Faculty of Electrical and Electronic Engineering Technology

TITLE: DEVELOPMENT OF SMART HOME CONTROLLED BY IOT

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Bachelor of Electrical Engineering Technology (Industrial Power) with Honours

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

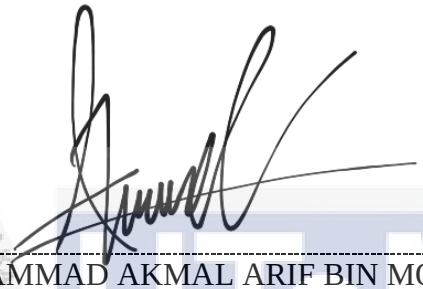
Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2022

DECLARATION

I declare that this project report entitled “DEVELOPMENT OF SMART HOME CONTROLLED BY IOT” 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.

Signature : 

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APPROVAL

I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electrical Engineering Technology with Honours.

Signature : 

Supervisor Name : KAMILAH BINTI JAAFAR

Date : .....

Signature : .....

Co-Supervisor : .....

Name (if any)

Date : .....

DEDICATION

To my beloved mother, Suhaila, and father, Mohd Adam,

and

my sister, Izzaty

ABSTRACT

As the electrical engine was the vector of technical progress in the Industrial Age, the Internet is the decisive technology of the Information Age. This worldwide network of computer networks, which is mostly built on wireless communication platforms nowadays, allows ubiquitous multimodal, interactive communication in chosen time and space. Smart home technology refers to a variety of commonplace household equipment that may communicate with one another and with the Internet. Owners can use this connectivity to programme simple everyday routines and, in certain situations, control device performance from afar. Smart homes, while designed for convenience, also carry the promise of enhanced independence for the elderly and those with impairments. As we know that we are having same problem which is we does not our current usage of electricity in our house, safety when we are away from our home, is it we already switch off the light fans and lightings when going out or even we having a lazy mood to turn on fan and light when already sit down at the couch. Hence, in this project all the problems will be solve.

ABSTRAK

Memandangkan elektrik adalah vektor kemajuan teknikal dalam Zaman Perindustrian, Internet adalah teknologi penentu zaman maklumat. Rangkaian rangkaian komputer di seluruh dunia ini, yang kebanyakannya dibina pada platform komunikasi tanpa wayar pada masa kini, membolehkan komunikasi interaktif multimodal di mana-mana dalam masa dan ruang yang dipilih. Teknologi rumah pintar merujuk kepada pelbagai peralatan rumah biasa yang boleh berkomunikasi antara satu sama lain dan dengan Internet. Pemilik boleh menggunakan ketersambungan ini untuk memprogram rutin harian yang mudah dan, dalam situasi tertentu, mengawal prestasi peranti dari jauh. Rumah pintar, walaupun direka untuk kemudahan, juga menjanjikan kebebasan yang dipertingkatkan untuk warga emas dan mereka yang cacat. Seperti yang kita tahu bahawa kita mempunyai masalah yang sama iaitu kita tidak menggunakan elektrik semasa di rumah kita, keselamatan ketika kita jauh dari rumah kita, adakah kita sudah menutup kipas dan lampu ketika keluar atau kita mempunyai mood malas nak pasang kipas dan lampu bila dah duduk kat sofa. Oleh itu, dalam projek ini semua masalah akan diselesaikan.

ACKNOWLEDGEMENTS

First and foremost, I want to thank my boss, KAMILAH BINTI JAFFAR, for her invaluable advice, wise words, and patience throughout this endeavour.

I also owe Universiti Teknikal Malaysia Melaka (UTeM) gratitude for providing financial assistance through my parents so that I may complete the project. Not to mention my fellow employee, who was happy to share his ideas and thoughts on the project.

The love and prayers of my mother Suhaila, my sister Izzati, and my father Mohd Adam during the time I was studying are greatly appreciated. My brother deserves recognition as well for all the inspiration and compassion. And thanks to Hariz Danial for all of your assistance.

Finally, I would like to thank all the staffs at the Universiti Teknikal Malaysia Melaka (UTeM), fellow colleagues and classmates, the faculty members, as well as other individuals who are not listed here for being co-operative and helpful.

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CHAPTER 1

INTRODUCTION

1.1 Background

This is a new era everything needs to be link to internet and it like a new norm everything need to be connected to internet to get latest information and always in trend with everyone else. As we know that more technology being connected to internet which everything being controlled by just a tap on screen from far away such as smart car which we able to control air conditioner even we are not in the car, smartphones literally is a small compact computer that can handle any task just like computers. Internet just like a new basic need for human to do interaction and connecting with others to get the easiest and faster alternative.

1.2 Problem Statement

Nowadays all thing has been optimized to be smart in term of efficiency, control and update to make sure our daily life easier and efficient. There have many new smart technologies has been created where we can control it just by our phone or an application. Sometimes we having some problem such as we were forgot to switch off lights, fan, our house safety in many aspects or during late night a woman wanted going back to her house while the environment was dark so she can ensure that her car porch is save from any intruder by turn on her porch lamp by using smartphone to ensure it is saved to enter the house. Besides that, people want a perfect ventilating and stable optimum temperature of the house and we want to reduce any fatal accident like burning house and any intruder.

1.3 Project Objective

The objective project is to make our daily life are more practical in term of we can control everything in the house system even we are away from home or even at the house. Besides that, this is an invention a way of convenience which we can control and know any data that link to IOT by our phone of the house system such as;

a) To design a smart home for controlling house system such as lighting, fan and security system.

b) To develop monitoring system using INTERNET OF THINKING (IOT).

c) To analyze energy efficiency by using the smart home controlling system.

1.4 Scope of Project

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

a) Investigate the best sensor that can be used for the system.

b) Using a stable application in phone to ensure the system are optimized.

c) Investigation of data transfer to the cloud system of an app.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Nowadays, what can be observed to all country over the world including Malaysia having a rapid development of infrastructure and this action are gaining an increment of energy demand and maybe after many years of using energy carelessly 1 day the world does not have enough natural resource to fulfil the demand. Many awareness campaign was given to public to give concern about reducing the intensity of electricity consumed but until now a suitable solution still unfound. Besides that, we are living in a new era which needed to be always updated and can control everything including our home need to be have all criteria should have in a smart system.

Hence, this project help to develop a smart home controlled by IOT and monitoring electric consumption by controlling all auxiliary inside the house by using smartphone. By using this system, it will help user to control all appliances in the house. This project may face some problem need to be solve such as massive amount of data need to be collected and upload it to the cloud and then connected to internet. Therefore, this project needs to be design accurately as possible to ensure there no flaws and having any data loss collected from smart home system.

2.2 Internet of Things (IOT)

Due to the integration of multiple devices with diverse owners and makers, Internet of Things (IoT) systems are vulnerable to a wide range of threats. IoT applications frequently involve components in clouds and fogs, as well as being part of broader cyber-physical systems; in other words, these systems are extremely complex, which adds to their security issues. Patterns are a good approach for this purpose because of their abstraction power, the design of IoT-based apps must be able to handle this complexity and heterogeneity, patterns are a suitable approach for this purpose because of their abstraction power. The Internet of Things (IoT) is a collection of things (items) with unique IDs that may connect and collaborate to achieve shared goals, such as sensors, actuators, smart phones, and so on. IoT systems have broadened the scope of applications by offering centralized control of a wide range of devices [1].

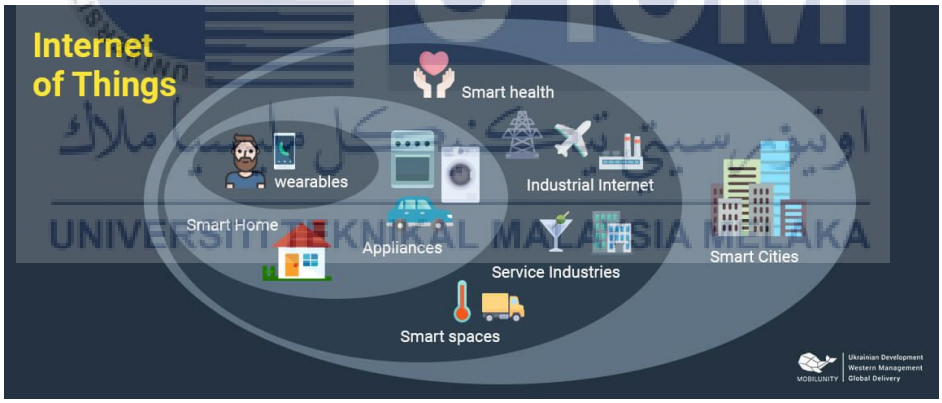

Figure 1: INTERNET OF THINGS

2.2.1 Smart Home Concept

Smart Home Systems have numerous advantages, including reducing environmental impact, lowering energy costs, and enhancing building security and safety. The technologies not only control building processes, but they also transform data to help customers figure but also provide them some control over them. over it when it's necessary Building occupants can control their energy consumption with smart controls. Only deliver energy in the form of heating, cooling, conditioned air, and lighting when there is a need from the user.

Users should be able to control when and how much energy they utilize. After the construction or renovation is completed, the behavior is adjusted to achieve the expected end functions of the building, such as turning on the heating/thermostat when it is cold, opening the windows for ventilation, turning on the air-conditioning if it is too hot, turning on the lights, and so on. The difference between the calculated final energy demand (i.e the building envelope and the installations) and the real measured final energy demand is large due to occupant behavior. Self-learning automation systems that alter the control algorithm based on the occupants chosen settings could be a solution. When considering a "Smart Home," information and feedback to building inhabitants should be considered" [2].

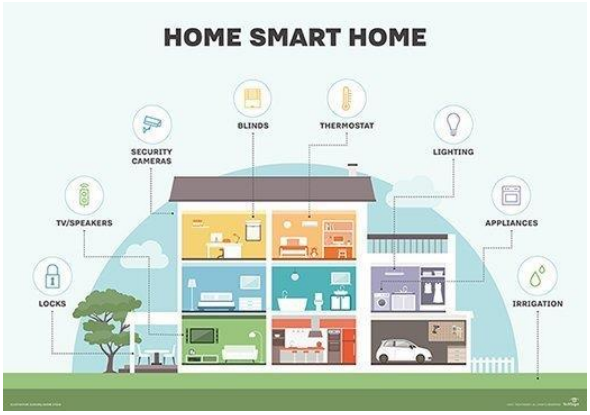

Figure 2 Smart home concept

2.2.1.1 Smart Home devices

Some products, such as the Blink smart camera, smart thermostat, fire sensors and smart lighting fixtures, interact wirelessly with an IoT hub. The reason for this is the device's energy efficiency, since they use the battery as the end device's power source, which gives them advantages in terms of mobility and independence from electricity as a power source. A wireless access point connects the IoT hub to Wi-Fi assessed to be a suitable collection point for traffic generated by IoT devices based on the foregoing wireless access point for traffic generated by IoT devices has been determined to be a wireless access point. Traffic in the communication network cannot be gathered directly due to the established modes of operation and features of computers, and thus wireless Wi-Fi networks. (Ivan et al., 2020)

In the "Internet of Things," where everything has an assigned IP address and can be watched and accessed remotely at anytime from anywhere, home automation, also known as "Smart Home," is a crucial element. It is the method by which additional gadgets and household equipment are networked to govern every element of a smart home. Home automation systems have traditionally been used to manage lighting and basic appliances. Recently, technology has made it possible for us to fully control our smart home appearances from anywhere, bringing the concept of a globally connected world to life [9]. Home automation can specify when, why, and how a gadget should react. It offers comfort, total control, and cost savings. (Jaabar et all., 2018).

2.3 Design And Development of Smart Homes

The sophisticated lighting control system is one of the advantages of Smart Home. The user is no longer required to manually turn on or off electrical appliances. For instance, the user has two alternatives when entering the bedroom: either the light will turn on and off automatically when the user enters and exits the space, or the user can control the switching from the application using his smartphone. In order to reduce power consumption, the brightness of the light can also be adjusted. In addition, the user has the option of changing the room's settings based on sensor data (temperature, humidity, etc.), such as controlling the fan's speed from a mobile application or having the speed automatically change in response to changes in the room's temperature. The energy efficiency can be increased in this way because when electrical equipment is readily or automatically shut off when not in use, more energy is saved and the cost of electricity is reduced.

Additionally, the user can utilize a smartphone, tablet, or laptop to manage electrical appliances and check on the state of the home from anywhere. For instance, if the user has already arrived at his or her office and has neglected to turn off the fan, he or she can do it using a smart device. In order for the user to know whether their house is flooded or the air around them is harmful, smoke, carbon monoxide, and flood sensors can also be added. In these cases, the user can choose to stay at home.

When a security event occurs, the user will receive a notification on their phone. They do not need to worry if a burglar tries to break into their home because they can keep an eye on things from their phone using the motion sensor, and if any movement is noticed, the alarm will sound. The security system is the component that will help protect our home from attackers the most. We can deter the thief from breaking into the residence by installing wired security cameras as part of a security system. All the elements of a smart house,

including the ventilation, heating, air conditioning, centralized lighting system, controlled appliances, and security system, can provide security as well as comfort in daily life.

Plywood was used to construct the smart home prototype shown in figure below. After that, wiring and hardware installation are completed. The Arduino Software's programming stage is then finished. Any issue that arises during project construction is found and fixed during the testing phase in order to improve and optimize the design. To avoid making the same mistake, several improvements are also made. The project's overall design is then assessed. A centralized lighting system, automatic appliances, and security system can provide convenience and security in daily life [10]. (Jaabar et all., 2019).

Figure 3: Shows example of smart house protype

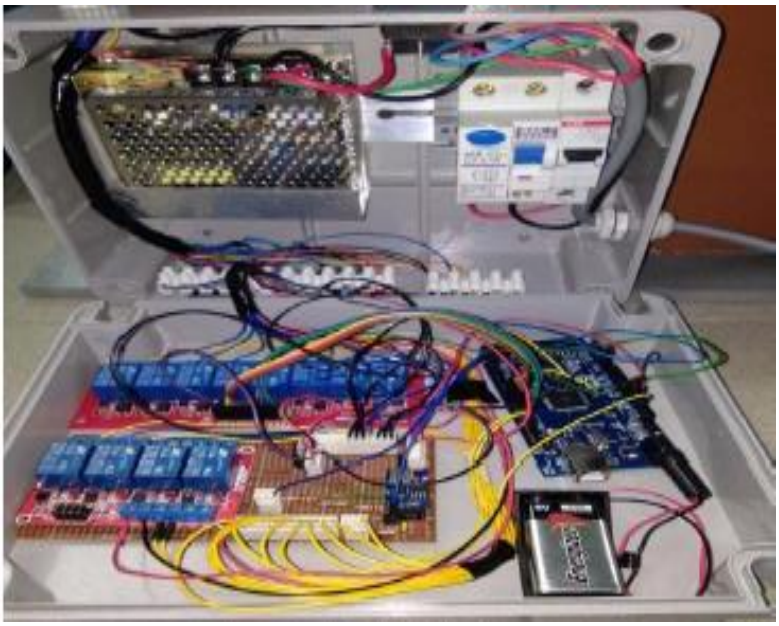

Figure 4: Shows example distribution box for controlling smart house Figure 5: Shows flow chart for Smart Home using AC power.

2.3.1 Flow chart and circuit based on previous study

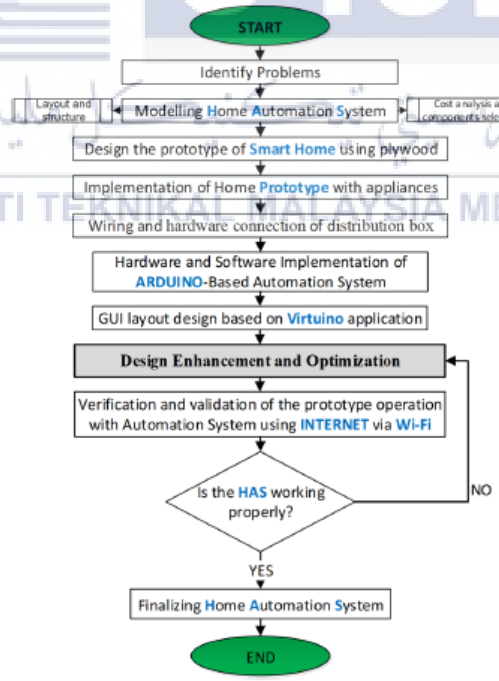

Figure 6 Shows flow chart for Smart Home using AC power.

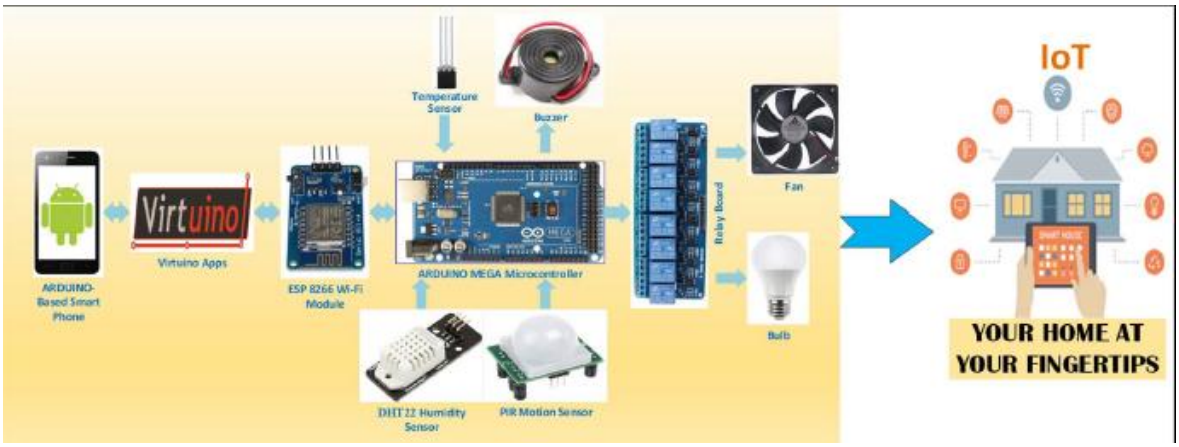

Figure 7:Shows flow chart for Smart Home using AC power.

2.4 Microcontroller

Microcontrollers are commonly used in a wide range of electronic devices, including automobiles, appliances, and industrial systems. They are also used in embedded systems and other applications where a small, low-power, low-cost computer is needed to control a specific function or group of functions. A microcontroller typically includes a central processing unit (CPU), memory, and I/O interfaces. The CPU is the heart of the microcontroller, executing instructions stored in memory. Memory can include both read-only memory (ROM) and random-access memory (RAM). I/O interfaces allow the microcontroller to interact with the outside world, such as by receiving input from sensors and controlling output to actuators.

2.4.1 ESP 8266 BOARD

The ESP8266 is a low-cost Wi-Fi microcontroller chip with full TCP/IP stack and microcontroller capability produced by Espressif Systems. It can be used to connect devices to the internet and is commonly used in IoT (Internet of Things) projects. The chip can be programmed using the Arduino IDE, and it has a large developer community that has created

a wide range of libraries and tutorials for it. ESP8266 is a highly integrated chip designed for the needs of a new connected world. It offers a complete and self-contained Wi-Fi networking solution, allowing it to either host the application or to offload all Wi-Fi networking functions from another application processor. The ESP8266 is a low-cost Wi-Fi microcontroller chip that can be used to connect devices to the internet. It can operate in three different modes:

- Station Mode (STA): In this mode, the ESP8266 connects to an existing Wi-Fi network, such as a home router, and can be used to send and receive data.
- Access Point Mode (AP): In this mode, the ESP8266 creates its own Wi-Fi network and other devices can connect to it.
- Both Station and Access Point Mode (STA+AP): In this mode, the ESP8266 can act as both a client and an access point simultaneously, allowing other devices to connect to it while also connecting to an existing network.

The ESP8266 can be programmed using the Arduino IDE or the Node MCU firmware, and it has a large developer community that has created a wide range of libraries and tutorials for it. These libraries include support for HTTP, MQTT, and other protocols commonly used in IoT projects. It can be powered by USB or external power supply, and it has a wide range of applications such as home automation, sensing, and control, industrial automation and control, and many more.

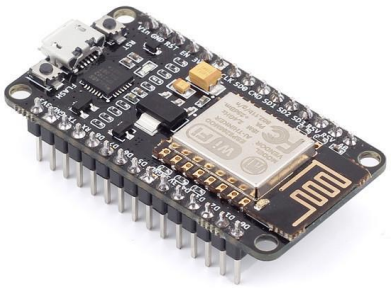

Figure 8: Shows a ESP8266 Board

2.4.2 ARDUINO UNO

The Arduino UNO is a popular open-source microcontroller board based on the ATmega328P microcontroller. It is designed to make it easy for beginners to get started with microcontroller programming and electronics. The board includes a USB interface for connecting to a computer, and it can be programmed using the Arduino software development environment.

The UNO board has 14 digital input/output pins, 6 of them can be used as PWM outputs, and 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It also has a built-in voltage regulator which allows it to be powered with a voltage range of 7-12 volts.

The board has a wide range of features that make it suitable for a variety of projects, from simple LED blinkers to more complex projects such as home automation, robotics, and data logging. It also has a large developer community and it is supported by a wide range of libraries and tutorials.

The UNO board is compatible with a wide range of shields, which are additional boards that can be stacked on top of the UNO to add new functionality, such as Ethernet, wireless communication, and more.

It is one of the most popular boards in the Arduino family and it is a good board to start learning microcontroller programming and electronics.

Figure 9: Show a ARDUINO UNO Board

2.4.3 RASBERRY PI

The Raspberry Pi is a small, low-cost, single-board computer developed by the Raspberry Pi Foundation in the United Kingdom. It is designed to promote the teaching of basic computer science in schools and developing countries. The device is small enough to fit in the palm of your hand and can be powered by a micro-USB adapter, making it portable and easy to use.

The Raspberry Pi comes in several models, with varying specifications and features. The most recent models (Raspberry Pi 4) has a 64-bit quad-core ARM Cortex-A72 CPU running at 1.5GHz and ranges from 2GB to 8GB of RAM. All models have built-in Ethernet and support for wireless connectivity, and multiple USB ports, and a 40-pin GPIO (General Purpose Input/Output) header for connecting hardware devices.

The Raspberry Pi runs on a Linux-based operating system, such as Raspbian, which is a free and open-source operating system based on Debian. Users can also run other Linux distributions, such as Ubuntu, and even Windows 10 IoT Core.

Figure 10 Show a RASBERRY PI Board

2.5 Microcontroller Comparison

Table 1: Summarize of micro controller

	ESP 8266	ARDUINO UNO	RASBERRY PIE
Price	Cheap	Cheap	Expensive
Processor	Tensilica L106 32-bit RISC processor	Atmel 8-bit AVR microcontroller	a 64-bit quad-core ARM Cortex-A72 CPU
Input/ Output connection	17 pins	14 pins	40 pins
Reliability	Enough	Enough	Overpower
Wi-fi card built in	Yes	No	Yes

2.6 Summary

Overall, the choice of which board to use will depend on the specific requirements of the project. The ESP8266 is a good choice for projects that need Wi-Fi connectivity and minimal processing power, the Arduino is a good option for projects that require more inputs and outputs, and the Raspberry Pi is a good choice for projects that need a more powerful computer.

CHAPTER 3

METHODOLOGY

3.1 Introduction

This chapter will summarize the project in order to meet the study's objectives. The process flow, software design, hardware that being used, circuit operation, and test method are all detailed in this chapter. Besides that, an explanation will be demonstrating the method that's used to analyze how the smart home will be function and also will be examine the house's to be a smart system concept.

3.2 Methodology

This thesis presents a new and integrated analytical approach of how a smart home operate, system to control all the feature that we can be use. Below shows the project flow chart in detail.

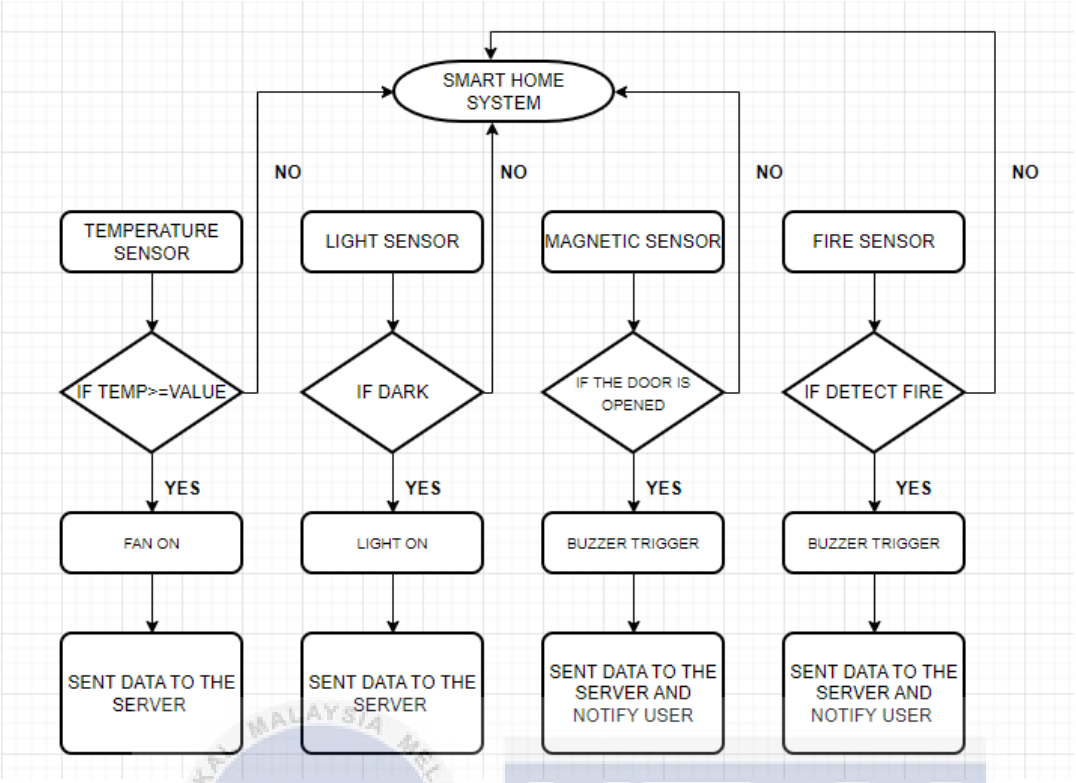

Figure 11: Flowchart of Smart Home

3.3 Project Development

There are two aspects to the development of the system, which includes both hardware and software design. The hardware component means the creation of a smart home system built of a wireless module, a microprocessor, and sensors. Meanwhile, the monitoring and alerting system is being developed by the software. Hence, both components hardware and software are really are critical to the system's overall efficiency.

3.3.1 Hardware Development

Hardware development includes an ESP8266 Wi-Fi module, light-dependent resistors (LDR), temperature sensor, servo motor, simple DC motor, fire sensor,magnetic sensor, LCD display and a power supply. Other than that, the development of designing the house

module to placing the most suitable spot to put the sensor to get the best sensor functionality are also has been taken care.

3.3.2 Circuit Design

ESP8266 Wi-Fi module board are the essential components of this smart home project. The coding and program are uploaded via USB connection to the ESP8266 Wi-Fi module board. All the data and can controll all the feature will be uploaded to the cloud and linked to the ARDUINO IOT REMOTE application.

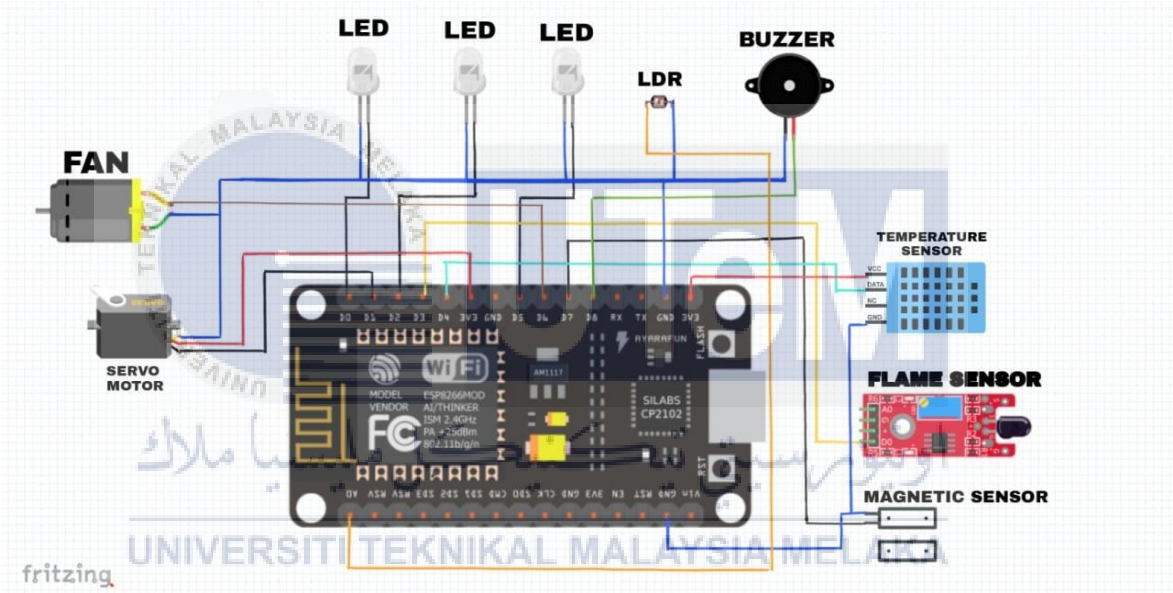

Figure 12: Circuit Design

3.3.2.1 ESP8266 BOARD

The ESP8266 board is programmed using the Arduino IDE, which allows for the easy uploading of code to the board and the ability to interact with the ESP8266's WiFi capabilities. It also has several GPIO pins that can be used to connect sensors, actuators, and other devices. Hence, the ESP8266 is the best choice to this project because it has a

wi-fi card built in and it can be relied on supporting all the sensor and no need have external microcontroller to control all the sensors.

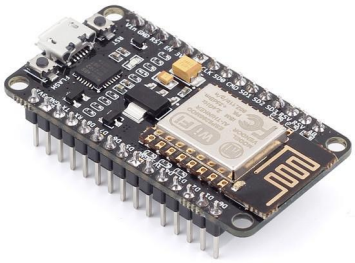

Figure 13: ESP8266 Board

3.3.2.2 FLAME SENSOR

A 4-pin IR flame sensor is a type of sensor that detects the presence of infrared radiation emitted by a flame. It typically consists of a sensor module with an infrared (IR) receiver and a signal processing circuit, and is often used in fire alarm systems and other applications where flame detection is needed. The 4-pin version of the sensor typically has four connections: a power pin, a ground pin, an output pin, and an adjust pin. The power pin is used to provide power to the sensor, the ground pin is used to complete the circuit, the output pin sends a signal to the microcontroller or other device indicating the presence of a flame and the adjust pin is used to adjust the sensitivity of the sensor.

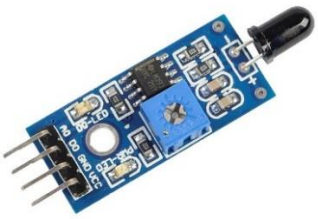

Figure 14: Flame Sensor

3.3.2.3 TEMPERATURE SENSOR

The DHT11 is a low-cost humidity and temperature sensor that can be used with the Arduino microcontroller. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and sends digital signals on a single data pin to the Arduino. The Arduino can then interpret the signals and convert them into meaningful temperature and humidity data. The DHT11 is a popular choice for Arduino projects due to its low cost and ease of use. There are also libraries available for Arduino that make it easy to read data from the DHT11 sensor.

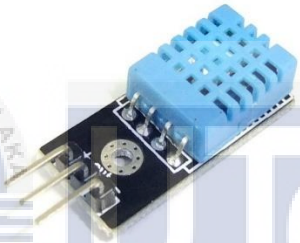

Figure 15: DHT Temperature Sensor

3.3.2.4 LDR SENSOR

An LDR (light-dependent resistor) board is a type of sensor board that can be used with an Arduino microcontroller to measure the amount of ambient light in the environment. The board typically consists of an LDR sensor and a voltage divider circuit, which is used to convert the resistance of the LDR into a voltage that can be read by the Arduino. By measuring the voltage, the Arduino can determine the amount of light hitting the sensor.

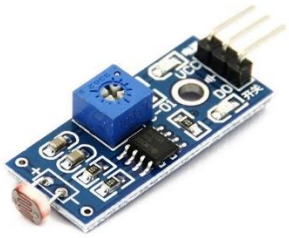

Figure 16: LDR Board Sensor

3.3.2.5 MAGNETIC DOOR SENSOR

An Arduino magnetic sensor can be used in a door application to detect whether a door is open or closed. This can be done by placing a magnet on the door and a magnetic sensor, such as a Hall effect sensor, on the door frame. When the door is closed, the magnet will be in close proximity to the sensor and a magnetic field will be present. The Arduino can be programmed to read the output of the sensor and determine whether the door is open or closed based on the presence or absence of the magnetic field.

Figure 17: Magnetic Door Sensor

3.3.2.6 BUZZER

An Arduino buzzer is a type of piezoelectric buzzer that can be controlled using the Arduino platform. It is a simple device that produces sound when a voltage is applied to it. The Arduino board can be used to generate the necessary voltage and control the frequency of the sound produced by the buzzer. This can be done using the built-in tone function or by directly controlling the digital output pin to which the buzzer is connected.

Figure 18: Buzzer

3.3.2.7 SERVO MOTOR

The SG90 is a type of micro servo motor it is a small, lightweight and low-cost motor that can rotate to a specific position based on the control signal it receives. It has a rotation range of approximately 180 degrees and can be controlled using Pulse Width Modulation (PWM) signals. The SG90 can be connected to an Arduino board using a 3-pin servo connector, with one pin for power, one for ground, and one for the control signal. The Arduino can then be used to control the position of the servo using the servo library, which provides functions for controlling the position of the servo motor.

Figure 19: SG90 Servo Motor

3.3.2.8 DC MOTOR

DC motor typically controlled using a DC power source and can be controlled using a variety of methods such as PWM, H-bridge or L293D motor driver IC. These motors can be connected to a microcontroller such as an Arduino to control the speed and direction of rotation.

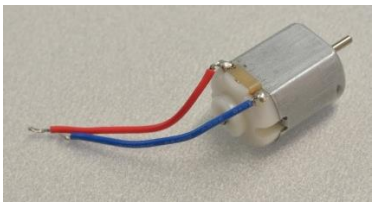

Figure 20: Mini Dc Motor

3.3.2.9 BUZZER

Buzzer is a simple device that can be used to produce sound with the help of an Arduino board. It typically consists of a piezoelectric transducer that converts electrical signals into mechanical vibrations, which in turn produce sound. Buzzers can be connected to a microcontroller board using digital output pins, and can be controlled using simple code to produce different sounds and frequencies.

Figure 21: Buzzer

3.3.2.10 RELAY

Relay is a device that allows a microcontroller board to control and switch electrical loads. A relay is an electrically operated switch that can be controlled by an electronic circuit, such as an Arduino and ESP8266. The relay consists of an electromagnet that, when energized, causes a switch to close or open. The switch can be used to turn on or off lights, motors, and other devices. The microcontroller board can control the relay by sending a signal to the relay's control pin.

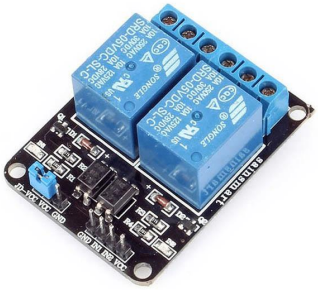

Figure 22: Relay

3.3.2.11 IOT CLOUD

IoT (Internet of Things) cloud services allow Arduino boards to connect to the internet and send or receive data to/from a cloud server. This enables remote monitoring and control of devices, as well as the ability to store and analyze data.

Figure 23:IOT CLOUD BY ARDUINO Software

3.3.2.12 Arduino Integrated Development Environment (IDE Software)

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 programmes.

Figure 24: ARDUINO IDE Software

3.3.2.13 FRITZING

Fritzing is an open-source software tool that allows users to create interactive electronics diagrams, schematics and PCB layouts. It is designed for both beginners and professionals.

It can be used for creating diagrams to document and share circuit designs, as well as for creating PCB layouts for manufacturing.

Figure 25: FRITZING Software

3.4 Summary

The method is the key element to completing the project, according to the synopsis for chapter 3. The project work plan is crucial to completing it on time. The way this project operates is essential since it acts as its "brain." The right hardware was used to complete this project. The project's flow chart also explains how it functions, and the techniques of procedure go into deeper detail about the entire process from beginning to end.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

The findings of the experiments conducted for this project are explained in this section. the state, functionality, and specifications of the product, etc. In this chapter, the analysis of the project's practical strengths and benefits was completed. The general outcomes and discussion of the project will be covered in more detail in this chapter. The project testing results, from simulation to real-time testing, include data analysis, project operation conditions, and each project testing outcome. The final result of this testing and analysis will be used as the yardstick for determining if the project objectives have been archived or not. The three components of this chapter are preliminary results, final results, and conclusion will be discussed.

4.2 Result

4.2.1 Programming

The Smart Home are controlled by a microprocessor which is ESP8266 and it need a programming code to contol and give command to all the auxiliary equipment to be function below are all the programming code for Smart Home system

```
8
9     String msg;
10    String msg2;
11    String msg3;
12    CloudTemperatureSensor temperature;
13    CloudRelativeHumidity humidity;
14    bool fan_connect;
15    bool led;
16    bool led2;
17    bool led4;
18    bool led5;
19    bool motor;
20    bool security;
21
22    Variables which are marked as READ/WRITE in the Cloud Thing will also have functions
23    which are called when their values are changed from the Dashboard.
24    These functions are generated with the Thing and added at the end of this sketch.
25  */
26  #include "thingProperties.h"
27  #include <Servo.h>
28  #include "DHT.h"
29  #define DHTpin 2 // D4 on the nodemcu ESP8266
30  #define DHTTYPE DHT11
31  DHT dht(DHTpin,DHTTYPE);
32
33  Servo servo;
34
35
36  const int hot = 30;
37  const int fire =0;
38  const int buzzer =15;
39  const int door =13;
40  const int ldrPin = A0;
41
```

```
int onboardled=14;
int onboardled2=16;
int ledPin = 4;
int fan =12;

int state;
int onboardled3;
int state2 = HIGH;

void setup()
{
  // Initialize serial and wait for port to open:

  pinMode(door, INPUT_PULLUP);
  pinMode(fire, INPUT);
  pinMode(buzzer,OUTPUT);
  pinMode(onboardled,OUTPUT);
  pinMode(onboardled2,OUTPUT);
  /*pinMode(onboardled3,OUTPUT);*/
  pinMode(ledPin,OUTPUT);
  pinMode(fan,OUTPUT);


  Serial.begin(9600);
  servo.attach(5);
  servo.write(0);
  // This delay gives the chance to wait for a Serial Monitor without blocking if none is found
  delay(1500);

  // Defined in thingProperties.h
  initProperties();

  // Connect to Arduino IoT Cloud
  ArduinoCloud.begin(ArduinoIoTPreferredConnection);

  /*
     The following function allows you to obtain more information
     related to the state of network and IoT Cloud connection and errors
     the higher number the more granular information you'll get.
     The default is 0 (only errors).
     Maximum is 4
 */
  setDebugMessageLevel(2);
  ArduinoCloud.printDebugInfo();
}

void loop()
{
  dht_sensor_getdata() ;

  Buzzer() ;

  LDR();

  LED();

  Motor();


}

void LED()
```

```
{
  if(led==1)
  {
    digitalWrite(onboardled,HIGH);
    Serial.println("ON");
  }
  else
  {
    digitalWrite(onboardled,LOW);
    Serial.println("OFF");
  }
    if(led2==1)
  {
    digitalWrite(onboardled2,HIGH);
    Serial.println("ON");
  }
  else
  {
    digitalWrite(onboardled2,LOW);
    Serial.println("OFF");
  }
   /*if(led3==1)
  {
    digitalWrite(onboardled3,HIGH);
    Serial.println("ON");
  }
  else
  {
    digitalWrite(onboardled3,LOW);
    Serial.println("OFF");
  }*/
  if(led4==1)
  {
    digitalWrite(onboardled,HIGH);
    digitalWrite(onboardled2,HIGH);
    /*digitalWrite(onboardled3,HIGH);*/
    Serial.println("ON");
  }
  if(led5==1)
  {
    digitalWrite(onboardled,LOW);
    digitalWrite(onboardled2,LOW);
    /*digitalWrite(onboardled3,LOW);*/
    Serial.println("ON");
  }

}
 void LDR()
{

  unsigned int AnalogValue;

  AnalogValue = analogRead(A0);

  /*Serial.println(AnalogValue);*/
  // Your code here

  if  (AnalogValue <= 400)
  {
    digitalWrite (ledPin,LOW);
  }
  else
  {
```

```
    digitalWrite (ledPin, HIGH);

  }
}

void dht_sensor_getdata()
{
   float hm= dht.readHumidity();
   Serial.print("Humidity ");
   Serial.println(hm);

   float temp=dht.readTemperature();
   Serial.print("Temperature ");
   Serial.println(temp);

   humidity=hm;
   temperature=temp;
   msg="Temperature = " + String (temperature)+"  Humidity = " + String(humidity);

    if (temperature >= 32)
   {

   digitalWrite(fan, LOW);
   Serial.println("Too hot");
   msg = "Too hot, initiating fan";
   //delay (2000);

   }
   else if (fan_connect == HIGH)
   {
    digitalWrite(fan,LOW);
   msg = "Fan ON";
    }
    else
    {
    digitalWrite(fan, HIGH);
    Serial.println("Optimum Temperature");
    msg = "Optimum temperature";
    //delay (2000);

    }


    if (isnan(hm) || isnan(temp))
    {

      Serial.println("Failed to read from DHT sensor!");

      return;
    }

}

void Buzzer()
{
  dht_sensor_getdata();

  ArduinoCloud.update();
  // Your code here
  state = digitalRead(door);
  state2 = digitalRead(fire);

```

```
  if (state == HIGH && security == HIGH)
  {
    tone(buzzer, 800);
    msg2 = "Your door was opened ";
    Serial.println("help!!!!!");
  }
  else if (state2 == LOW)
  {
    tone(buzzer, 800);
    msg2 = "Warning! Fire detected ";
    Serial.println("help!!!!!");
  }
  else
  {
    analogWrite(buzzer, 0);
    msg2 = "Door is secured";
    Serial.println("Anda Selamat!!!!!");

  }
  delay(200);

}


void Motor()
{
  // Your code here
  if (motor == HIGH)
  {
  servo.write(90);
  msg2 = "Door is LOCK";
  delay(2000);
  }
  else
  {
  servo.write(0);
  delay(2000);
  }
  float hm= dht.readHumidity();
    Serial.print("Humidity ");
    Serial.println(hm);

    float temp=dht.readTemperature();
    Serial.print("Temperature ");
    Serial.println(temp);

    humidity=hm;
    temperature=temp;
    msg3="Temperature = " + String (temperature)+"  Humidity = " + String(humidity);

      if (isnan(hm) || isnan(temp))
    {

      Serial.println("Failed to read from DHT sensor!");

      return;
   }
}

```

4.2.2 IOT REMOTE APPS

Further explanation about application layout, how it operate remotely to controll all the auxiliary equipments, and messenger cloud to keep up to date in real time situation

Figure 26: IOT REMOTE APPS LAYOUT

Figure above shown that the apps dashboard on smartphone, the layout on controlling the auxiliary equipment such as light, fan, security mode, door locking system, and humidity and temperature indicator meter.

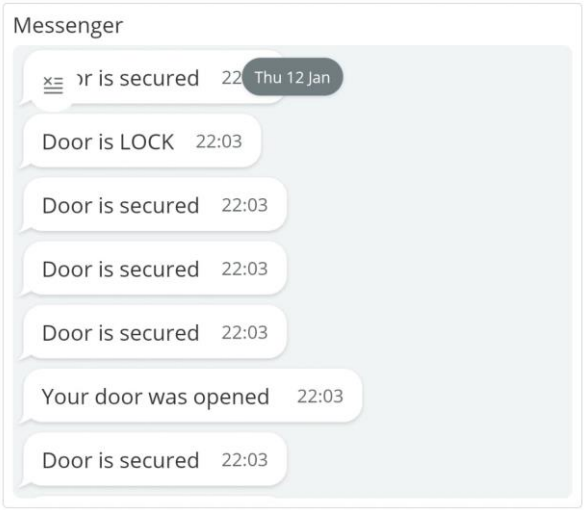

Figure 27: Messenger For Security Purpose

Figure above show messenger sent detail information received data from sensor and uploaded to cloud and display it to phone.

Figure 28: Messenger For Updating Operated Feature

Figure above show messenger sent detail information received data from sensor and uploaded to cloud and display it to phone.

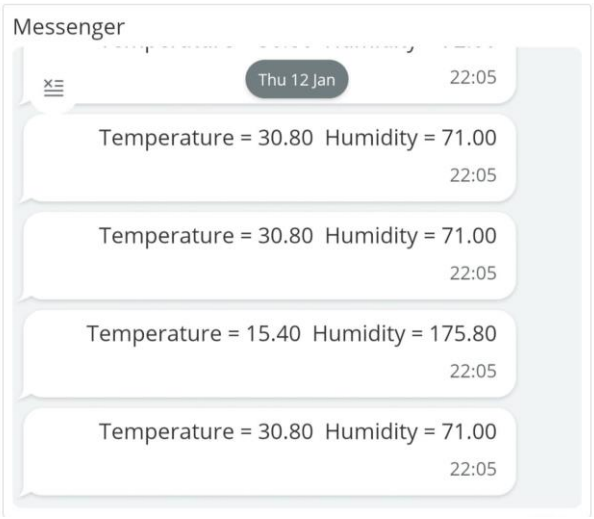

Figure 29: Messenger for Updating Temperature And Humidity values

Figure above show messenger sent detail information received data from sensor and uploaded to cloud and display it to phone.

4.3 Hardware Setup

Figure 30: The Project Connected To Power Supply

The figure above show that the circuit was connected completey with power supply and being connected to wifi to be controlled and monitor by IOT Apps.

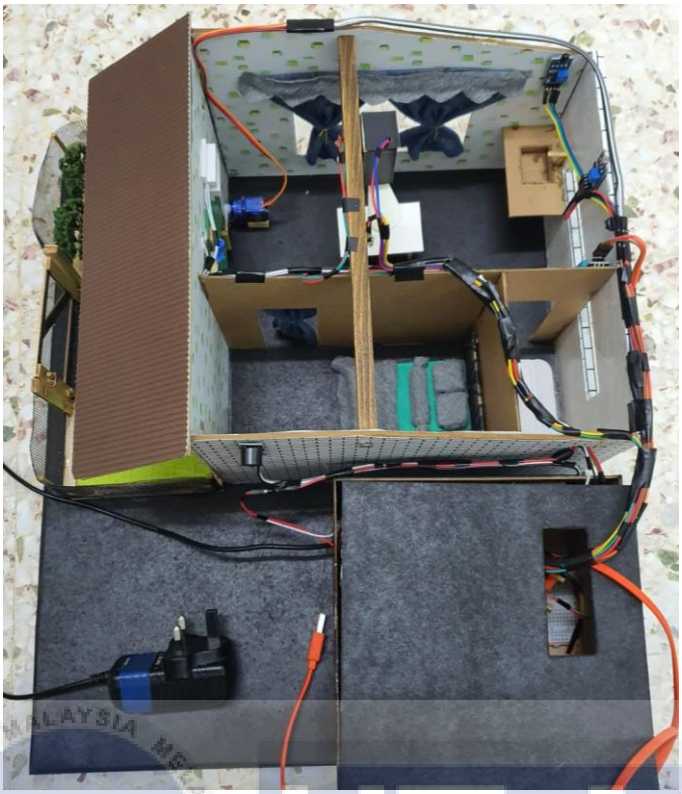

FIGURE 31: Smart Home layout from above

The figure above show that the Smart Home Layout from above in overall to show all the places of the sensor.

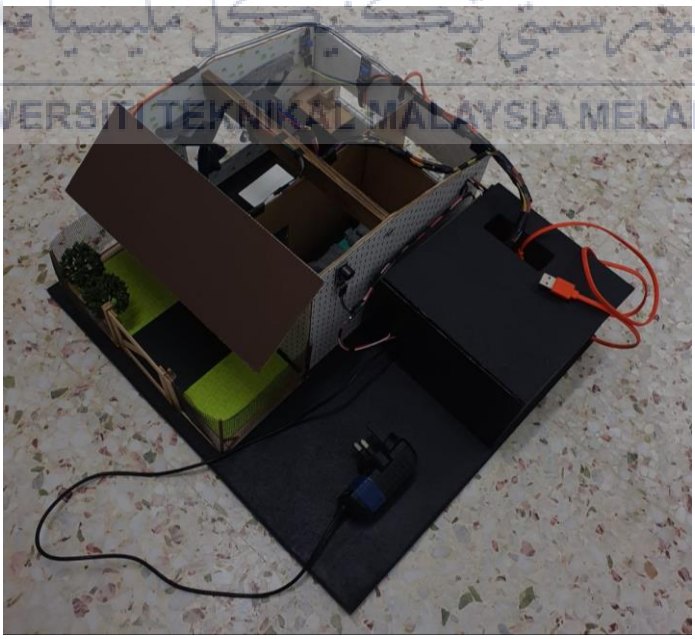

FIGURE 32: Show Overall Look of The Smart Home

4.3.1 Security Feature

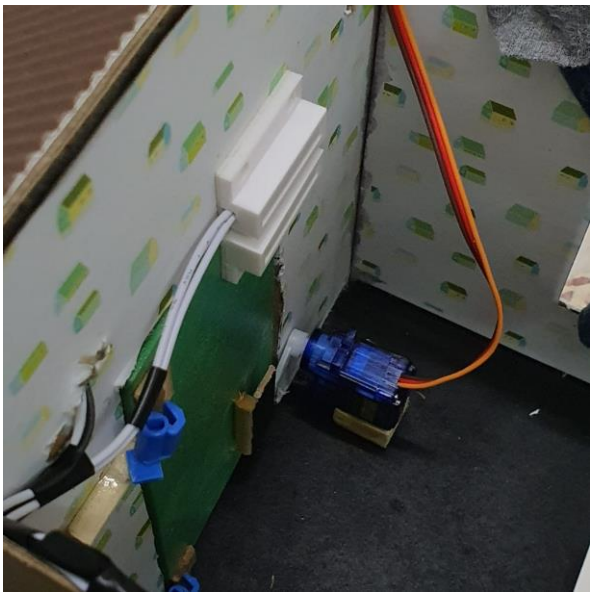

Figure 33: Show That Servo Motor and Magnetic Sensor

Figure above show that servor motor and magnetic sensor as security feature where the servo motor will act as automatic door locking system and magnetic sensor will act as intruder sensor if the door is opened during security mode is turning on it will notify user and it will trigger the buzzer.

4.3.1.1 Buzzer

Figure 34: Buzzer

Figure above show that the buzzer will trigger if thre have any input from magnetic sensor and flame sensor to notify people nearby.

4.3.1.2 Flame Sensor

Figure 35: Flame Sensor

Figure above show that the flame sensor where it will detect flame at the range of 3 feet maximum range and it will notify user by using application in the smartphones and also will trigger buzzer act as alarm to alerting that the house is on fire.

4.3.2 Lighting Feature

Figure 36: LDR Sensor

Figure above shows that the LDR sensor will detect the light emmiting to it, if less than the value was set it will turn on LED to light up to ensure the smarthomes are not in dark condition.

4.3.3 Ventelation and Temperature Feature

Figure 37: Temperature Sensor (DHT-11)

Figure above shows that the temperature sensor which is it will detect the humidity and temperature, if the temperature in the house are increasing it will turn on fan to ensure the smarthome are in optimum temperature and humidity.

4.4 Result and Data

The outcomes produced by the IOT for smart homes will be covered in this section. Using the Arduino IDE, the data is gathered and uploaded to clouds for analysis. The result had been the subject of some discussion.

4.4.1 TEMPERATURE SENSOR TESTING

The temperature sensor DHT-11 has being used in this Smart Homes project,the sensor is testing with a lighter to increase the temperature instantly. The sensor was been compare with thermometer to see either the data taken by the sensor were accurate or not.

Temperature	Temperature value upload to cloud read by temperature sensor	Temperature value using thermometer	Fan operation
26	25	26	off
27	26	27	off
28	27	28	off
29	28	29	off
30	29	30	off
31	30	31	off
32	31	32	on
33	32	33	on

TABLE 2: TEMPERATURE SENSOR TESTING TABLE

Based on the data table comparison between temperature sensor and thermometer what can be disscuss is the thermometer get the actual value of temperature in real time but the temperature sensor are quite late due to sensor and cloud system that need to take some time to upload data.

4.4.2 FLAME SENSOR TESTING

The flame sensor being use in this Smart Home project to detect flame , the sensor is testing by lighter to demonstare a flame effect. When the sensor detect flames it will trigger the buzzer.

Distance flame with flame sensor	Time taken to buzzer trigger	Time taken data upload to cloud
3 cm	5 seconds	10 seconds
4 cm	5 seconds	10 seconds
5 cm	5 seconds	12 seconds
6 cm	6 seconds	12 seconds
7 cm	7 seconds	13 seconds
8 cm	7 seconds	14 seconds
9 cm	8 seconds	15 seconds

TABLE 3: FLAME SENSOR TESTING TABLE

Based on the data table comparison between distance of flame detected by the flame sensor, time taken to buzzer triger and time taken data to upload to the cloud to notify user are the further the distance of the flame the longger time taken to trigger the buzzer and upload data to the cloud. Due to data need to upload to the cloud server it will having some delay because the server are not in Malaysia.

4.4.3 LDR (light-dependent resistor) TESTING

The LDR (light-dependent resistor) being use in this Smart Home project to detect the light rate in the Smart Home, the sensor is testing by lux meter and lux meter apps in smartphones.

LUX Meter	LUX Meter Application	Light Operation
60	58	Off
50	51	Off
40	47	Off
30	39	Off
20	19	On
10	8	On
0	0	On

TABLE 4: LDR (light-dependent resistor) TESTING

Base on the data table comparison between LUX Meter and LUX Meter Application is LUX Meter give the accurate value of one lumen per square meter than LUX Meter Application. When the LDR receive less than 20 lx it will turn on lighting feature.

FIGURE 38: LUX METER

FIGURE 39: LUX METER APPLICATION

4.5 Summary

The implementation of the hardware is briefly described in Chapter 4 Finally, an analysis is performed using the data gathered to ascertain the validity and to support whether all the programmed objectives were accomplished.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter focuses on the description of the overall system for creating Smart Home Control by IOT. in addition, a recommendation may be made to a real scale of house to make it more reliable as my objective.

5.2 Conclusion

As a summary, the objective of this project is accomplished to development of smart home controlled by IOT. This project is mainly for controlling the whole house system by using smartphones to helping user know the house condition when they are outside the house and it will help user to fell more mind free about their house safety. By installing these features to the house user will save their money from hire a guard when they are going vacation and knowing the details of the house condition.

5.3 Future Works

For future improvements, Smart Home Control by IOT results could be enhanced as follows:

i) Controlling more lighting and fans feature

ii) Using better flame sensor to increase the sensitivity in detecting fire in faster respond time

iii) Using better temperature sensor to increase the sensitivity in detecting temperature changes in faster respond time

iv) Installing vibration sensor to windows to detect any intruder if they are breaking the house through windows.

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APPENDICES