filtration, means removing the ripples in resulted wave.The voltage regulator 7808 has been used to Regulate the DC wave, to provide the uninterrupted and smooth 8v DC supply. The whole process of converting 220v AC into low voltage DC, has been explained in this article: (Jayant, 2016).

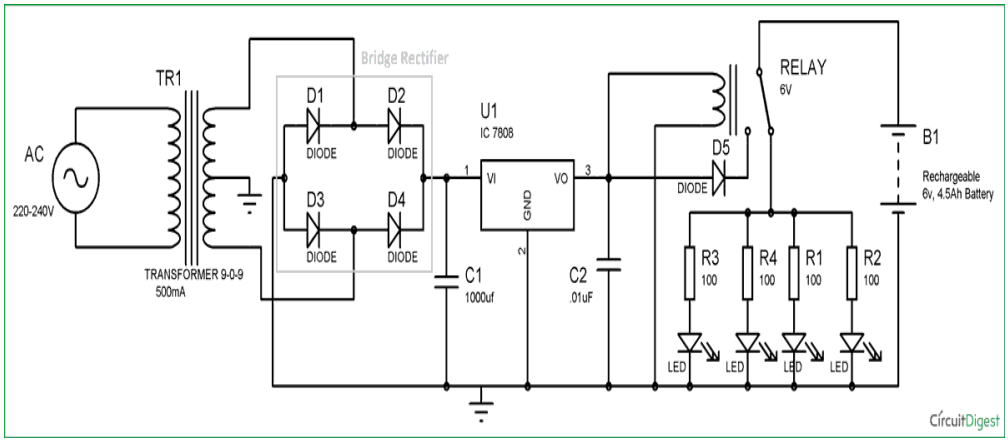


Figure 2.12 : Example Circuit in Emergency Light System(Jayant, 2016).

The second part of the emergency light circuit consist the main functionality, that is to automatically switch ON the emergency light (Array of white LEDs) on Power Failure. This circuit have used Relay here to automate this. A 6v, 4.5A rechargeable battery is connected to the Array of LEDs, through a Relay. Normally when there is no power failure, the coil of Relay remains energised and lever is attracted towards the NO (normally open) terminal and NC (normally connected) terminal remains open. In this situation LEDs are disconnected from the rechargeable battery and remains OFF, also battery is getting charge through the power supply from the transformer. A diode D5 is used to prevent the battery from flowing back.

Now when the power fails, relay coil become de-energized and lever gets connected to NC terminal, which connects the LEDs to the rechargeable battery, and LEDs array goes ON. This is how this emergency light works. Now when the power is restored back, relay gets activated and lever again connects to NO terminal which in turn disconnects the LEDs from the battery and connects battery to the transformer for charging. Generally 6V, 4.5A rechargeable battery comes with Deep discharge recovery and overcharge protection mechanism, but we can use zener diode of 6.8V to protect the battery from overcharging. We can also use other rechargeable batteries like Nickel-cadmium battery (NiCad),Nickel-metal hydride battery (NiCad), Nickel–metal hydride battery, cell phone batteries etc. Further this system also use PNP transistor BD140 in place of Relay. PNP transistor can be used here as a switch, like it will be OFF when continuously voltage is applied to base of it, in case when power is there and it will be ON, in case of power failure which connects the LEDs to the rechargeable battery, and activates the LED emergency light**.**

CHAPTER 3

METHODOLOGY

3.0 Introduction

For this chapter, the flow charts will explain about overall method in carrying out the project is presented. Other than that, were also able to focused and construct their project based on software and hardware.

3.1 Project Implementation and Development

In this part, there are several findings and research from research previously and some journal give information and advantage to improve to future studies. In this methodology is used to target and achieve our objective in order to get result successfully and perfect. Before project evaluation have several part to complete the project and report.

The Figure 3.1 shown the flows the process for overall project development. For starting process before develop this project there have some search and finding information based on previous article and journal. Firstly, the problem is how to achieve the objective and scope for the project has been defined. After research and viewing go through next process to plan how to construct this project from initial to complete and arranged via systematically.

For the software development was using Proteus 8.0 for simulation circuit design in same time the compiler for program Arduino using assembly language. For

the last part construct circuit on the PCB board and test their performance to ensure the circuit functioning follow by simulation.

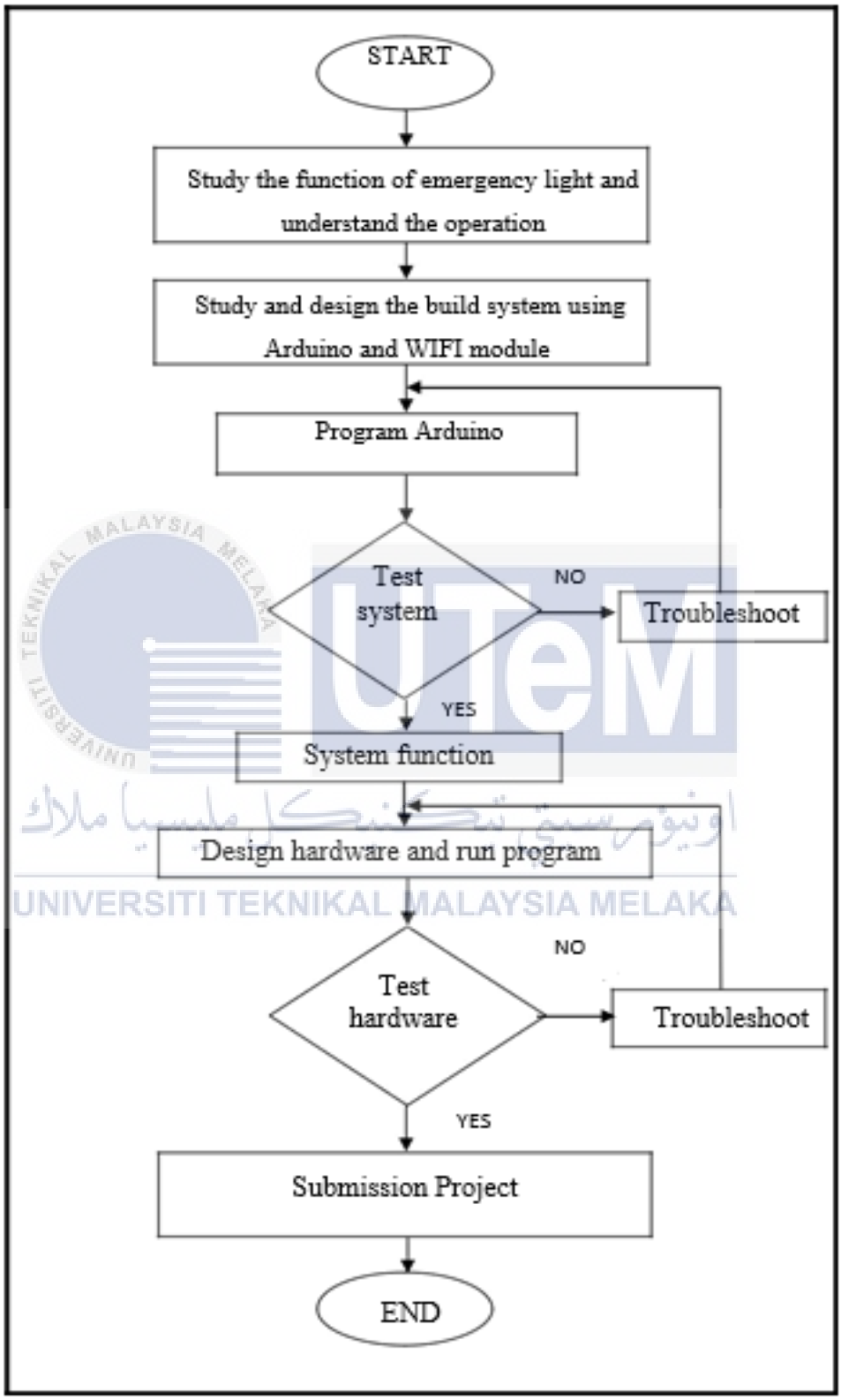


Figure 3.1: Flow Chart of Overall Project.

3.2 Block Diagram of Project Development

Figure 3.2 illustrates the block diagram of emergency light monitoring using computer and communicate using WIFI NodeMCU ESP8266 . The NodeMCU ESP8266 will send the signal to check the status or condition of lamp to identify the fault and the internal damage such as battery not function, or lamp not function. Firstly, the main part of this project that used the NodeMCU ESP8266 or WIFI module to transfer the signal to Arduino. Then, through a computer, the result of condition whether the light functioning or not and decide to operation maintained can be obtained. Moreover, it also can control or monitor the entire system emergency light at all departments and building. When the something happens at emergency light the system will be detected by the LDR sensor to check the LED and voltage sensor to know the value voltage of battery in emergency light. The status will be transferred when the button light test from the interface computer based on web page will be pressed and signal or data will be processed in Arduino then transmit the signal using the NodeMCU ESP8266 to computer monitoring. In hardware part the NodeMCU ESP8266 WIFI module has been used as the path to transmit the signal and using the IP address from NodeMCU ESP8266 to a computer. For this project for monitoring, emergency light that functions are not functioning without to check each one of them using manual methods. On the software part we using the Arduino software to program the circuit to detect the condition of emergency light have a failure and need to be maintenance. Proteus software also used to simulate the circuit in order to know the circuit function.

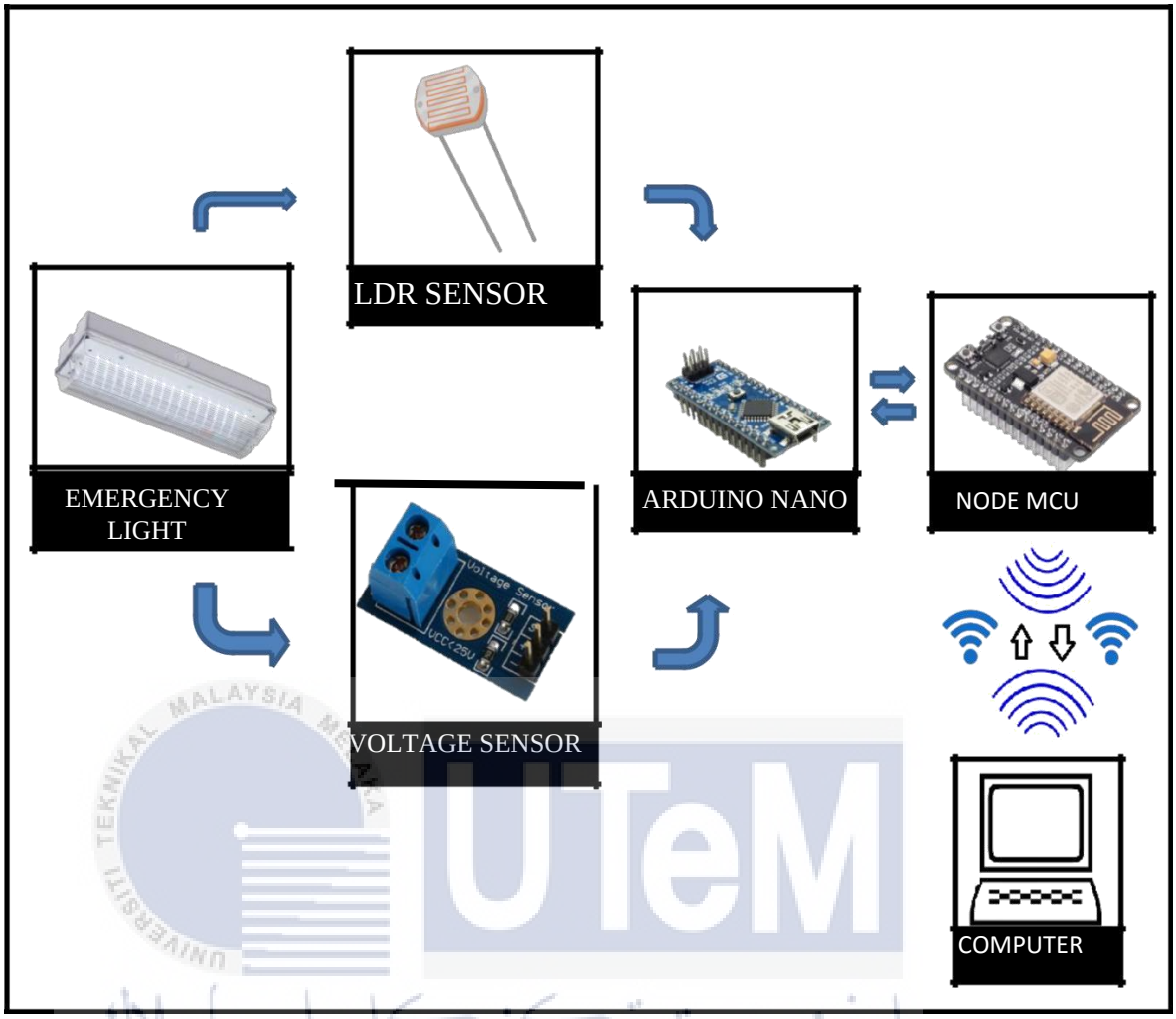


Figure 3.2: General Block Diagram of Project Development.

3.3 Flow Chart of Project Planning

Figure 3.3 shown the flow chart on how the process or system is running. At the beginning, the sensor and relay are triggered and communicated between NodeMCU ESP8266 and Arduino in order to transfer signal to check the status condition of battery and LED. This system is monitored by using a computer based on webserver through IP address from NodeMCU ESP8266 .

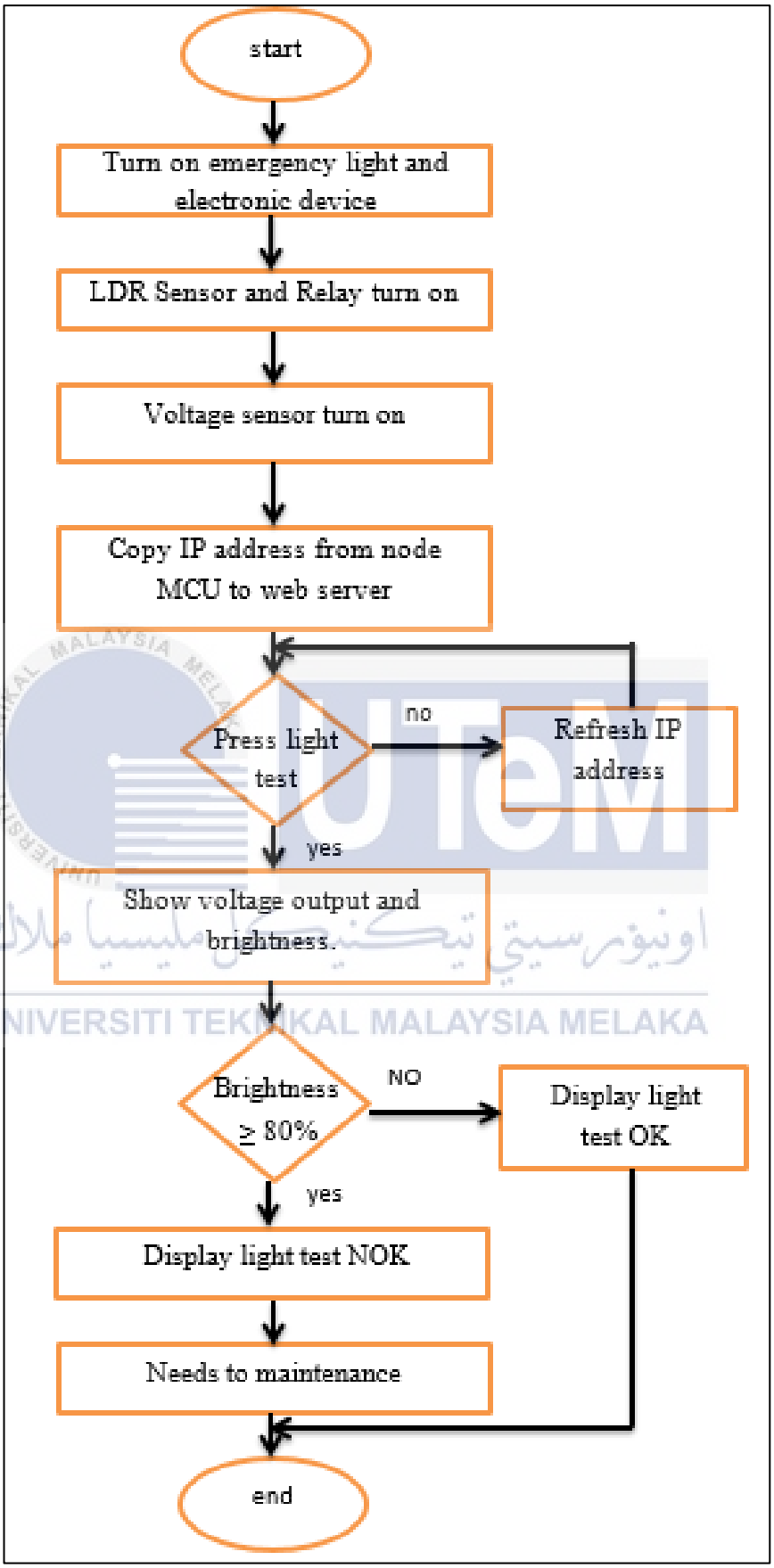


Figure 3.3: Flow Chart of Process on How it is Running.

3.4 Circuit Arduino with NodeMCU ESP8266 WIFI Module

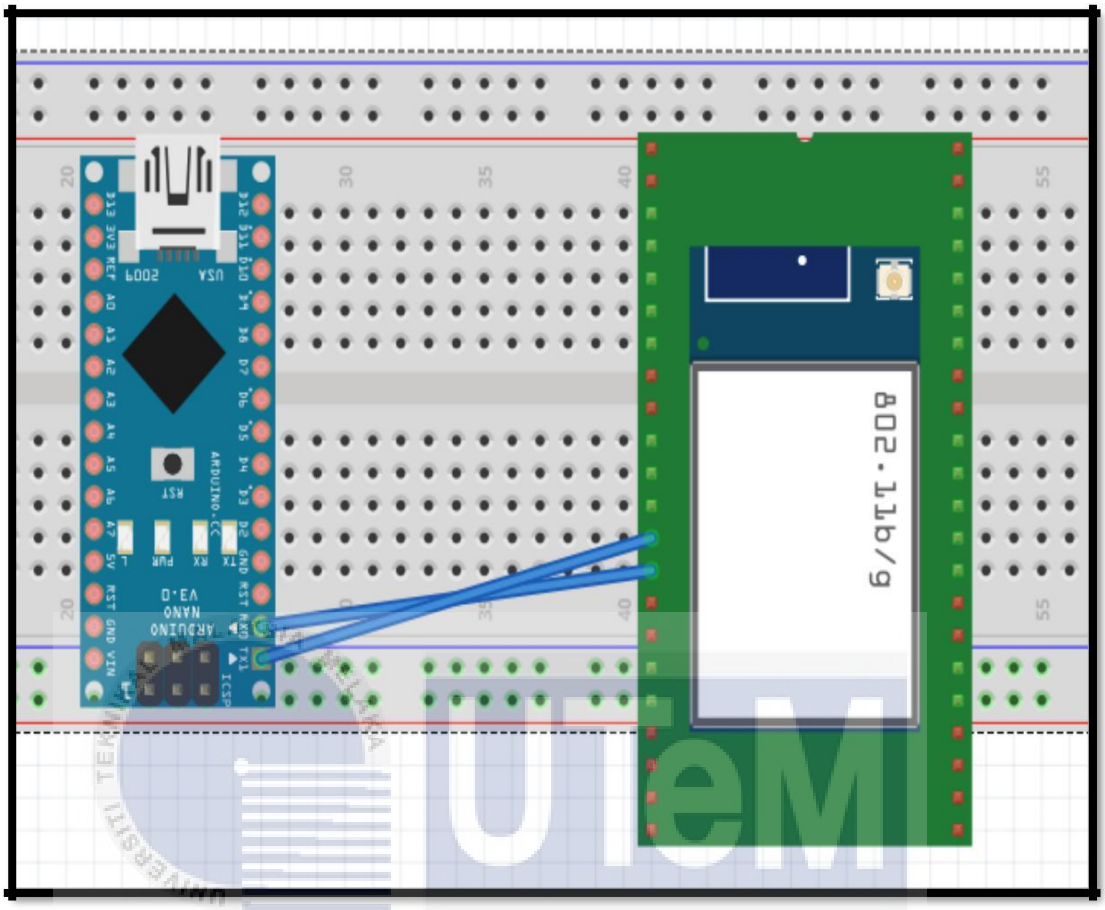


Figure 3.4: Circuit Connection Arduino with Nodemcu ESP8266 WIFI Module.

From Figure 3.4 the circuit demonstrates how to wire up or connection the ESP8266 of WIFI module with Arduino. The supply from Arduino Nano is a 5V power supply which is stepped down to 5V, but the power device, however needed and to conduct this circuit cannot have any supply from battery 9V because the component cannot work when supply over the limit. The NodeMCU ESP8266 WIFI module have function quite different with esp8266 because NodeMCU ESP8266 provide access to the GPIO (general purpose input output) and have 12 pins and one pin for analog input. The importance pin is TX and RX which mean TX for transmitting the data signal and RX for receiving the data signal.

This project used a single microcontroller, Arduino Nano. This is because it has analog input port for LDR and voltage sensor. While the NodeMCU ESP8266 only contain one port analog input.

3.5 Proteus 8 Software

To construct simulation by using Proteus make sure the component has in library schematic and pcb layout. After construct the simulation the software can simulate the circuit to make sure circuit functioning before construct the pcb. Figure 3.5 shown the interphase of Proteus 8 and user can simulate the programming of microcontroller accordingly to the design of required design.

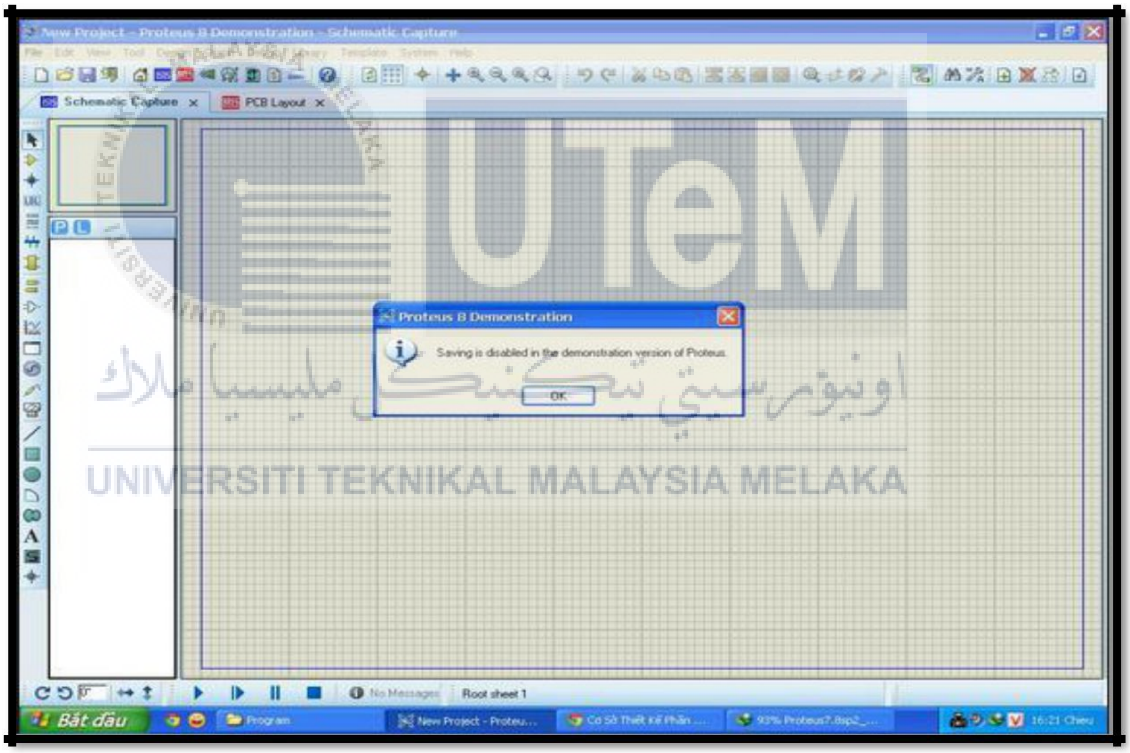


Figure 3.5: Interface of Proteus 8

CHAPTER 4

RESULT AND DISCUSSION

4.0 Introduction

Based on this chapter, our topic focused at result and analysis of this project then were shown and explained step by step. This project consists of implementation of hardware and software such as relay module, NodeMCU ESP8266 WIFI, voltage sensor, LDR sensor and Arduino.

4.1 Project Prototype

The project prototype are built in order to solve the problem previously and after develop this project were can save many part such as time to check condition, save cost to maintenance and other than that.

The purpose for this project is to shown the functionality of device used in this project implementation and how the connection when the data or signal will transfer to check the status and condition using web browser or web page.

4.2 Hardware Development and Experimental Works.

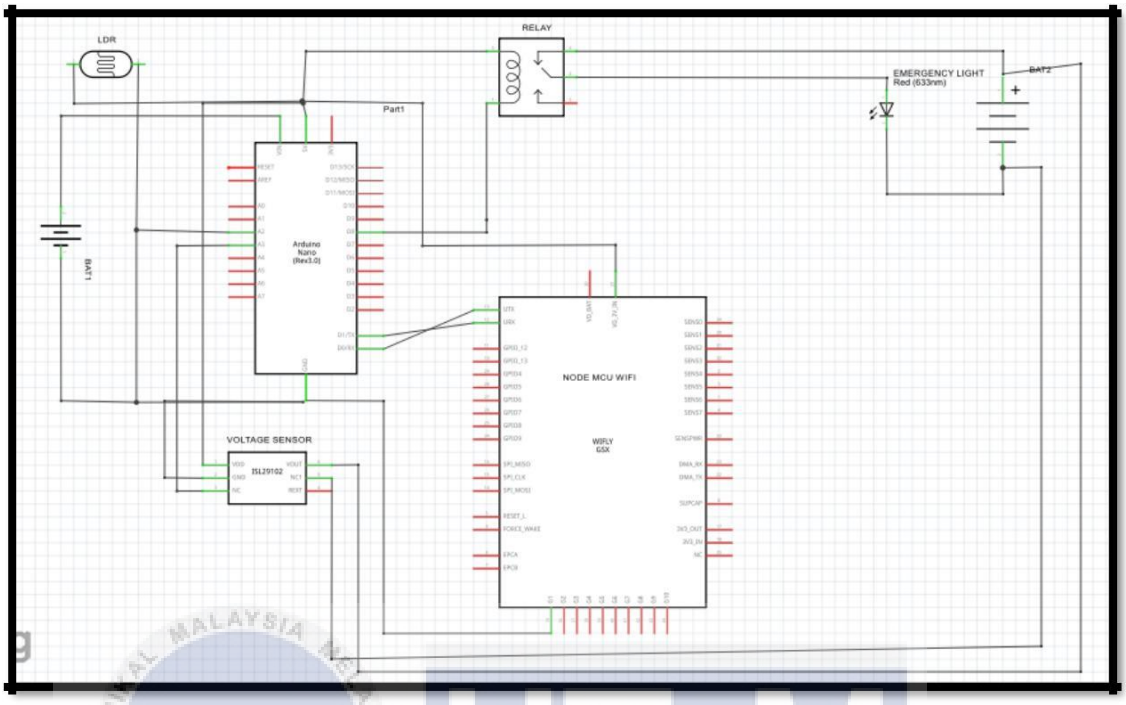


Figure 4.2: Layout for All Connection From Arduino to Nodemcu.

The component from this project will be setup and test the connection after construct the schematic. Figure 4.2 shown the connection from Arduino Nano give analog signal from LDR for detect the brightness of LED from emergency light and second from voltage sensor to measure the voltage or battery in emergency light. Both component are given analog input and were measured.

NodeMCU ESP8266 uses for carry out the specific IP address then after get IP address were monitor the system using web browser that have created. Then we use one channel relay active low to cut the supply when system turn on to measure the brightness of LED using LDR analog input. When the LDR read value 80% to 100% were consider the LED not ok or not function because function of LDR is read value of bright environment then when LDR read value 1% to 79% were consider the LED is ok or emergency light in good condition.

4.3 Software Development and Experimental Works

For this project, the important aspect to determining the approval and recognition of the method are used is integration between software and hardware. After that, this system is designed based on software and hardware capabilities and have several main important part during create this project such as interface web page and programming to connection. Figure 4.3 were shown the interface web page.

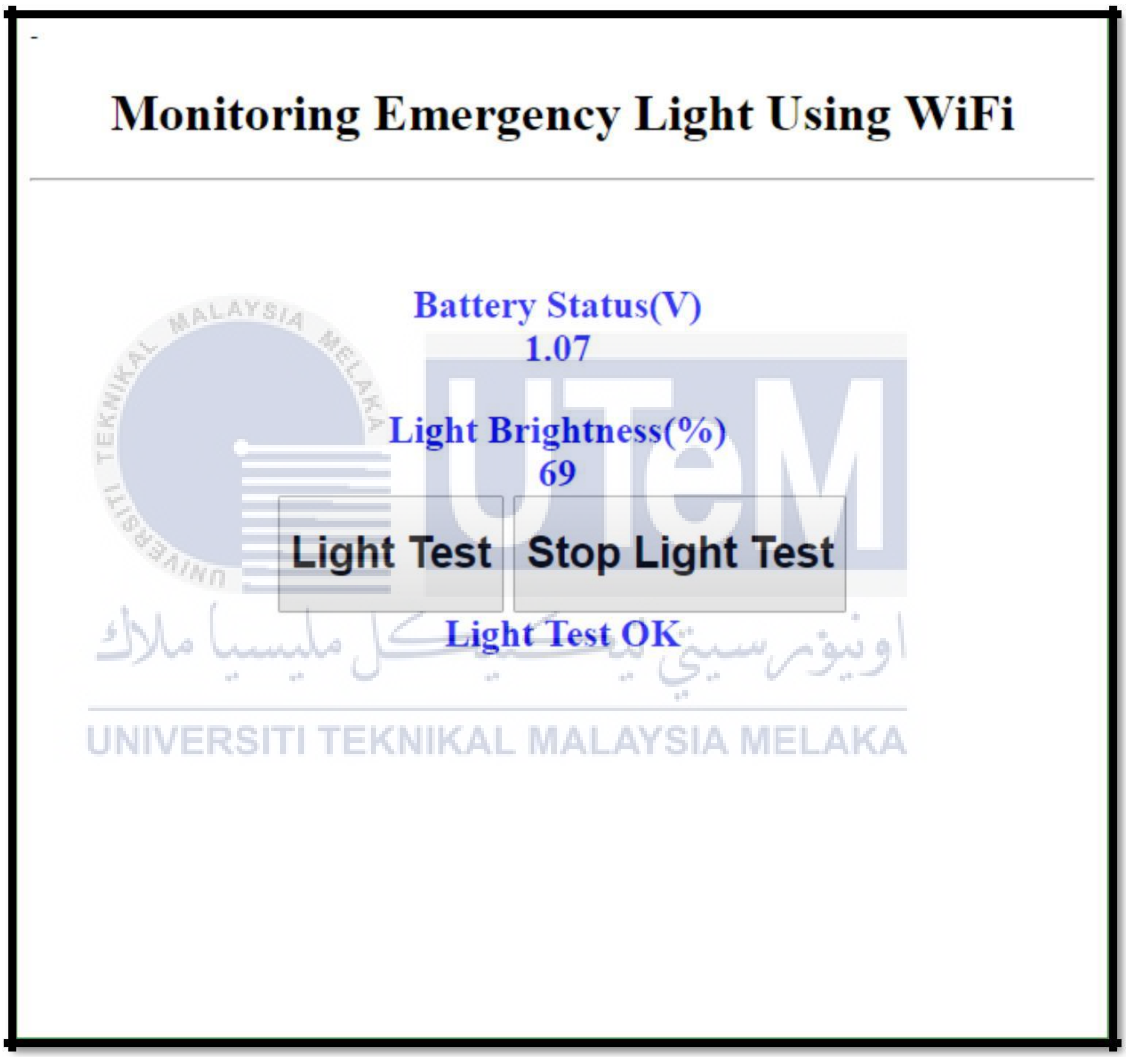


Figure 4.3: Interface Web Page to Monitoring.

4.3.1 Arduino and NodeMCU ESP8266 Programing

Arduino Nano is main component that were used in this project as microcontroller to control of the relay or controls the operation of the monitoring system for emergency light. Firstly, from Arduino IDE must installed into the computer and Arduino as the platform for writing the code and straight upload the program to Arduino device. Figure 4.3.1 below shown the code for the device that written using Arduino IDE.

Figure 4.3.1: Example Code for Arduino IDE.

The Figure 4.3.1 shown that the program of Arduino that were used in this project. For the basically, user must define the pins that are used for example used analog input “int voltage sensor = A3;” and then do the programming for variable setting and function prototype is set. All of input

must define and declare and follow by term such as int, char, and string or other than that.

```
const char* ssid = "iPhone";
const char* password = "man123456";
int luxvalue = 0;
int voutvalue = 0;
float vbat = 0.0;
int ledPin = 13; // GPIO13
WiFiServer server(80);

void setup() {
  Serial.begin(9600);
  delay(10);

  pinMode(ledPin, OUTPUT);
  digitalWrite(ledPin, LOW);


  Serial.println();
  Serial.println();


  Serial.print("Connecting to ");
  Serial.println(ssid);

  WiFi.begin(ssid, password);
```

Figure 4.3.2: Example Code for WIFI to get IP Address using NodeMCU ESP8266.

The Figure 4.3.2 shown the how to develop program for get IP address and this program are use at NodeMCU ESP8266 WIFI and uploaded. After that, interface at web page must create at same pogram in NodeMCU ESP8266 device. The program between Arduino Nano and NodeMCU ESP8266 must communicate each other to functioning the system and make sure all of character that use must similar. It is because when the IP address display at serial monitor first condition is the NodeMCU ESP8266 must send the data or signal to poweroff the relay at Arduino Nano based on Figure 4.3.3 below.

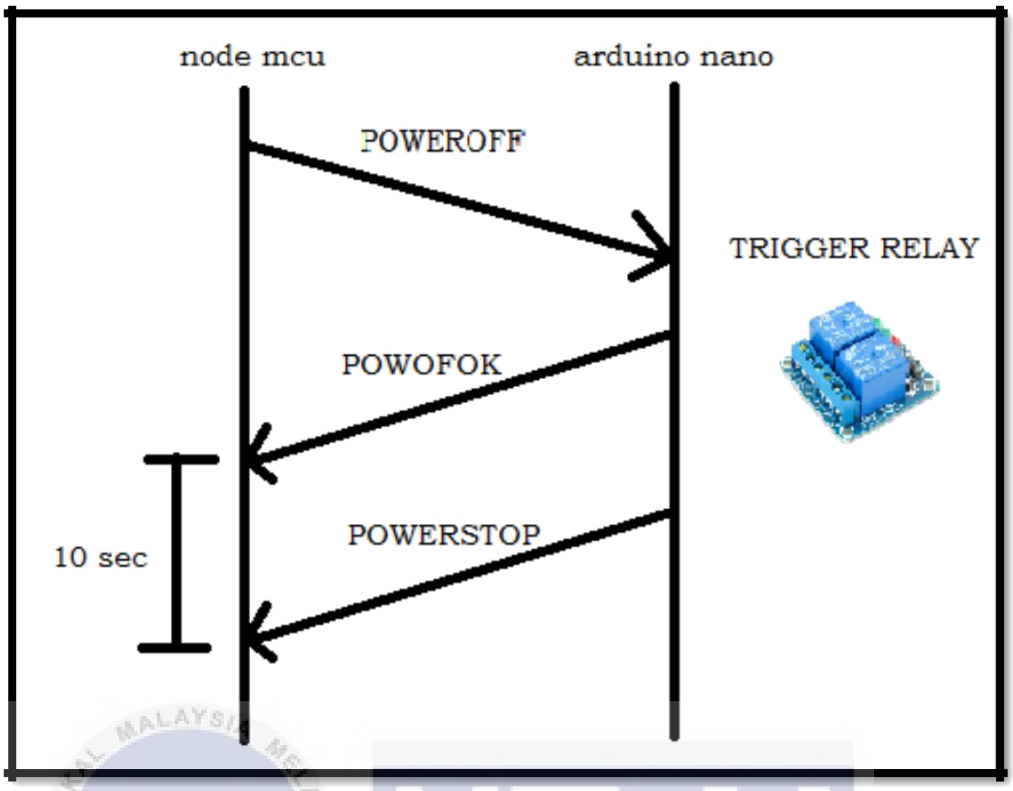


Figure 4.3.3: Communication Between Arduino Nano and NodeMCU ESP8266.

Based on the illustration above shown that how the communication between NodeMCU ESP8266 WIFI with Arduino Nano for initial condition. For example when the NodeMCU ESP826 send the signal “poweroff” to Arduino, the instruction should trigger the relay from normally close to normally open around 10 second. When the relay started Triger, Arduino send “powerok” and timer on around 10 second. After 10 second Arduino will send “powerstop”. At same time Arduino always send the signal to NodeMCU ESP8266 to check the status “lux” and “vout”. This process will repeated every 10 second when user start press the button “light test” from web page to monitor. Figure 4.3.4 shown the communication when relay started trigger.

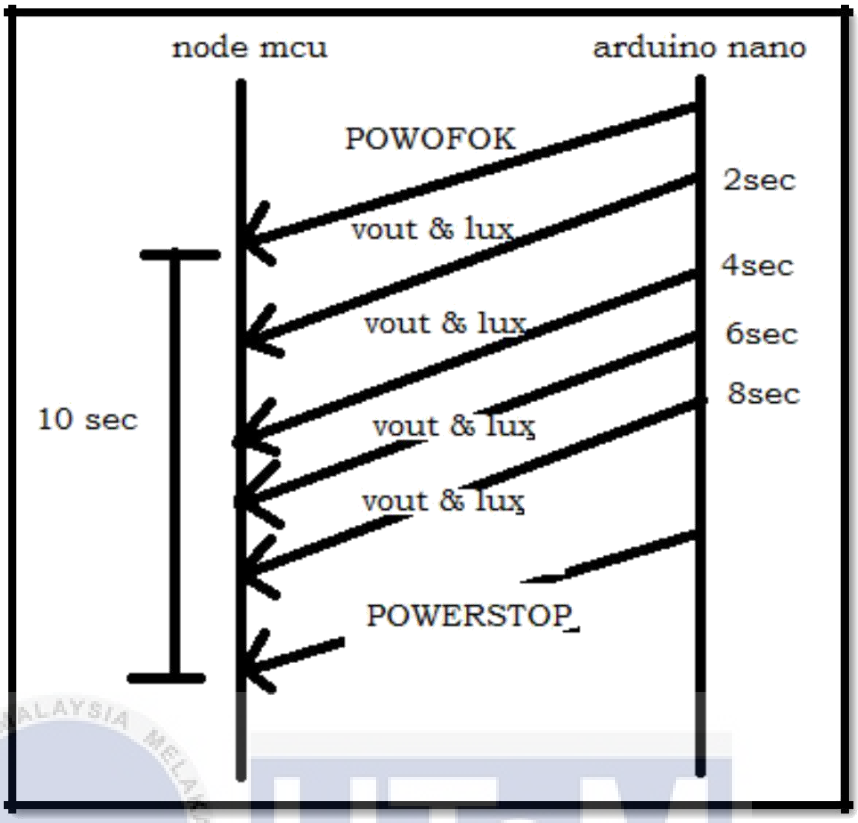


Figure 4.3.4: Communicate with Arduino to Nodemcu ESP8266 Around 10 Second.

The Figure 4.3.4 above shown the connection transmits and received signal from Arduino to NodeMCU ESP8266 WIFI. During 10 second start from relay trigger data always send to get the latest result or data from voltage out to know status output battery and lux to check the brightness of LED. The concept of emergency light is when the supply cut off the LED will be turn on and LDR take the data from brightness of LED. Relay is important part to cut off the supply using normally close to normally open and then LDR functioning to read the data brightness from LED. To get the latest result web page must always refresh around 10 second and the output result will be recorded.

4.4 Experimental Result.

4.4.1 Interface from Web Page.

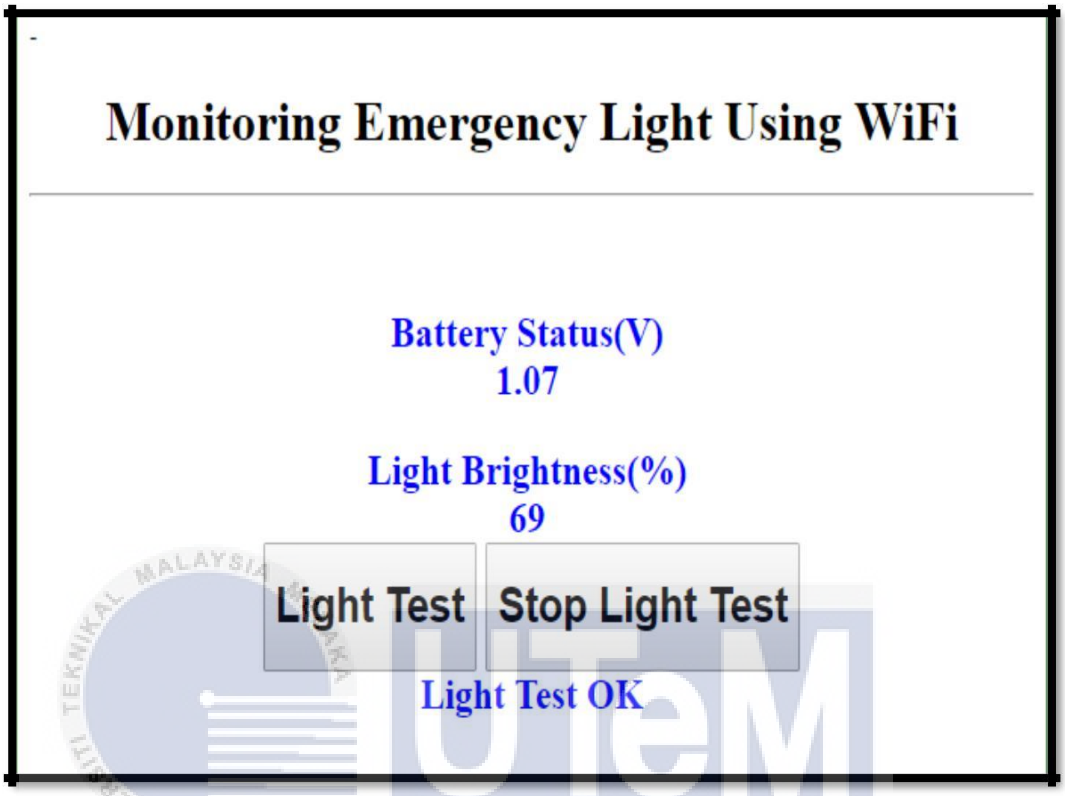


Figure 4.4.1: Condition of Battery of Emergency Light is Not Fully Charged.

Based on Figure 4.4 the light not in good condition because battery status not fully charged. To declare the LED in good condition is when the LDR read the data 1% to 79% and we consider the LED good and functioning. In this case the problem is battery and rate of fully charge is around 3V.

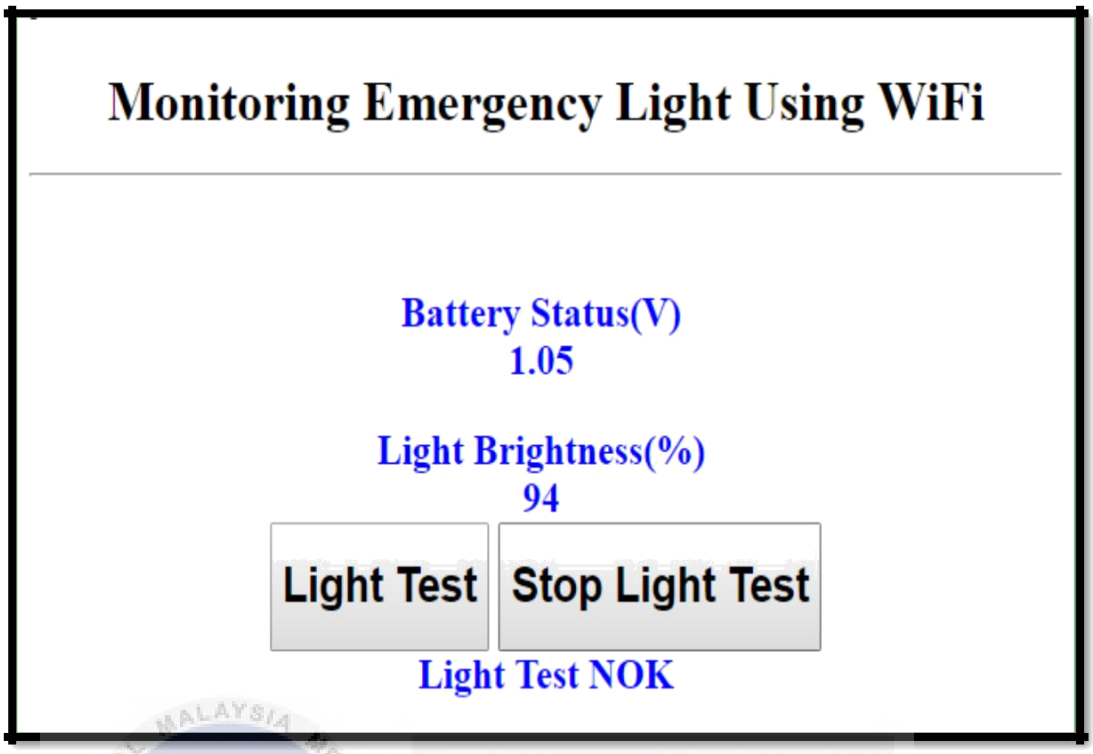


Figure 4.4.2: Condition Emergency Light Not Good (LED).

Figure 4.4.2 shown the condition of emergency light not good because the LED from emergency light not functioning. It can be proved by the reading of LDR which is detected the dark condition because the LED was not functioning and the present of brightness more than 80%. The status battery also not in normal condition compared to the previous result.

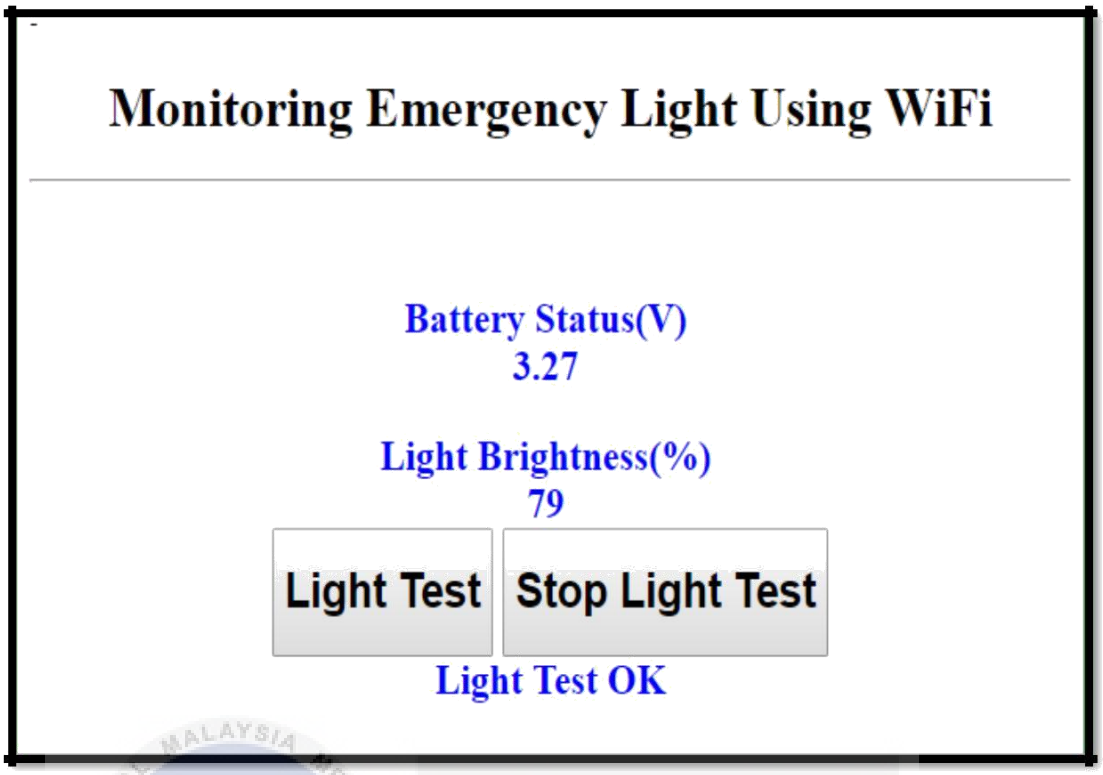


Figure 4.4.3: The Emergency Light in Good Condition.

From Figure 4.4.3, in this condition; the emergency light is good condition and normal. It can be said that the status output voltage is fully charged and the brightness in normal condition because reading percentage of brightness not more than 80% and were considered the lamp is normal. During checking maintenances if get this result, it considered emergency light in good or normal condition.

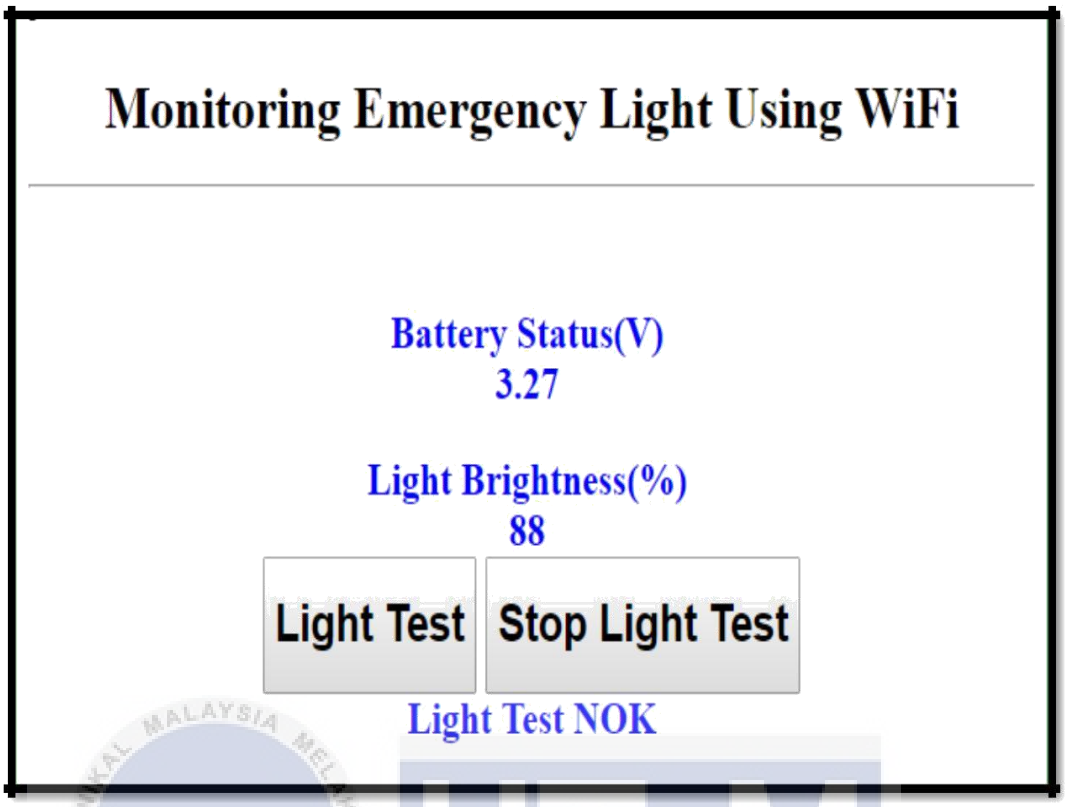


Figure 4.4.4: The Emergency Light in Not Good Condition.

From Figure 4.4.4, the problem from LED of emergency light will detect by LDR sensor based on percentage of reading value that was recorded. The emergency light was in not good condition as the light testing result was dark which was sensed by LDR sensor. This is the main purpose why this project is done to apply on a real situation.

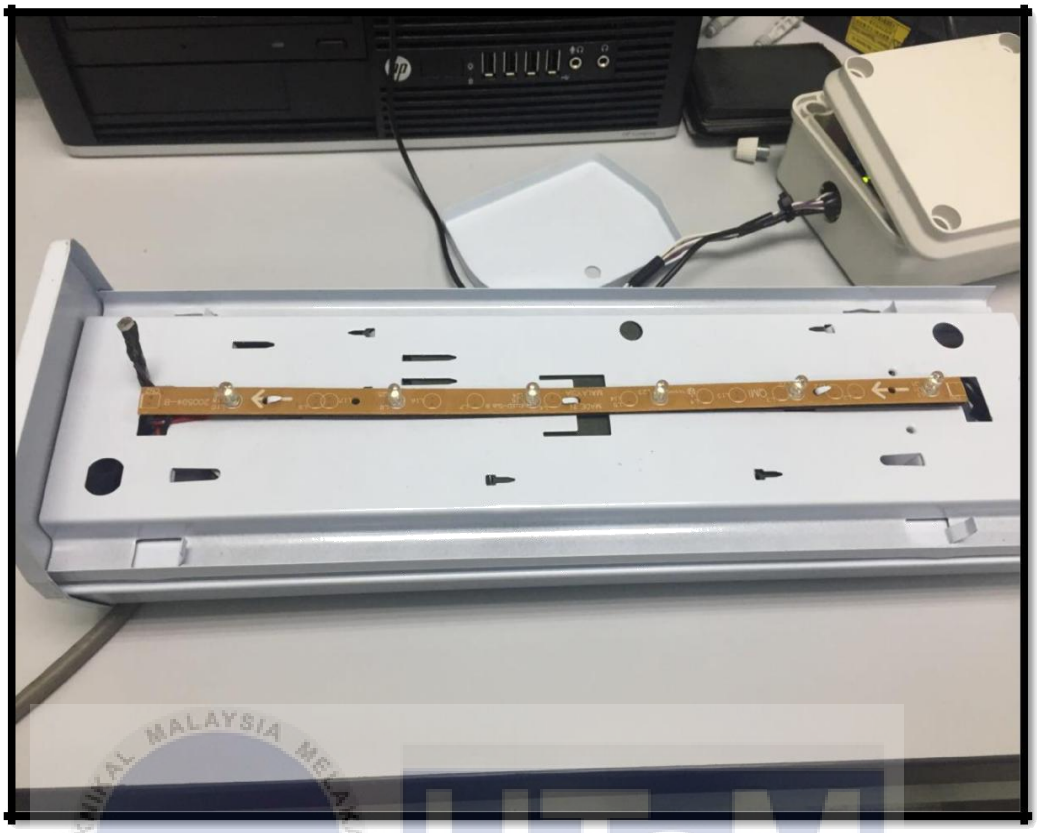


Figure 4.4.5: The Emergency Light in Open Condition.

Based on Figure 4.4.5 the emergency light were test the LDR in open condition and LDR read value from light environment of room. This is because to observe the comparison between open condition and close condition to identify the result is normal or not. After this were recorded the result and do the comparison.

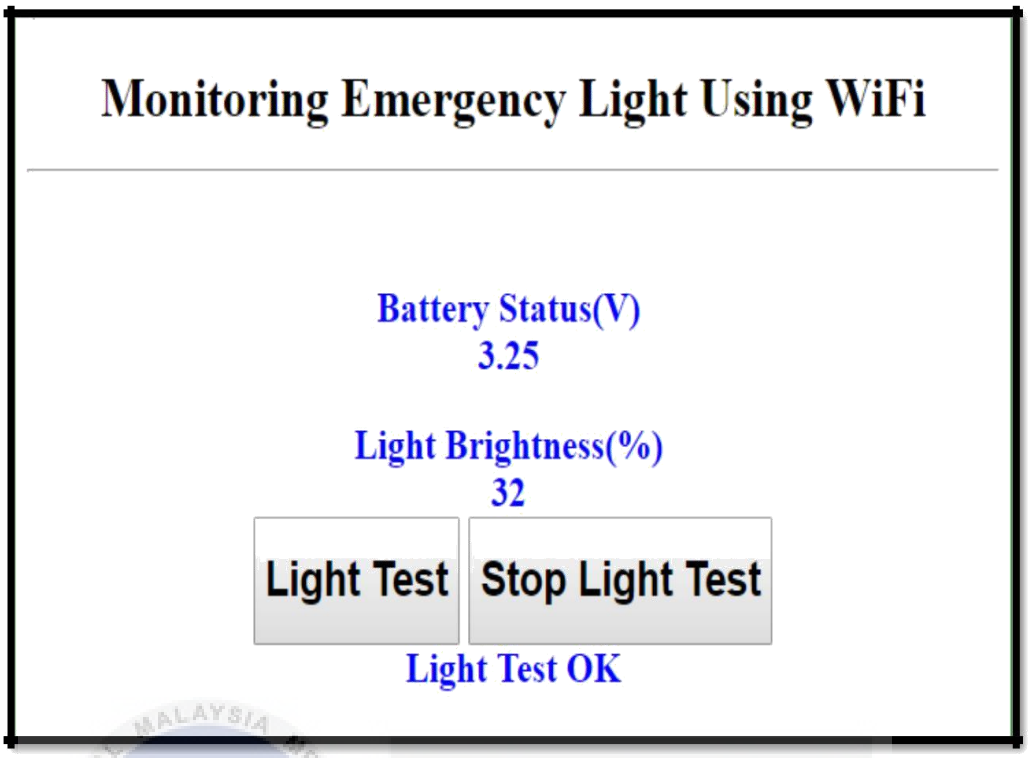


Figure 4.4.6: Result for LDR Open Condition.

Figure 4.4.6 is the result when emergency light in open condition. LDR detected based on the open condition of emergency light. This battery good and normal status because the battery fully charge and were consider the light is normal.

Figure 4.4.7: The Emergency Light in Close Condition.

The Figure 4.4.7 shown the emergency light in close condition so were recorded the value percentage of LDR sensor. When the lights in close condition were get the accurate value from LDR sensor and were compere form both condition.

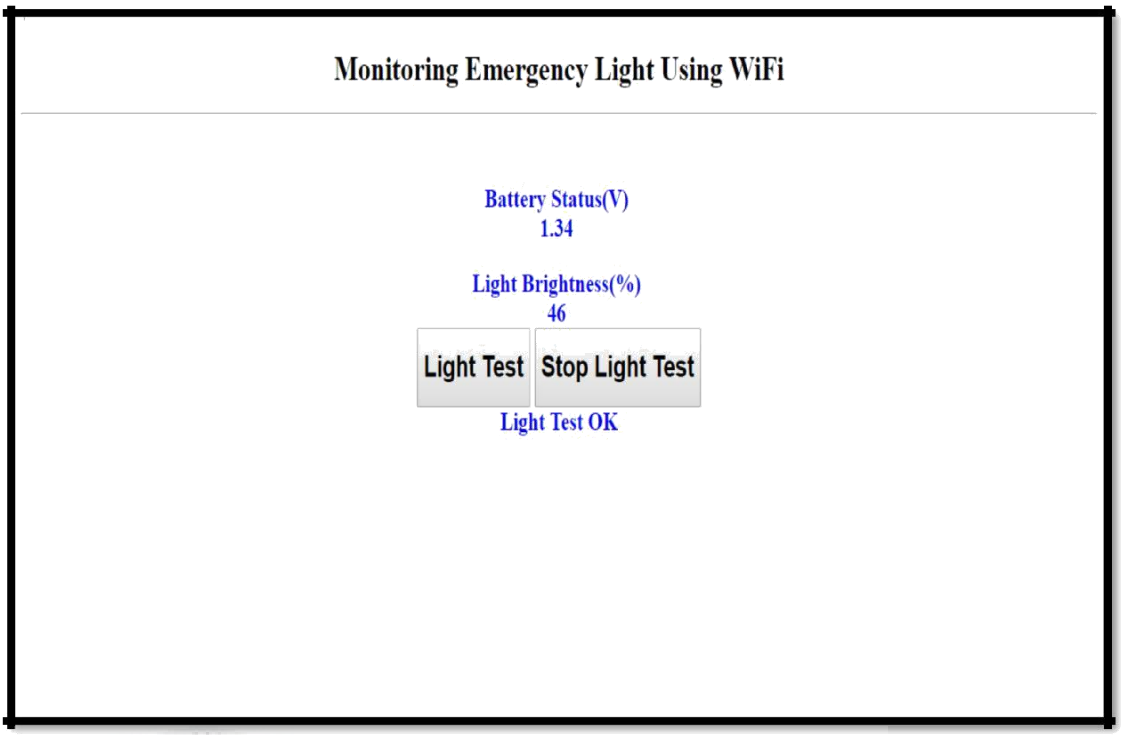


Figure 4.4.8: Result for LDR Close Condition.

This Figure 4.4.8 shown the exactly reading of LDR in close condition and this is a real condition to all emergency light from any place indoor or outdoor. Sometimes were get result not accurate because the LDR is analog input.

Table 4.4: Comparison condition between LDR and Voltage Sensor.

Input	Condition	Output Emergency Light
LDR (close condition)	≥ 80%	LED Abnormal
LDR (open condition)	< 79%	LED Normal
Voltage Sensor	≥ 3V	Battery Normal
Voltage Sensor	< 3V	Battery Abnormal

Table 4.4 shown the comparison condition between LDR in open and close condition with voltage sensor. Input from LDR detected from LED emergency light in open and closed condition. When the LDR detected brightness from 80% to 100%, it will considered the light abnormal and vise versa. When the voltage sensor detected and read the voltage value more or equal to 30%, it is considered as the battery is good and normal.

4.5 Project Analysis

4.5.1 Output Voltage.

The effectiveness of this project is determined by how the data or signal to check status send the accurate result for example Table 4.5.1 above. These data below are comparison data output voltage based on measurement and calculation. From the table, the result based on measurement and calculation not quick, different and were can consider the result is correctly because data from calculations based on theoretical and measurement from practical.

Table 4.5.1: Comparison Output Voltage.

V_{in}	V_{out} (measurement)	V_{out} (calculate)	Adc value	Vb_{bat}
1v	0.19v	0.2148v	44	1.07v
2v	0.39v	0.4297v	88	2.14v
3v	0.59v	0.6494v	133	3.24v
4v	0.79v	0.8643v	177	4.32v
5v	0.99v	1.0498v	215	5.24v

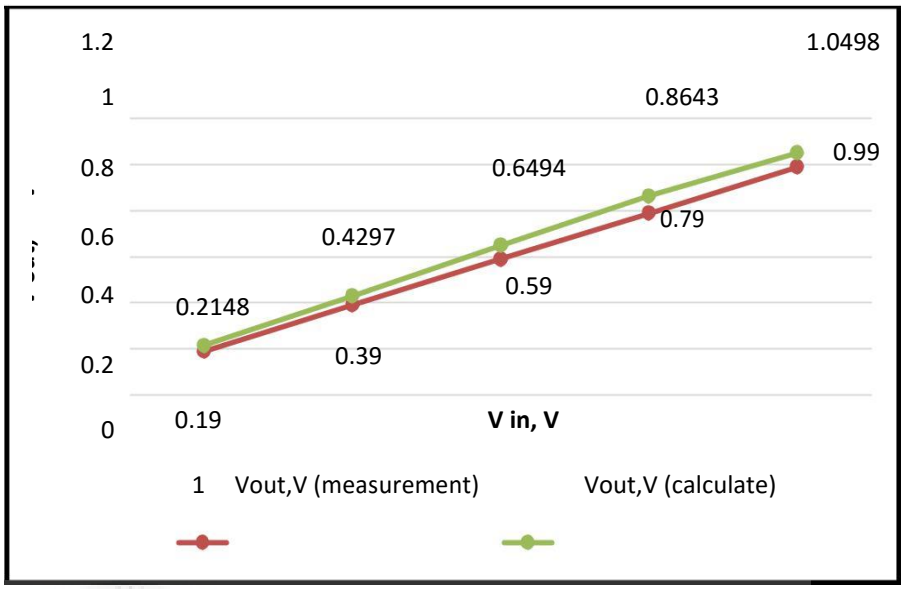


Figure 4.5.2: Graph V_{in} Versus V_{out}

To get the accurate output voltage were comparing with value measurement and calculation to identify the value is exactly same or not. Sometimes after test and data carry out from result that were get, data is not exactly same and to make sure the data is correctly with compare then calculation. With comparison data it will know which mean the correct or incorrect data.

Figure 4.5.2 shown the graph input voltage versus output voltage based on measurement and calculation. From observation between input and output voltage is directly proportional if input voltage increase the output voltage becomes increase.

4.5.2 Formula For Calculate Output Voltage.

$$V_{out} = (V_{out}value * 5.0) / 1024$$

$$V_{bat} = V_{out} \times 5$$

4.5.3 Calculation Result

i) Input voltage = 1volt

$$V_{out} = \frac{44 \times 5.0}{1024}$$

$$V_{bat} = 0.2148 \times 5$$

$$= \underline{1.07v}$$

ii) Input voltage = 2volt

$$V_{out} = \frac{88 \times 5.0}{1024}$$

$$V_{bat} = 0.6494 \times 5$$

$$= \underline{2.14v}$$

iii) Input voltage = 3volt

$$V_{out} = \frac{133 \times 5.0}{1024}$$

$$V_{bat} = 0.6494 \times 5$$

$$= \underline{3.24v}$$

iv) Input voltage = 4volt

$$V_{out} = \frac{177 \times 5.0}{1024}$$

$$V_{bat} = 0.8643 \times 5$$

$$= \underline{4.32v}$$

v) Input voltage = 5volt

$$V_{out} = \frac{215 \times 5.0}{1024}$$

$$V_{bat} = 1.0498 \times 5$$

$$= \underline{5.24v}$$

4.5.4 Signal Transfer

Table 4.5.4: Signal Transmit and Received.

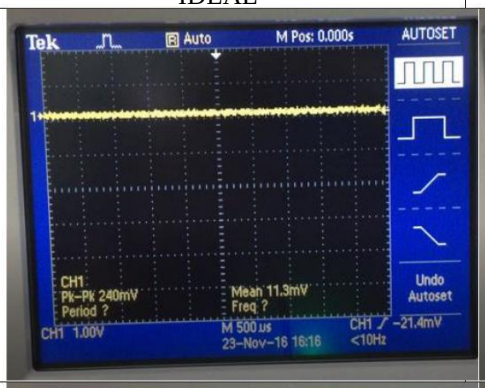
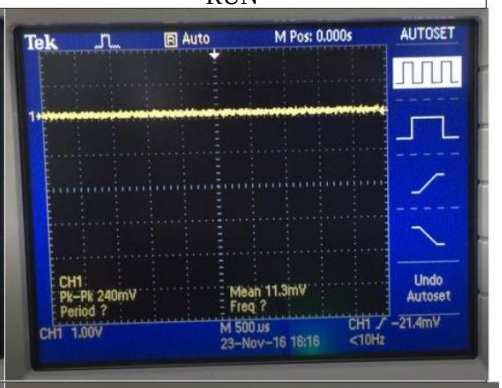
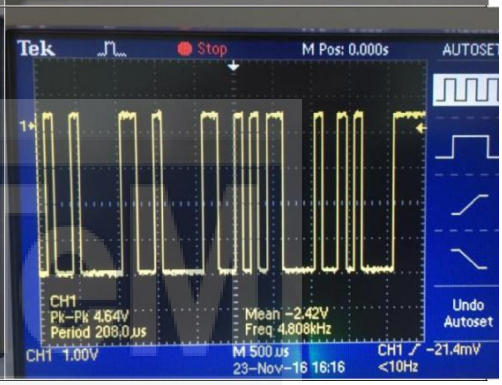
	IDEAL	RUN
Transmit (Tx)		
Received (Rx)		

Table 4.5.4 shown the signal transmits and received between Arduino to NodeMCU ESP8266 WIFI. According to condition ideal when the signal or data transmit not change everything because no data transfer. After that, during run condition signal or data transmit change from 240mV to 4.54V because the supply transfer from Arduino 5V and at NodeMCU ESP8266 received 4.54V.

It is found that the comparison between ideal and run condition using oscilloscope. This is concept how the communication transmits and received data. Figure 4.5.4 shown the hardware connection between Arduino and NodeMCU ESP8266 WIFI the connection must crossing from transmit to receive and from received to transmit.

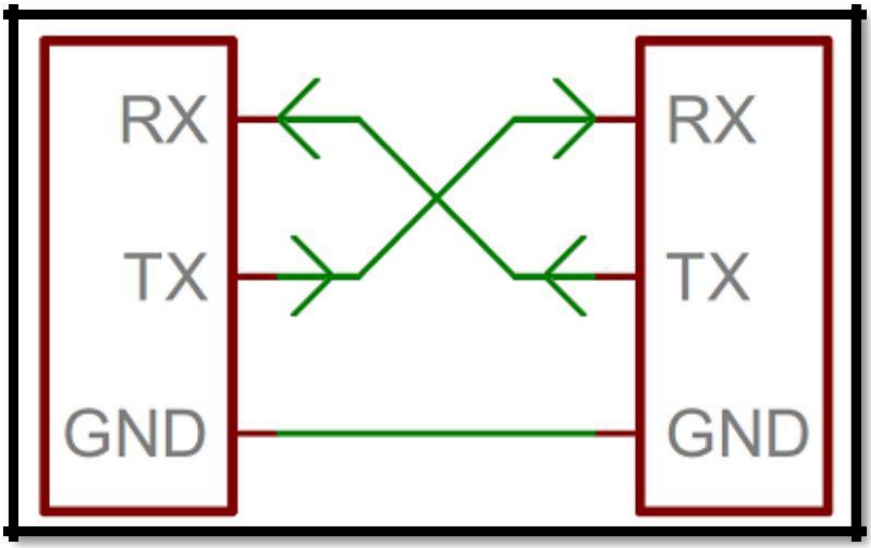


Figure 4.5.4:Hardware Serial Connection Arduino Nano with NodeMCU ESP8266.

CHAPTER 5

CONCLUSION

5.0 Introduction

In this chapter will discuss about conclusion and suggestion to develop and improvement from side system and technical. This project has potential to create and modified then system more efficient and effective.

5.1 Summary of Research

According to project monitoring, emergency light using wifi, this project aimed to design a circuit or system that can control many emergency lights using single microcontroller and monitor all light using a computer at central room. Wifi is an important part or medium in this system to transfer signal or data between emergency light and computer for monitoring.

The electronic component that used is relay and two main components which are LDR sensor and voltage sensor to check status of emergency light. For initial conditions relay must trigger to cut the main supply 240v to functioning the emergency light around 10 Sec. After that, at the same time during 10 Sec Arduino always send status from LDR and voltage sensor to get latest result.The concept of emergency light is when the supply turn off the lamp will be turned on using supply battery in the lamp and can survive a few hours depend on voltage of battery supply in emergency light. If the voltage of battery bigger, the emergency light can turn on long time depends on condition of battery.

Purpose to build this project is to improve the method of maintenance using manually checking which mean, during checking the light must take a long time and spend many costing to check the emergency light. Monitoring emergency light using wifi can save everything such as manpower, save costs and save time at every maintenance operation. Emergency light is important things must have anywhere,such as home, office, department building and so on. That is why, emergency light must in good condition before something happen and check the light to make sure the light in good condition.

5.2 Achievement of Research Objectives

The goal of this project research can be concluded of a monitoring system that can be used in domestic or industry such as for monitoring the status emergency light. We able to design the emergency light monitoring based on wifi and monitor using web page. We also able can develop prototype device that can be connected between emergency light and wifi.

5.3 Significance of Research

The significance in this research is mainly to increase the adaptability and flexibility if the system monitoring in order to accommodate changes. This system is designed to improve the method checking of monitoring and web page as is platform and wifi connection as it medium of communication. This system user must know the IP address every emergency light and wifi connection to communicate each other device follow by technology now.

5.4 Recommendation

For the next improvement of this project is the suggestion to create the system that can be monitored and control it from server at one center. For example,in one building or department must have a control room for maintenance system, especially in emergency light to easier the checking. For this project, monitoring based on one by one device and directly troubleshoot in case has a problem.

Furthermore this system can be implemented in industry and no need to request other man power to operation, maintenance and worker from own company from team maintenance can do it. Besides that, another suggestion is a feedback mechanism system or from web page also be included which provides the display more attractive to monitor and easier to conduct.

An additional part is, this system must upgrade for uses a single controller for transmitting signals and data because for node mcu just have one output ADC for analog output. For next method this project must use controller many analog outputs.

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APPENDICES A

```
#include <SimpleTimer.h>
#include <SoftwareSerial.h> // library - double
communication
#define RELAY1 8 //
the timer object
SimpleTimer timer;
int timerID;

int Voltage_Sensor = A3;// voltage sensor connection
arduino
int LDR_Sensor = A2; // LDR sensor connection arduino
int Voltage = 0;// storage voltage for battery
int LUX =0; // kecerahan led data

unsigned int lightest =0;
float vout = 0.0;
float vin = 0.0;
float R1 = 30000.0; //
float R2 = 7500.0; //

int value = 0;
int status = 0;

String inputString = "";         // a string to hold
incoming databoolean string
Complete = false; // whether the string is complete
unsigned long prevMillis=0;


// a function to be executed periodically
```

```
void OnceOnlyTask() {

  String lightTestResult =
  ""; if(LUX >=90)

  {
  lightTestResult = "NOK";
  }
  else
  {
    lightTestResult = "OK";
    digitalWrite(RELAY1,HIGH);
    Serial.print("POWEROFFSTOP:");
    Serial.print(lightTestResult);
    Serial.print(LUX);
    Serial.println('#');
    timer.disable(timerID);
}
void setup() {
  // initialize serial:
  Serial.begin(9600);
  pinMode(RELAY1, OUTPUT);
  // reserve    200    bytes    for    the
  inputString: inputString.reserve(200);
}
void loop() {
  timer.run();
  // print the string when a newline arrives:
             LUX = analogRead(LDR_Sensor); LUX
             = map(LUX, 0, 1023, 0, 100); value
             = analogRead(Voltage_Sensor);

if(millis()-prevMillis >= 2000)
{
```

```
                Serial.print("ADCDATA:");
                Serial.print("LUX:");
                Serial.print(LUX);
                Serial.print(";VOUT:");
                Serial.print(value);
                Serial.println('#');
                prevMillis = millis();
}
  if (stringComplete) {
    if(inputString.indexOf("POWOFF")>=0)
    {
    timer.disable(timerID);
    digitalWrite(RELAY1,LOW);
    Serial.println("POWOFFOK#");
    timerID= timer.setTimeout(5000,
    OnceOnlyTask); timer.enable(timerID);
    }
    else if(inputString.indexOf("LUXOK")>=0)
    {
    Serial.println("LUX#");
    }
    else if(inputString.indexOf("VOUTOK")>=0)
    {
     Serial.println("VOUT#");
    }
    else
    {

    }
    inputString = "";
    stringComplete = false;

  }
}
```

```
void serialEvent() {
  while (Serial.available())
    { // get the new byte:
    char inChar = (char)Serial.read();
    // add it to the inputString:
    inputString += inChar;
    // if the incoming character is a newline, set a
flag
    // so the main loop can do something about it:
    if (inChar == '\n') {
      stringComplete = true;
    }
```

APPENDICES B

NODE MCU WIFI PROGRAMMING

```
#include
<ESP8266WiFi.h>
String
inputString="";

String LightTestStatusHTML
= ""; boolean
stringComplete = false;
boolean luxsent=false;

boolean
pwroffsent=false;
boolean voutsent=false;
boolean LightTestRun =
false; String
refreshStr ="";

const char* ssid = "iPhone";
const char* password =
"man123456"; int luxvalue =
0;

int
voutvalue =
0; float
vbat = 0.0;

int ledPin = 13; //
GPIO13 WiFiServer
server(80);
```

```
void setup() {
  Serial.begin(
  9600);
  delay(10);
  pinMode(ledPin, OUTPUT);

digitalWrite(ledPin, LOW);

Serial.println();
Serial.println();
Serial.print("Connecting to ");
Serial.println(ssid);
WiFi.begin(ssid, password);
while (WiFi.status() !=
  WL_CONNECTED) { delay(500);
  Serial.print(".");
}
Serial.println("");
Serial.println("WiFi connected");
// Start the server
server.begin();
Serial.println("Server
started");
// Print the IP address
Serial.print("Use this URL to connect: ");
  Serial.print("http://");
  Serial.print(WiFi.localIP());
  Serial.println("/");

}
void loop() {
```

```
while
  (Serial.available())
  { // get the new
  byte:

  char inChar = (char)Serial.read();

  // add   it   to   the
  inputString:
  inputString += inChar;

  // if the incoming character is a newline, set a flag

  // so the main loop can do something about it:

  if (inChar == '#')
   { stringComplete
   = true;
    Serial.flush();
    break;
  }
 }
//
 Serial.println(inputString.indexOf("POWEROFFSTOP:")
 ); if(stringComplete == true )

 {
  //Serial.println( inputString);
  if(inputString.indexOf("POWOFFOK#
  ")>=0)
 {
 // Serial.println(inputString);
 Serial.println("Start Light Test");
```

```
    pwroffsent=1;
    }

    if(inputString.indexOf("ADCDATA:")>=0)

    {

     Serial.println(inputString);

     luxvalue=
    getValues(inputString,"LUX:",";"); //
    Serial.println(x);

     voutvalue =
    getValues(inputString,"VOUT:","#"); float
    vout = (voutvalue * 5.0) / 1024.0;

    vbat = vout * 5 ;

    }
  if(inputString.indexOf("POWEROFFSTOP:")>=0)

    {
      pwroffsent=0;
      Serial.println("Complete Light
      Test");
    }

  stringComplete=
  false;
  inputString="";

}
```

```
 WiFiClient client =
 server.available(); if (!client) {
   return;
 }
 while(!client.available()){
   delay(1);
 }
 // Read the first line of the request
 String request =
client.readStringUntil('\r'); //
Serial.println(request);
 client.flush();
 // Match the request
 int value = LOW;
 if(request.length
 ()>0)
 {
 if (request.indexOf("/LIGHTTEST=ON") != -
   1) { digitalWrite(ledPin, HIGH);

    refreshStr = "<head>-<meta http-
equiv=\"refresh\" content=\"10\"
url=\"http://172.20.10.12\"></head>";
```

```
  Serial.println("POW
  OFF"); LightTestRun
  = true; value =
  HIGH;
}

if (request.indexOf("/LIGHTTEST=OFF") !=
  -1) { refreshStr = "+";

  LightTestRun =
  false; value =
  HIGH;

}
if(LightTestRun
    ){
     if(luxvalue
     >=80)
        {
          LightTestStatusHTML = "Light Test NOK";
        }

     else{

       LightTestStatusHTML = "Light Test OK";

       }
}

client.println("HTTP/1.1 200 OK");
client.println("Content-Type: text/html");
client.println(""); //  do not forget this one
client.println("<!DOCTYPE HTML>");
client.println("<html>");
```

```
  client.println(refreshStr);
  client.print("<center><p><h1>Monitoring Emergency
Light Using WiFi</h1></p><center><hr>");

  client.println("<font color=blue>");
  client.println("<br><br>");
  client.println("<p><h2>Battery Status(V)");
  client.println("<br />");
  client.println(vbat);
  client.println("<br />");
  client.println("<p><h2>Light Brightness(%)");
  client.println("<br />");
  client.println(luxvalue);
  client.println("<br><a
href=\"/LIGHTTEST=ON\"\"><button><h1>Light
Test</button></a>");
  client.println("<a
href=\"/LIGHTTEST=OFF\"\"><button><h1>Stop
Light Test</button></a><br>");

  client.println(LightTestStatusHTML);
  client.println("</html>");

  delay(1);

  }
}

int getValues(String inputStr, String
startPattern,String endPattern )
{
      int posS =
      inputStr.indexOf(startPattern); int
```

```
 posE = inputStr.indexOf(endPattern);
 int leng = startPattern.length()
 String tmp =
inputString.substring(posS+leng,posE); return
tmp.toInt();
```