Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF AN AUTOMATIC CASEMENT USING MICROCONTROLLER

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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Bachelor of Electronics Engineering Technology (Industrial Electronics) with Honours

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DEVELOPMENT OF AN AUTOMATIC CASEMENT USING MICROCONTROLLER

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

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DECLARATION

I declare that this project report entitled "DEVELOPMENT OF AN AUTOMATIC CASEMENT USING MICROCONTROLLER" is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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Date : 14.01.2023

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APPROVAL

I approve that this Bachelor Degree Project 1 (PSM1) report entitled "DEVELOPMENT OF AN AUTOMATIC CASEMENT USING MICROCONTROLLER" is sufficient for submission.

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Date : .....

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ABSTRACT

In every household will have window to facilitate the entry of natural light indoors. In this modern society, everyone is busy working and sometime late working from morning to night and not able to close the window before dark. The purpose of this project is to secure the window by open or close a window automatically when the raining day in daylight using rain sensor to detect rain and light sensor to detect day and night even nobody at home. Using Node MCU ESP8266 as controller and servo motor to adjust window to open or close. As the sensor, using rain sensor to detect wheather outside the house and photoresistor to determine it day or night. IOT are also used to notify home owner that everything happen according to order.

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ABSTRAK

Setiap rumah akan mempunyai tingkap untuk memudahkan kemasukan cahaya semula jadi ke dalam rumah. Dalam masyarakat moden ini, semua orang sibuk bekerja dan kadang-kadang bekerja lewat dari pagi hingga malam dan tidak dapat menutup tingkap sebelum gelap. Tujuan projek ini adalah untuk memeastikan tingkap dengan membuka atau menutup tingkap secara automatik apabila hari hujan di siang hari menggunakan sensor hujan untuk mengesan hujan dan sensor cahaya untuk mengesan siang dan malam walaupun tiada sesiapa di rumah. Menggunakan Node MCU ESP8266 sebagai pengawal dan motor servo untuk melaraskan tetingkap untuk membuka atau menutup. Sebagai penderia, menggunakan penderia hujan untuk mengesan cuaca di luar rumah dan photoresistor untuk menentukannya siang atau malam. IOT juga digunakan untuk memberitahu pemilik rumah bahawa segala-galanya berlaku mengikut perintah.

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LIST OF SYMBOLS

s	-	Seconds

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LIST OF ABBREVIATIONS

IoT	-	Internet of Thing
LDR	-	Light Dependant Resistor
RTC	-	Real-Time Clock

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CHAPTER 1

INTRODUCTION

1.1 Background

In today modern world, people are now likely to priority to works and sometime late to back home due to overtime. Due to increasing of people intended to do works more than chores, people are more likely not to closed casement at home. With this an automatic casement, it will help every household to open and closed casement according to plan even nobody at home.

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1.2 Problem Statement

In every house in malaysia always completed with a window to overcome heat or sense of bad smell in room, bedroom, kitchen and even a living room. The problem with window is need to open and close manually in house and it need human interaction to do so. People nowdays have is always busy with job and sometime because of overtime lead to late back home to close the window. This project to open or close the casement in every home owner automaticly even there are no people in the house.

1.3 Project Objective

a) This project is a development to convenient in every houseowner to ensure every casement in house is according to plan. There are a few goals need to succeded in this project :

b) a) To develope an automatic casement using microcontroller.

c) b) To make an adjustment and modify the system with blynk implementation.

d) c) To make a prototype window to open and close automaticly or manually.

1.4 Scope of Project

e) To avoid any uncertainty of this project due to some limitations and constraints, the scope of the project are defined as follows:

- Node MCU ESP8266 as a brain to control the components in this project and for comunication between the user and microcontroller
- LDR sensor was used to detect light during the day and night to make automatic casement to open and close.
- Rain sensor was used to detect rain during the day and night to make automatic casement to open and close
- Linear actuator is an actuator to move the casement to open or close.
- Mobile application is developed to display the information received and perform monitoring toward ESP8266.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In today society, we all about living in easy life and to have that people nowadays stuck with a lot of works and sometime staying at office until late night instead staying at home and do chores. with the technologies growth like mushroom on rainy days, Malaysian now have the capability to have internet in every household. With this internet we can do a lot of things such as Internet Of Thing (IOT) that can connect with electronics part to make out part of life easier. This project is to open and close casement using Linear Actuator controlled by Microcontroller with Internet of Thing (IoT) to notify the homeowner every window in the house open and close according to plan. With the help of sensors, it can detect daylight or night to automatically open and close the casement. This project using previous related project to perform a smooth build of the project.

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2.2 Previous Related Project

2.2.1 "Design of an Automatic Window Using a PIC Microcontroller and Stepper Motor" by Design of an Automatic Window Using a PIC Microcontroller and Stepper Motor

The perpose of the project is used in the hopital because hospital using alot of windows to make sure the airflow in hospital. The problem is, the nurse dont have time to closed the window in time after the rain fall. It can damage the hospital equipment and report if the window is not close in time. In the project, it using 5 main component in system which is

stepper motor, current driver, rain detector, microcontroller and power supply unit to make the automatic window. Due to the usage of a sliding window that functions as a railing system window to open and close, the stepper motor can be used in the project. Although standard AC and DC motors might have been used for this project, they would have required an external feedback mechanism, which would have resulted in the motor not being precisely positioned. Because the feedback mechanism is embedded into the software design of the microcontroller, a stepper motor is a superior solution.

2.2.2 "Analysis of an Automatic Sliding Window" by Adedotun O. Owojori, Hawal O. Alade, Adebola O. Olotuah.

The perpose of the project is to help the society in a country to increase of using more technology to make life easier and conforting life by relying on technology. It also mention the project is to help a disable person to open and close the window. The paper focuses on the design of an automatic sliding window system that responds to system command via a Bluetooth developed App on a mobile phone. By sending and receiving pulses, an ultrasonic sensor is utilised to measure the distance between the sliding window and the wall's edge. A distance greater than or less than a threshold indicates that the system is closed or open, and this can be altered via the mobile application according to the user's preferences. The window size would be of a quater size with fabrication compared with a normal size window and the material used would be a wooden edge with acrylic galss. At the top of the model is the part of the window that houses the accessories. The drive belt and pulley, gears, stepper motor, and microcontroller are all found in there. The project consist of 4 element which is Power supply, Sensing, Actuator or motor selection, and the communication link.

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2.2.3 "Design and construct of a weather-based Automatic sliding window" by Ademola AbdulKareem, T.E. Somefun, V.Ogunstosin,B.O.Adeyemi.

The project is about an automatic sliding window with a weather-based. The main purpose of this project is to make human live in less stressful enviroment, which is the goal of engineering as a field. In the jurnal is explaining what is an automation, automation is use of various control system for operating equipment with minimal or reduced human intervention. The system is consist of Power supply, Microcontroller(Arduino), Temperature sensor and rain sensor, DC motor, and LCD Display. The detection in the project using a rain sensor and Temperature sensor are used to detect rain and degree of a temperature in the enviroment repectively. The problem it state in the project is rain sensor need to use in in limited enviroment because need to be in a constant downfall of a rain, which make it unsuitable for for area that had harsh weather condition.

2.2.4 "Intelligent Window Control System Design Based on Single Chip Microcomputer" by Zhao Sun, Shuyi Wei, Xiuxia Zhang.

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A single chip microcontroller operated the intelligent window control system, which was integrated with a variety of sensors. It included an automated closing feature to keep slant rain from damaging indoor objects. Natural gas, second-hand smoke, and other indoor hazardous gases were among them. These gases are dangerous if they surpass the limit, so the smart window will automatically open. If a thief enters a room, the intelligent window may sound an alert. The technology would keep a constant eye on the indoor environment. The smart window would automatically modify the switch state if the inside temperature and humidity were above or below the established criteria. Temperature sensor, gas sensor, and

infrared detection module are among the sensors included in the project. The project's microcontroller is an STC89C52 chip from STC, which is an 8-bit microcontroller.

2.2.5 "Automatic Sliding Window" by Sumit P Patil, Jignesh R Dhabuwala, Liyakat Ali Patel.

The project's main goal is to get experience in design and fabrication. The design is eco-friendly and incorporates simple features such as lead screw and dc motor qualities, as well as remote controls and sensors. Sliding windows have a wide range of applications nowadays. Its unique characteristic is that it contains rollers that assist in sliding on a designated rack. It decreases friction and facilitates handling. When we press the open button on the automated sliding window, a signal is sent to the main circuitry board, which then allows current to travel through to the window motor, causing the motor to run and the window to open. The motor stops running once the window is fully open (depending on where the resistance beam is positioned), causing the window to cease moving. When the close button is hit, the same thing happens, only the motor now runs in the opposite direction, closing the window.

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2.2.6 "Design and Implementation of Automatic Window Closer Based on Intelligent Control Algorithm" by Keping Zhang, Guangtian Shi and Zhihao Zhai.

This project designs an intelligent window closing device that can sense external information and convert it into an electric signal to control the mechanical part to complete the corresponding action based on an intelligent control algorithm and mechanical design principle in order to realise the intelligent home concept. Through the collection, analysis, transfer, and control of many external data, the design can realise the corresponding switch

window action in response to changes in the real-time weather environment, which is an ideal choice for smart home and also provides security for people's lives and property. Smart windows; control system; single chip are all terms that can be found in the project. The motor drive drive mechanism completes the mechanical element of switching a window; use a DC motor as the power source, with a 24V battery power supply system, to eliminate the inconvenience caused by a power outage at home. It is important to select thrust bearing (thrust bearing) in order to perform the function of self-locking anti-theft. Thrust bearing is separated into thrust ball bearing and thrust roller bearing, with two one-way thrust ball bearings available.

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2.3 Comparison of past year research

Table 1 : Comparison Table

No	Title	Author	Objective	Project Scope	Method
1	Design of an Automatic Window Using a PIC Microcontroller and Stepper Motor.	Design of an Automatic Window Using a PIC Microcontroller and Stepper Motor.	To develop automatic window to avoid damage hospital property.	PIC microcontroller PIC16F877A	• Stepper Motor • Rain Detector
2	Analysis of an Automatic Sliding Window.	Adedotun O. Owojori, Hawal O. Alade, Adebola O. Olotuah.	To develop automatic sliding window for home automation	Arduino Uno	• HC-05 Bluetooth Module • HC-SR04 Ultrasonic sensor • MITSUMI M49SP-2K bipolar stepper motor • LCD Display
3	Design and construct of a	Ademola AbdulKaree	To develop automatic	Arduino Uno	• Rain Sensor

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	weather-based Automatic sliding window	m, T.E. Somefun, V.Ogunstosin,B.O.Adeyemi	sliding window for home automation		• Temperature Sensor • LCD Display • H-Bridge Driver • DC motor
4	Intelligent Window Control System Design Based on Single Chip Microcomputer	Zhao Sun, Shuyi Wei, Xiuxia Zhang	To develop automatic sliding window for home automation	STC89C52 shingle chip 8-bit microcomputer	• Temperature Sensor • Humidity Sensor • Photoresistance • LCD Display • Infrared Sensor • Buzzer • Gas Sensor • Stepper Motor
5	Automatic Sliding Window	Sumit P Patil, Jignesh R Dhabuwala, Liyakat Ali Patel	To develop automatic sliding window for home automation		• Stepper Motor • Remote • Relay module

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6	Design and Implementation of Automatic Window Closer Based on Intelligent Control Algorithm	Keping Zhang, Guangtian Shi and Zhihao Zhai	To develop automatic sliding window for home automation	STC89C52 single chip 8-bit microcomputer	• Temperature Sensor • Wind Sensor • Infrared Sensor • Buzzer alarm • pm2 5 sensor • DC motor

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CHAPTER 3

METHODOLOGY

3.1 Introduction

The Methodology provides a comprehensive overview of a variety of research paradigms and procedures, as well as the instruments and techniques that support them. This chapter's purpose is to focus on the overall research and hardware process flow, as well as the design methodology. Conducting research through journals and articles, planning a project design and parts that will be required, implementing hardware and software into the project, testing the project, troubleshooting problems that arise, and writing a report are all part of this methodology's structured plan. Any project requires an organization that elaborates on the technique for finishing it. To do so, a detailed flow chart outlining the steps required to complete the project from start to finish is created. Apart from that, it is critical to understand the hardware and software tools that will be used before beginning this project.

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3.2 Methodology

Methodology is a method that will be used in the project that we will be working on. This project will examine previous year's projects, particularly those from the previous five years, in order to succeed by utilising the problem statement and solutions from previous projects. We are able to identify the type of error we will encounter and how to remedy the problem. It also makes the project easier due to a list of hardware and software that had already been compiled prior to the commencement of the project.

3.2.1 Gantt Chart

Table 2: Gantt Chart

Task	W1	W2	W3	W4	W5	W6	W7	W8	Mid Term Break	W9	W10	W11	W12	W13	W14
Briefing PSM 2															
Installing softwares															
Survey and buy component															
Assemble electronic component															
Design hardware															
Submit logbook and supervisor meeting															
Making coding															
Start making hardware															
Continue code with IoT															
Troubleshot problems															
Collecting data and analysis															
Submit PSM 2 report draft and PSM2 Report															
Create a poster															
Presenting PSM 2															

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3.2.2 Flow Chart

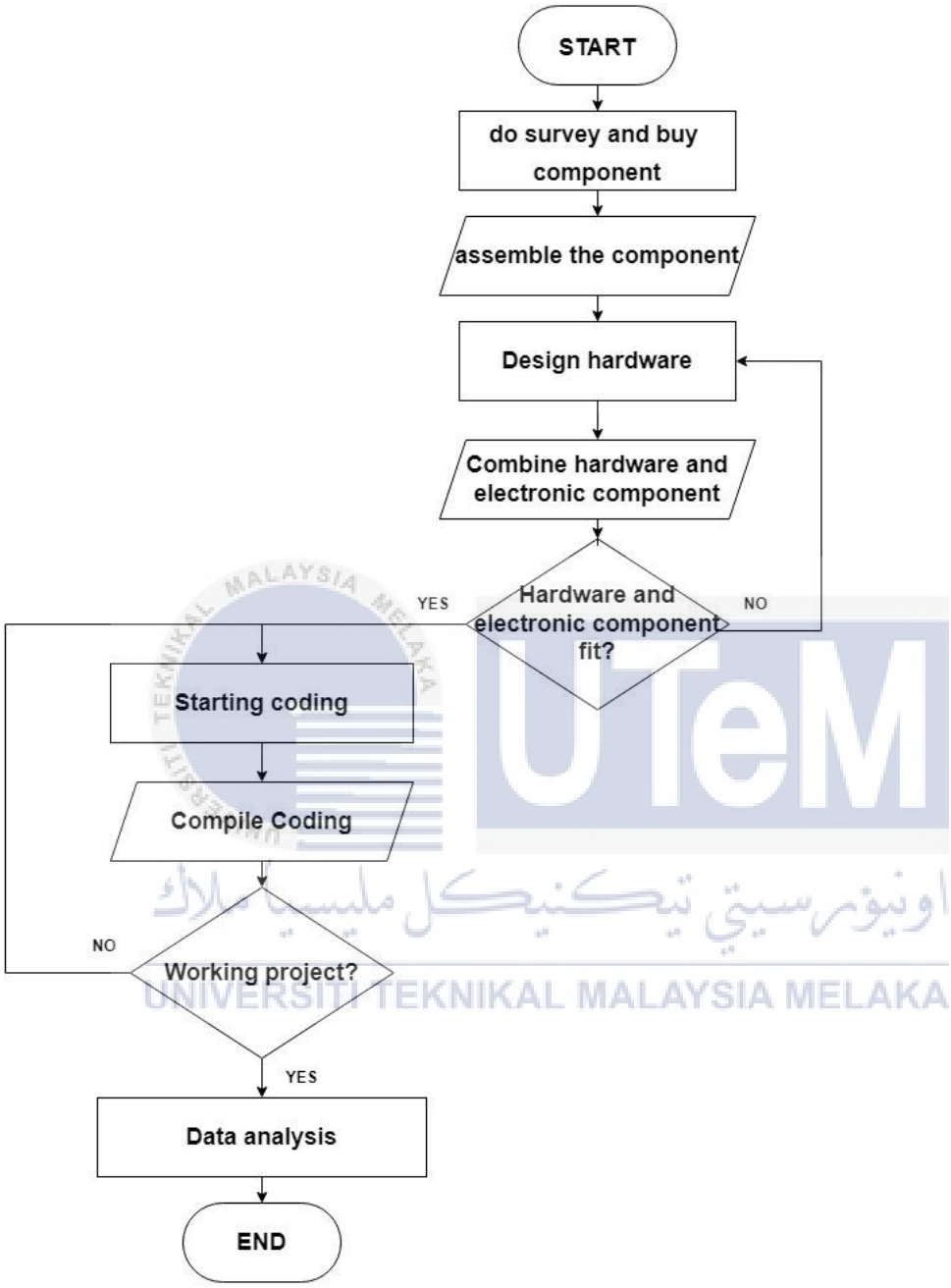

Figure 1: Flow Chart

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3.2.3 Block Diagram

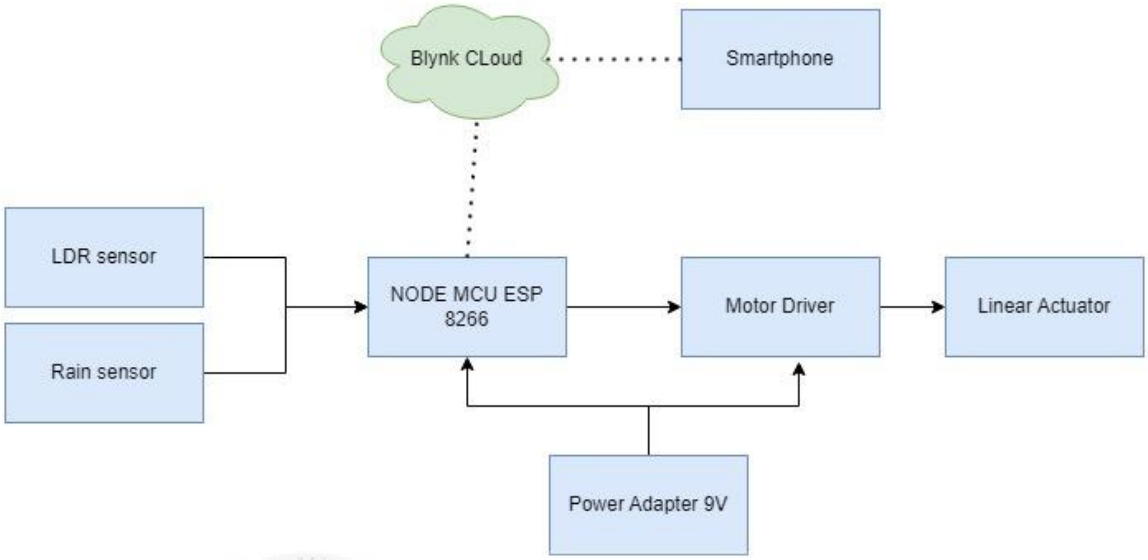

Figure 2 : Block Diagram

3.3 Software Implementation

The software is really necessary in the project to simulate and to have a communication between hardware and software. Software also used to upload data from editor pane to the microcontroller that we are using. In this project we have varieties of software is implemented.

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3.3.1 Arduino IDE

The Arduino Software (IDE) includes a text editor for writing code, a message box, a text console, a toolbar with buttons for basic functions, and a series of menus. It links to the Arduino hardware, allowing it to upload and communicate with programmers.

Figure 3: Arduino IDE

3.3.2 Blynk

Blynk is intended to control and monitor home devices via a smartphone. The goal of this research is to control and monitor electrical devices with the IoT concept using NodeMCU and the Blynk framework. In this study, a prototype comprised of sensors, actuators, NodeMCUs, and Smartphones was built. Actuators and sensors are used to move the device, while sensors detect conditions. The ESP8266 is used as a server and as a bridge to the internet. With the ESP 8266, the NodeMcu microcontroller serves as a link between home equipment and sensors. Sensor data is read by NodeMcu and sent to the server. The server responds to smartphone-related requests.

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Figure 4: Blynk

3.4 Hardware Implementation

In this section, we can recognize what hardware we want to use in this project. Need to know the specs, the size, and etc. to make sure all the component can be works together in one working system.

3.4.1 Node MCU ESP8266

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoT based Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. This module can work as same as Arduino uno but with various features that can be used for IoT based Application. It can act like a microcontroller in this project.

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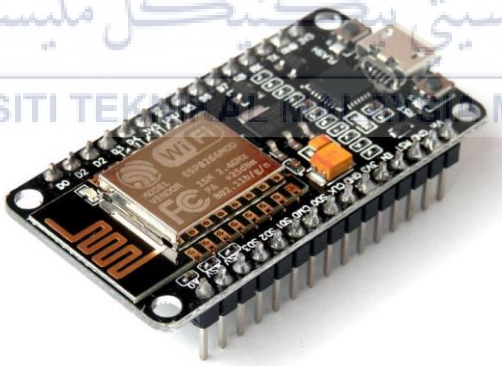

Figure 5: Node MCU ESP 8266

3.4.2 Light Dependant Resistor module (LDR module)

LDR sensor module is to detect the intensity of light from outside and convert it into analog reading so the microcontroller can read. This LDR will associated with analog pin in arduino.

Usually on A0 in arduino uno i/o pin. The features of LDR module is Able to detect ambient brightness and light intensity, adjustable sensitivity (via blue digital potentiometer adjustment), Operating voltage 3.3V-5V and Digital switching outputs (0 and 1) -D0.

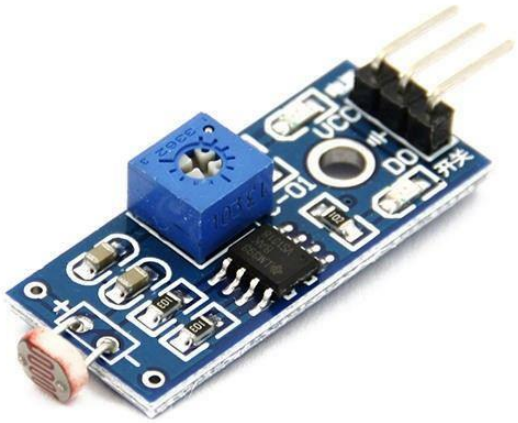

Figure 6: LDR Sensor Module

3.4.3 Linear Actuator

Linear actuators are a type of actuator that convert rotational motion in motors into linear or straight push/pull movements. Linear actuators are ideal for all types of applications where tilting, lifting, pulling or pushing with pounds of force are required. This suitable actuator can be used in the system for open and close window controlled by controller such as Arduino. Linear actuator is strong enought to move the window rather than servo motor is not enough strength to open or close the casement. Most of the electric linear actuator using 12V supply and above. The maximum Load output force of this electric linear actuator is 700N with of 10mm/S.

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Figure 7: Linear Actuator

3.4.4 Rain Sensor module

The rain sensor detects rain falling outside the house. It checks the digital output for 0 or 1 to determine whether or not it is raining outside the house. This rain sensor includes a module that allows you to control the sensitivity of the rain or liquid detection without using coding.

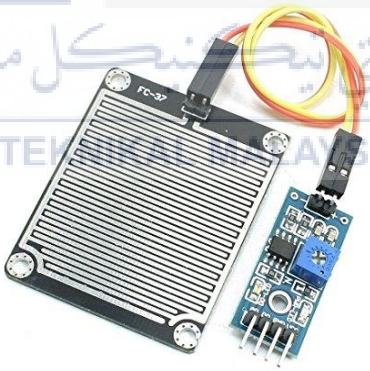

Figure 8: Rain sensor module

3.4.5 Motor Driver

Motor drivers provide high power to motors by using a small voltage signal from a microcontroller or control system. If the microprocessor sends a HIGH signal to the motor driver, the driver will rotate the motor in only one direction while keeping one pin HIGH

and one pin LOW. When the motor's direction is changed, the pin HIGH is switched to LOW and the other pin LOW is switched to HIGH.

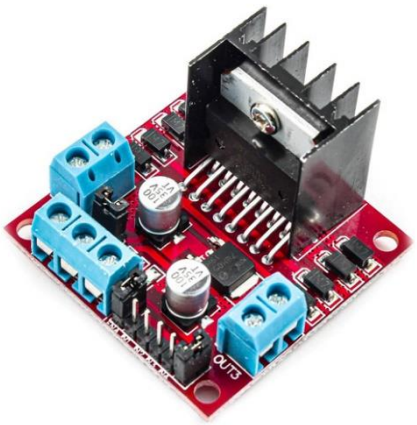

Figure 9: Motor driver

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CHAPTER 4

RESULTS

4.1 Introduction

In this chapter, we will discuss how the result of this project will be. What will be expected of the project by following all the procedure and item that been listed in the report.

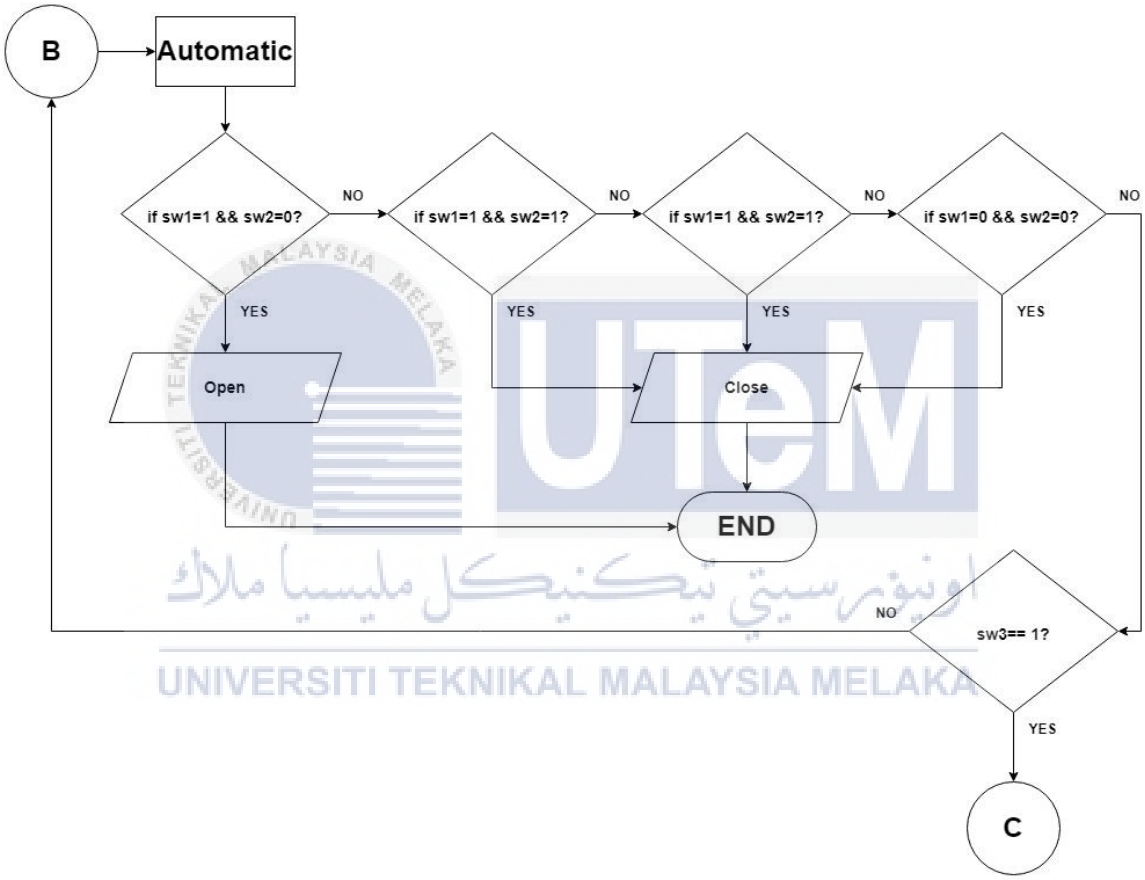

Figure10: Automatic Flow Chart

This is how the flow will be going on in the coding in Arduino IDE. The start of the process is using MODE=1. To use this flow, at the start needed to give whether MODE=1 or MODE=0. Since we want it Automatic, it will declare as MODE=1. Then the microcontroller need to choose in between 2 sensors which is sw1 for rain sensor and sw2 or photoresistor sensor. Now we assume that , there are not raining outside and sunlight

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outside the houses, it will sent digital signal which is 0 or 1 to the microcontroller. With a help of code already made, it will choose in between 4 if statement. Every if statement has a command of its own which has 2 option is to open casement or close casement.

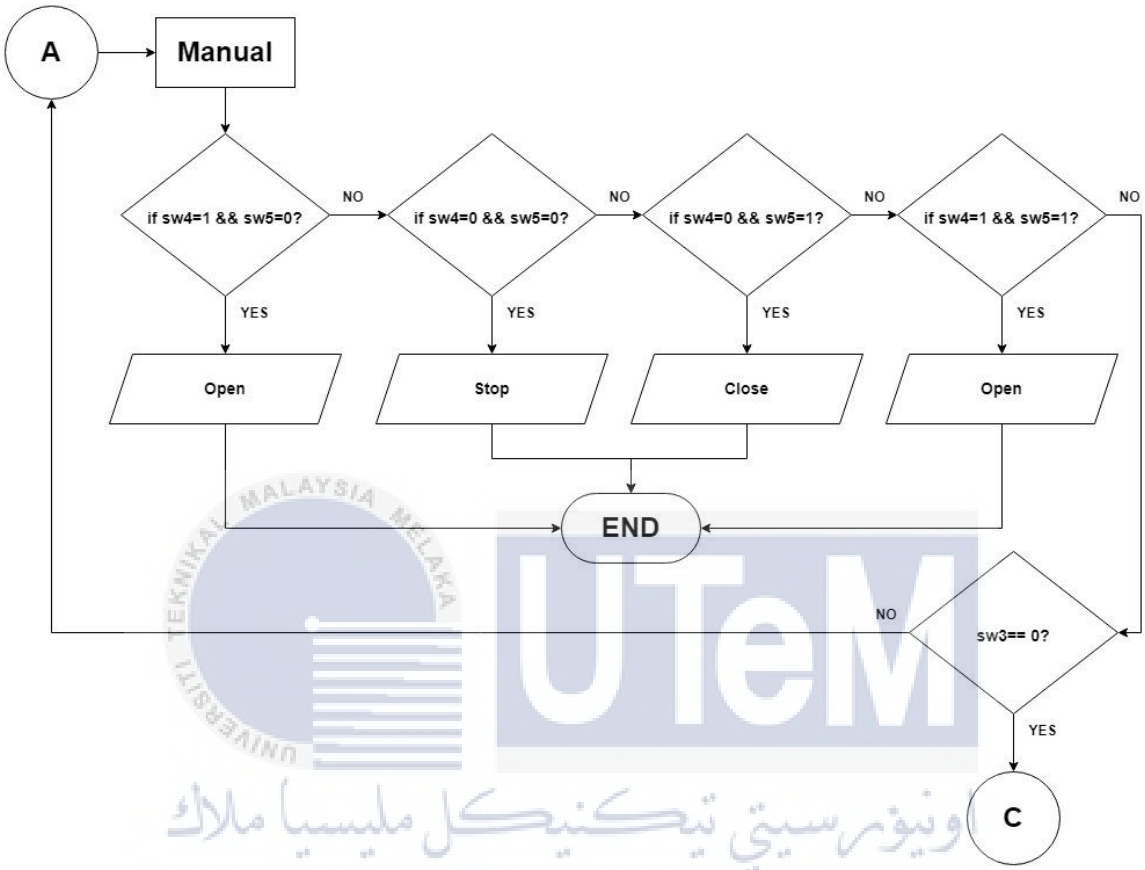

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Figure 11: Manual Flowchart

Figure 4.2 is a working flowchart for a manual control, in this project it is MODE=0. To make the project from Automatic to Manual control, microcontroller already set a switch which is sw3=0 or sw=1. In manual mode, it has 4 if condition because it has 2 switch button. The 2 switch button are declared as sw4 and sw5. The first if condition is an open casement manually, this condition is chosen by the microcontroller when the OPEN button on the smartphone is pressed and the CLOSE button is not pressed. The second if condition when both button didn't pressed, it will sent out signal sw4=0 and sw5=0. The output will stop the linear actuator from open or close the casement. Same output happen with the forth if

conditions, but in that condition, the input is set to sw4=1 and sw5=1. Last if condition is the third if condition. In this if condition, sw4=0 and sw5=1 is to close manually the casement.

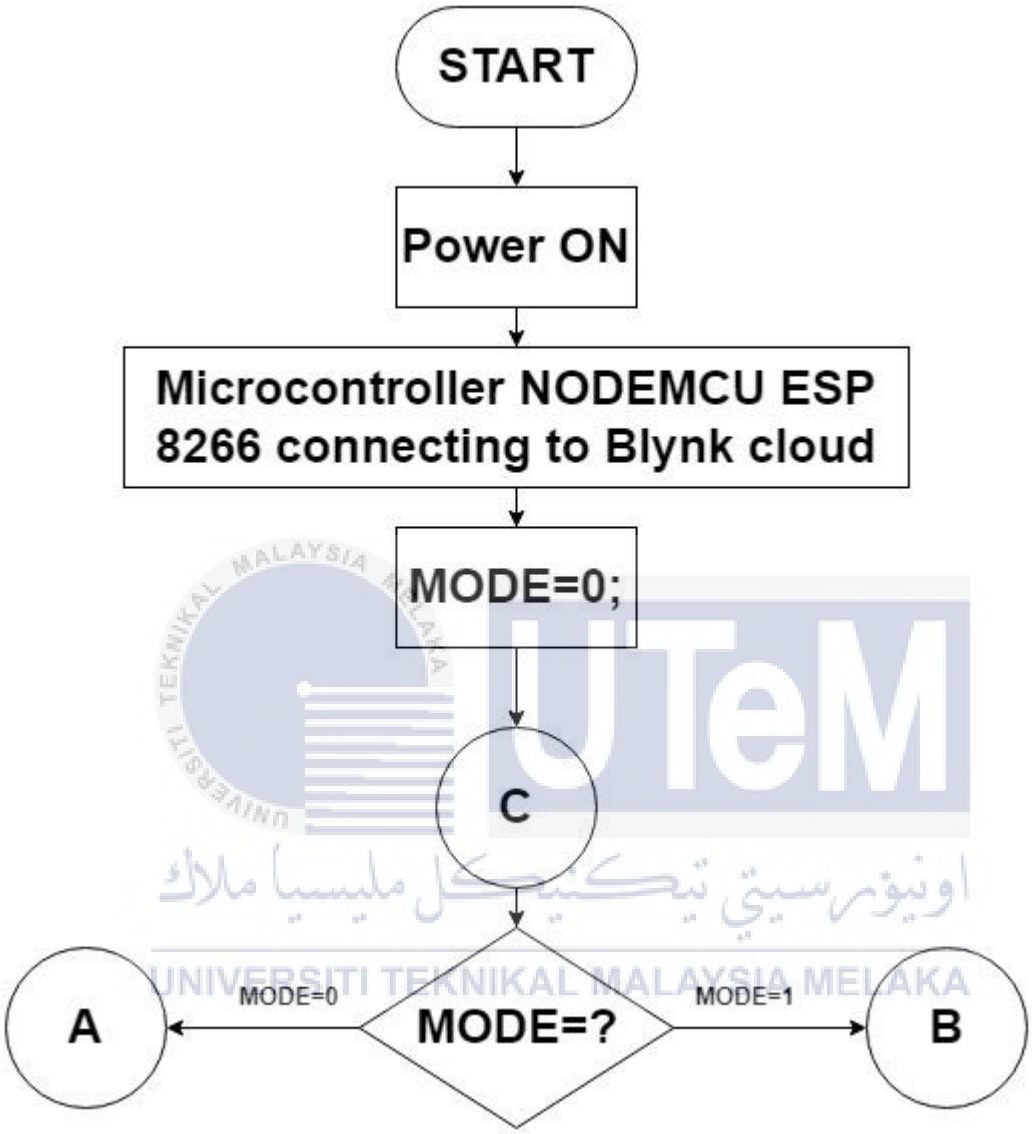

Figure 12: starting flowchart

This is the full flowchart from top of the programmed without the blynk connection. To start this, all needed is to open the power plug ON to make the programmed start reading. After the power ON, it will search for the wi-fi and password that already set in the programmed and try connecting to internet. This will allow data transmit into blynk-cloud via internet. The programmed will give mode=0 and goes to manual control in the programmed. But, it

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will change to Automatic mode due to have sw3=1 because sw3 is controlled in the apps blynk and it give signal 1 initially.

Figure 13: Blynk interface

Figure above shows blynk application look like. It only has 3 button to pressed which is to switch the mode between Automatic or Manual, open and closed button. The button open and close manual only functioning when in manual mode.

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4.2 Data analysis

The data is collect using Light Meter on ios smartphone and recorded as the data below:

Table 3 : Ligh Intensity in evening

TIME	Light Intensity	Digital Signal
6:48 P.M	160	0
6:53 P.M	130	0
6:58 P.M	94	0
7:03 P.M	60	0
7:08 P.M	41	0
7:09 P.M	37	1
7:13 P.M	29	1
7:18 P.M	23	1
7: 23 P.M	11	1
7: 28 P.M	4.4	1

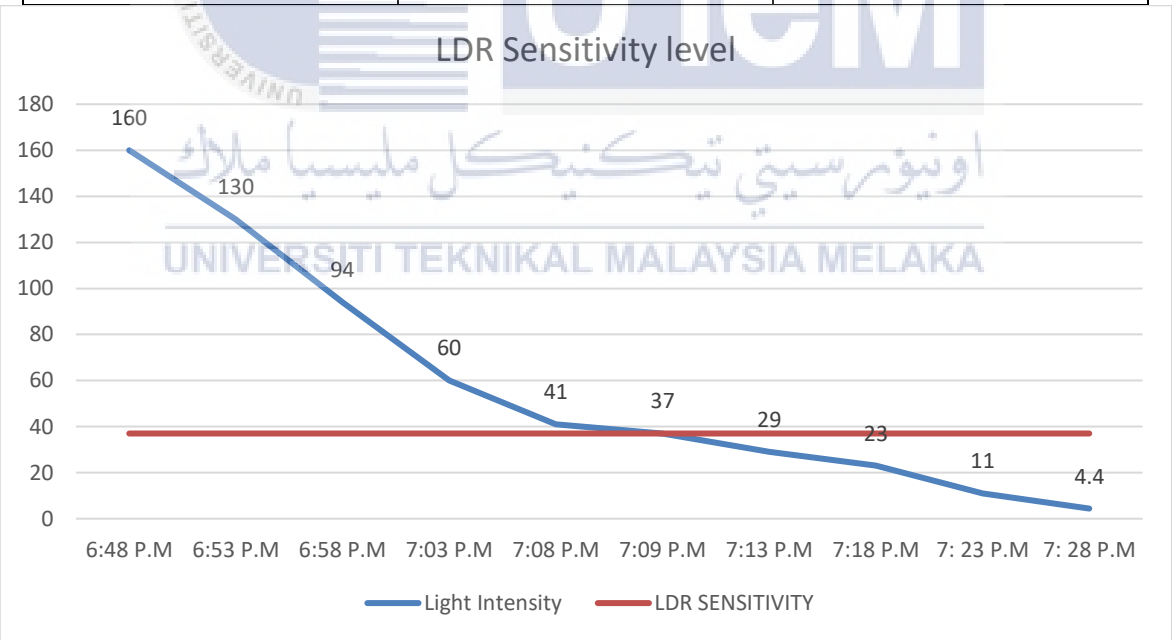

Figure 14: Data in evening

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The data above is conducted in the evening with a clear weather . As can be conclude in the graph above, the window closed automaticly when it hit 37 lux at 7:09p.m. The red line crossing is when the micorocontroller read as 1 and the window is closed.

Table 4: Light intensity in morning

TIME	Light Intensity	Digital Signal
6:45 A.M	1.2	1
6:50 A.M	1.2	1
6:55 A.M	1.2	1
7:00 A.M	1.4	1
7:05 A.M	2.3	1
7:10 A.M	6.0	1
7:15 A.M	14	1
7: 20 A.M	26	1
7:25 A.M	37	0
7:30 A.M	56	0

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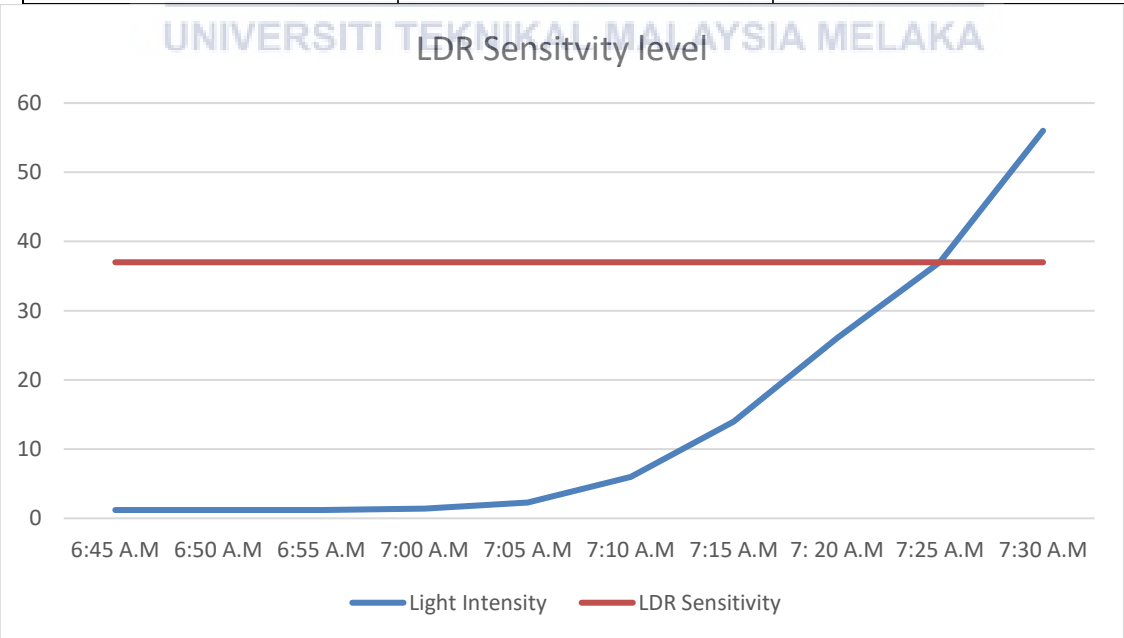

Figure 15: Data in morning

The data above taken in the morning to compare the light intensity in the morning and evening and to determine accuracy of the light intensity for the project to open and close window. According to the data, the LDR react when it hit 37 lux of light intensity.

Table 5: Raindrop Sensitivity

Number of raindrop	**Digital signal**
0	1
1	1
2	1
3	0
4	0

Data above to test how much rain drop needed for the rain sensor to detect by microcontroller. It show it needed more than 3 raindrop for the rain sensor to sending signal from 1 to 0.

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Table 6: Time taken linear actuator

	Time taken
Close - Open	49.89 *s*
Open - Close	46.65 *s*

Table shown above time taken for the window to fully open and fully close the window. It take less than 50 seconds to fully opened and closed.

CHAPTER 5

CONCLUSION

5.1 Conclusion

In conclusion, every goal, including creating an automatic casement utilizing a microcontroller, was effectively attained. The microcontroller in this project is a NODE MCU ESP8266, and the Arduino IDE is used to compile code. After conducting study on the use of an IoT, the first initial proposed using an Arduino uno is changed to use a Node MCU 8266 due to its ease of connection with wi-fi. It is simpler to utilize this microcontroller because it uses the same language as the Arduino Uno. This can enable communication between the project system and Blynk utilizing the Node MCU. The project was first developed using simple code without the aid of a smartphone, but it now depends on the internet to function. The buttons were virtually constructed to control the project's functioning. That is the project's restriction, which is that there will be an issue if there is no internet.

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5.2 Project Limitation

Nowadays, the internet is the most important thing, and this project is leveraging the internet to make daily life easier. sending real-time data to the user through the internet. Because this project uses virtual buttons, it may be limited by the fact that it cannot be utilized without an online connection. The virtual data must be transmitted across the internet. Without internet, the project cannot follow the virtual button and the data cannot be transferred.

5.3 Future works

The project that has already been created has issues of its own and needs opportunity for improvement. Future work on this project is required due to the safety-related concern that has been raised. This project still lacks protection, and there are nighttime thieves. Only a flash light may be used by a burglar to automatically open the window. Simply aim the flash light at the LDR sensor to open the window and remove all securities from this project. In upcoming projects, an RTC module could be used to give the microcontroller a real-time clock capability. The microcontroller can become aware of real-time thanks to the real-time clock. To prevent automatic mode from operating at a certain period, especially after midnight, all that is required to do is set a time.

5.4 Project Potential

This project's major goal is to benefit homeowners. However, there is also an office, hospital, and industrial potential for this project. This project might prevent water damage to property at a business. For instance, you can protect sensitive documents from water damage caused by windows nearby. The same applies if your PC is next to a window; water damage can harm electronic devices. With this project, there is a lot of potential; all that must be done is replace the sensor with a reliable environment.

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APPENDICES

APPENDIX 1

Coding for automatic casement using microcontroller with IoT

Blynk_Testing

```
#define BLYNK_PRINT Serial

/* Fill-in your Template ID (only if using Blynk.Cloud) */
#define BLYNK_TEMPLATE_ID   "TMPLpm5FIjFB"


#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

// You should get Auth Token in the Blynk App.
// Go to the Project Settings (nut icon).
char auth[] = "apPmVMfSKbJwuedXYM3q7oIet4BnodwX";

// Your WiFi credentials.
// Set password to "" for open networks.
char ssid[] = "mohammad syafiq";
char pass[] = "aal23456";

int sw1= D0;
int sw2= D1;
int sw3= D2;
int sw4= D3;
int sw5= D4;

int mt1 = D5;
int mt2 = D6;


BLYNK_WRITE(V0) {
  digitalWrite(D2, param.asInt());
```

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```
}

BLYNK_WRITE(V4) {
  digitalWrite(D3, param.asInt());

}
BLYNK_WRITE(V5) {
  digitalWrite(D4, param.asInt());

}

int MODE=0;

void setup()
{
  pinMode(mt1,OUTPUT);
  pinMode(mt2,OUTPUT);
  pinMode(sw3,OUTPUT);
  pinMode(sw4,OUTPUT);
  pinMode(sw5,OUTPUT);

  pinMode(sw1,INPUT);
  pinMode(sw2,INPUT);


  // Debug console
  Serial.begin(9600);

  Blynk.begin(auth, ssid, pass);
```

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```
  Serial.println("Automatic Casement");
}

void loop()
{
  if(MODE==0)    //Manual
  {
    if (digitalRead(sw4)==1 && digitalRead(sw5)==0)     //manual Buka
  {

    Serial.println("manual Open");
    digitalWrite(mt1, LOW);
    digitalWrite(mt2, HIGH);
  }
  if (digitalRead(sw4)==0 && digitalRead(sw5)==0)     //manual berhenti
  {

    Serial.println("manual Stop1");
    digitalWrite(mt1, LOW);
    digitalWrite(mt2, LOW);
  }
  if (digitalRead(sw4)==0 && digitalRead(sw5)==1)     //manual tutup
  {

    Serial.println("manual close");
    digitalWrite(mt1, HIGH);
    digitalWrite(mt2, LOW);
  }
  if (digitalRead(sw4)==1 && digitalRead(sw5)==1)     //manual berhenti
  {
```

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```
    Serial.println("manual Stop2");
    digitalWrite(mt1, LOW);
    digitalWrite(mt2, LOW);
  }
    if(digitalRead(sw3)==0)
    {
      Serial.println("AUTOMATIC");
      MODE=1;
    }
  }
  if(MODE==1)   //Auto
  {
    if (digitalRead(swl)==1 && digitalRead(sw2)==0)   //tiada air, ada cahaya
    {
      Serial.println("Buka tingkap");
      digitalWrite(mt1, LOW);
      digitalWrite(mt2, HIGH);

    }
    if (digitalRead(swl)==0 && digitalRead(sw2)==1)   //ada air, tiada cahaya
    {
      Serial.println("Tutup tingkap");
      digitalWrite(mt1, HIGH);
      digitalWrite(mt2, LOW);
    }
    if (digitalRead(swl)==1 && digitalRead(sw2)==1)   //tiada air, tiada cahaya
    {
      Serial.println("Tutup tingkap2");
      digitalWrite(mt1, HIGH);
      digitalWrite(mt2, LOW);
    }
    if(digitalRead(sw3)==1)
    {
      Serial.println("MANUAL");
      MODE=0;
    }
  }
  Blynk.run();
}
```

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APPENDIX 2

Overall of the project

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