Faculty of Electrical and Electronic Engineering Technology

THE DEVELOPMENT OF AN IOT BASED CHARITY BOX AUTOMATION AND SECURITY SYSTEM

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AZIMAH BINTI ZAINAL ABIDIN

Bachelor of Electronics Engineering Technology with Honours

2023

THE DEVELOPMENT OF AN IOT BASED CHARITY BOX AUTOMATION AND SECURITY SYSTEM

AZIMAH BINTI ZAINAL ABIDIN

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

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2023

DECLARATION

I hereby, declared this report entitled The Development of An IoT Based Charity Box Automation and Security System is the results of my own research except as cited in references.

Signature : AZIMAH……

Author : Azimah Binti Zainal Abidin

Date : 13th January 2023

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

APPROVAL

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

Signature : 

Supervisor Name : EN AMAR FAIZ BIN ZAINAL ABIDIN

Date : 13th January 2023

UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEDICATION

To my beloved mother, Kidah Binti Musa and father, Zainal Abidin Bin Che Mok,

and to my supervisor Amar Faiz Bin Zainal Abidin.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRACT

This paper or report presents the Internet of Things system for security system as well as automation. With the availability of the Internet of Things, it helps consumers in their daily lives to some extent, In addition to the increasing number of cases of theft or intrusion in Malaysia in recent years, which has various negative effects on society has shifted their focus towards the effectiveness of the security system. This has indirectly sparked the idea of implementing a mosque fund with the concept of security features that are targeted by criminals. It is therefore a responsibility for consumers to take precautionary action in order to prevent charity boxes from being stolen. One of the safety applications that are applied is several components and sensors in or around the charity box. Therefore, if a theft activity is detected this system will sound the alarm siren, by using this system it can reduce the risk of theft mosque funds and this system is also equipped by sensors as secure ways in the mosque when the charity box was break in by someone. Another advantages of this system is that the key can only be accessed by the mosque committee in order to open it.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ABSTRAK

Kertas kerja atau laporan ini membentangkan tentang sistem Internet of Things untuk sistem keselamatan dan juga automasi. Dengan adanya Internet of Things ia sedikit sebanyak membantu pengguna dalam kehidupan seharian, tambahan pula bilangan kes kecurian atau pencerobohan yang semakin meningkat di Malaysia sejak kebelakangan ini yang memberi pelbagai kesan negatif terhadap masyarakat secara tidak langsung telah memberi kesedaran yang tinggi terhadap sistem keselamatan, ini secara tidak langsung telah tercetusnya idea untuk saya melaksanakan sistem pada tabung masjid berkonsepkan ciri keselamatan yang menjadi target penjenayah. Oleh itu, ia menjadi satu tanggungjawab untuk pengguna mengambil tindakan yang berwaspada supaya dapat mengelakkan tabung masjid dicuri. Salah satu keselamatan yang digunapakai ialah dengan menggunakan beberapa komponen dan sensor di dalam tabung atau di kawasan tabung tersebut. Oleh itu, jika terdapat kecurian sistem ini akan mengeluarkan bunyi penggera. Kajian ini memfokuskan kepada pernyataan masalah, dengan menggunakan sistem ia dapat mengurangkan risiko kes kecurian tabung masjid dansistem ini juga dilengkapi dengan beberapa sensor untuk sebagai langkah keselamatan di dalam masjid apabila tabung masjid dipecah oleh seseorang dengan kelebihan sistem ini kunci hanya boleh dibuka oleh ahli jawatankuasa masjid untuk membukanya.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

ACKNOWLEDGMENT

First and foremost, I would like to express my gratitude to my supervisor, Amar Faiz Bin Zainal Abidin for their precious guidance, words of wisdom and patient throughout this project.

I am also indebted to Universiti Teknikal Malaysia Melaka (UTeM) and my parents for the financial support through PSM 1 and 2 which enables me to accomplish the project. Not forgetting my fellow colleague and my senior Muhammad Fadhil Bin Amiruddin for the willingness of sharing his thoughts and ideas regarding the project.

My highest appreciation goes to my parents, and family members for their love and prayer during the period of my study. An honourable mention also goes to Muhammad Shahrul Bin Kadid and Nik Muhammad Arif Fahmi Bin Nik Ab Aziz for all the motivation and for all play role in completing this project.

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

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

TABLE OF CONTENTS

PAGE

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF TABLES

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF FIGURES

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF SYMBOLS

cm	-	Centimeter
v	-	Voltage
m	-	Meter

UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاك
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF ABBREVIATIONS

BOM	-	Bill of Materials
$CCTV$	-	Closed Circuit Television
dB	-	decibel
DC	-	Direct Current
GSM	-	Global System Mobile
IoT	-	Internet of Things
KBps	-	KiloBytes Per Second
LCD	-	Liquid Crystal Display
NO	-	Normally Open
RAM	-	Random Access Memory
RFID	-	Radio Frequency Identification
SCL	-	Serial Data
SDA	-	Serial Clock

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF APPENDICES

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter aims to set up a framework and present simple ideas for project. It focusing on the project overview, elaborated on the purpose of the project, a brief description of the problem, scope and results.

1.2 Background

The mosque is a place of worship for Muslims, not only that but the mosque is place where the activities of collecting zakat and payment of zakat as well as a place to gain knowledge. Sourced from alms and waqf donations from various parties, the mosque instituteis believed to be able carry out this responsibility and trust. According finding by Hidayah (2022) donation collection during Friday's prayers 50% increases since the mosque reopened [1].

From several news article burglars break charity box and steal money was increases. Since then, the purpose of this project to develop an IoT based mosque automation and security system that can be implement in our society and send the data through wireless device to microcontroller. Next, microcontroller processed and transmitted the data to sensor. These would help the society from crime. Usually the system with an IoT still not widespread. With the availability of this technology it can reduce the rate of criminal cases.

1.3 Problem Statement

As of late, there are some not really pleasing news to hear which is regarding the increasing the number of theft cases in our country. Namely the case of breaking into mosques.According to the article R. Meor (2022) cases of breaking the charity boxes in Melaka, Malaysia up to 163% [2]. Although there are several type of electronic devices or security system such as CCTV marketed but the cases still increases. Nowadays, theft cases are very common in the mosque. The mosque management can see the footage after the break in case occurs thisis indirectly makes the security system looks a little weak from an emergency response. Then the padlock that are using now in the mosque charity box easy to break in. Not only that, there no alarm system trigger during the charity box was break in. Moreover the less demand from consumers for security system is due to relatively expensive cost factors in the market and the complex installation methods.

1.4 Project Objectives

The main objectives to produce a prove of concept an electrical charity box equipment with alarm system and push notification. Based on the main objective, there are four elements the charity box

a) To design an electrical the charity box using Autocad to design 3D model and Arduino IDE as source code.

b) To build a low cost, portable electronic charity box for mosque management. A portable electronic charity box with size 30cm x 30cm x 34.5cm box. Estimated cost for this project less than RM 200.00.

c) To verify the functionality, security and performance of the electronic charity box by performing a set of system testing fully integrated applications.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

d) To validate the effectiveness of electronic charity box by performing a survey consist of 15 questions.

1.5 Scope of Work

Scopes are recorded to guarantee the venture will be inside its expected limit. This project will use Nodemcu which connect to application Blynk IoT, The NodeMcu development board can be easily programmed with Arduino IDE. Looking back in the old days, most people would give charity to mosque members manually or by shaking hands because at that time there were no more existing facilities, but the change of times has resulted in the mosque fund, which makes it very easy for the public or mosque members to give charity regardless of time. Not only that, in fact the mosque fund has also been innovated in line with IR 4.0. If in the past there was only a mosque fund, but nowadays, funds are implemented with the concept of safety and automatic features to reduce the rate of theft of mosque money.

In implementing the low cost prototype that can be used in Internet of Things based automation and security system with cost the system also less than RM200 including required component. With around 1.5kg weight and width 34.5cm x length 30cm x height 30cm of size, the project focusing in automation and security system. The prototype also made from wooden that has 1 cm thickness where it is a low cost than steel or plastic acrylic transparent. The electronic charity box more safer in high position which is can avoid from violations with animals such as cats.

For develop the application, Blynk IoT is used. This application required the mosque management to connect it using WiFi to open the solenoid key, As we know mostly the mosques throughout in Malaysia have already internet facilities. Blynk IoT is choose for develop the application as it can operate in Android Operating System, where most we can

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

afford to buy android phone. It can control hardware remotely and also can display data or send notification. Not only that, Blynk apps also can create an amazing interface for projects IoT. Furthermore, the accelerometer has been used which is it can sense the vibration from scale that are program in Arduino IDE. A 3 axis digital accelerometer and 3 axis digital gyroscope. It helps to measure the angular velocity along the x axis, y axis and z axis. The accelerometer and linear velocity do not effect the measurement of the gyroscope. Hence the 6 axis acceleration is used for an accurate reading. Not only that, the charity box also have siren alarm that produce the sound loudly around 10 meter can be heard.

1.6 Contribution Project

The main motivation in doing this project to introduce IoT to user especially to the mosque management. This project may help user to monitor both analog and digital devices across the world either from a web interface (Blynk cloud server) of from local server without the need for human interaction over a wireless network. So, by introducing this project it can assist the charity box from home and cities via mobile phone. By automating activities, it saves us a lot time even we are far away from our actual location, and it is updated frequently in real time.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

The electronic charity box previously mostly used RFID cards to access the keys, but the project now utilizes WiFi or data to unlock it using a smartphone, as it is known that most mosques in Malaysia have stable and decent WiFi internet access to ease the management work. If the WiFi not stable the money in the charity box can be collect for tomorrow. Not only that, but this electronic charity box project also has an alarm system when there is a case such as an attempt to steal, it can be heard loudly inside the mosque and the mosque's committee will receive a notification thru on their respective smartphone.

Nowadays, as we can see out there the charity box in the mosque still less of improvement, by using IoT platform it much better effiency which is system operate at a much higher speed than human workers for example it can send data thru mobile phone and the user will get the notification. In this project automation and security system it will send notify if someone try to remove the charity box. Moreover, by using IoT it can reduce the rate of thievery.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The research and records collected have been analyzed to investigate the troubles and feasible solutions to those troubles. This analysis helped to recognize the important thing troubles and hit upon the fine methods to solve them. The research and facts also helped to pick out the exceptional strategies which could be implemented in addressing the troubles. The accuracy and precision of information have been tested to make sure that the findings and solutions had been accurate. The information were also double checked for accuracy and precision. This allowed for the objectives to be completed successfully and inside the given time. Finally, the objectives changed into examined for achievement. This allowed for the objectives to be evaluated and to make certain that the dreams and objectives had been met. This allowed for the objectives to be finished efficiently and to make sure that the goals had been met and the objectives become successful.

In this part, a few article from google scholar website are explored based on the title as Figure 2.1 below. Several keyword are used to find the related information which are security system, IoT and charity box. This literature review focuses on the automation and security system based on IoT Blynk app to improve the electronic charity box for mosque management.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

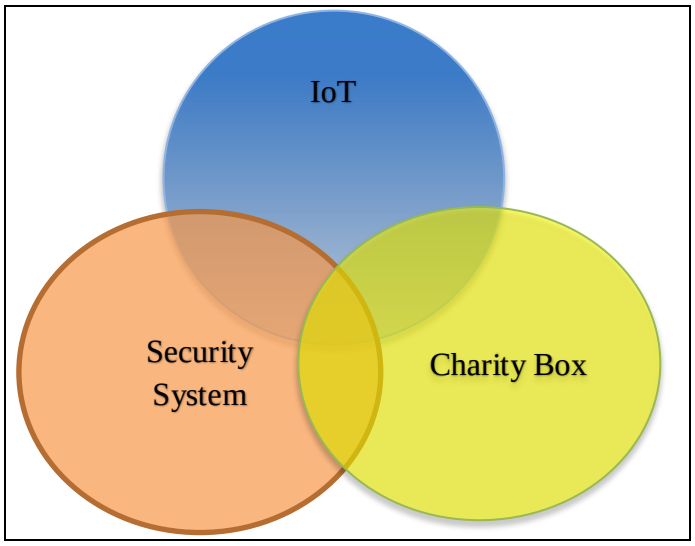


Figure 2.1 Venn diagram

2.2 Analysis of Article

The growth of the research literature from 2009 to 2022 is shown its curve with (R2 = 0.2657 the graph illustrate that total paper published grows rapidly year by year due to acknowledgement of IoT among the researchers has been increased at 2020 and the researches design automatic electronic charity box.

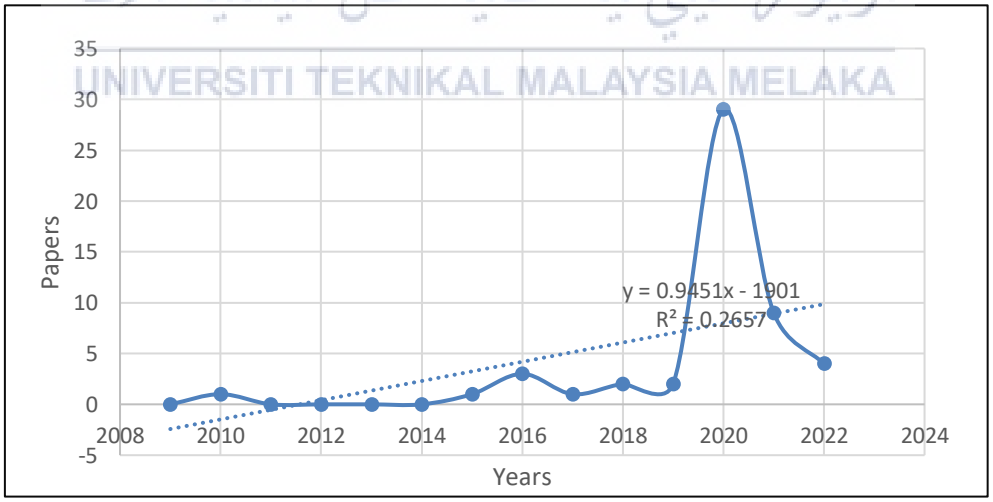


Figure 2.2 Graph of published

Authorship distribution shows number of authors involved in a published paper. The bar graph demonstrates the authorship distribution of the security system and automation articles. The majority published papers were produced by 7 authors and followed by 6

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

authors and 5 authors.

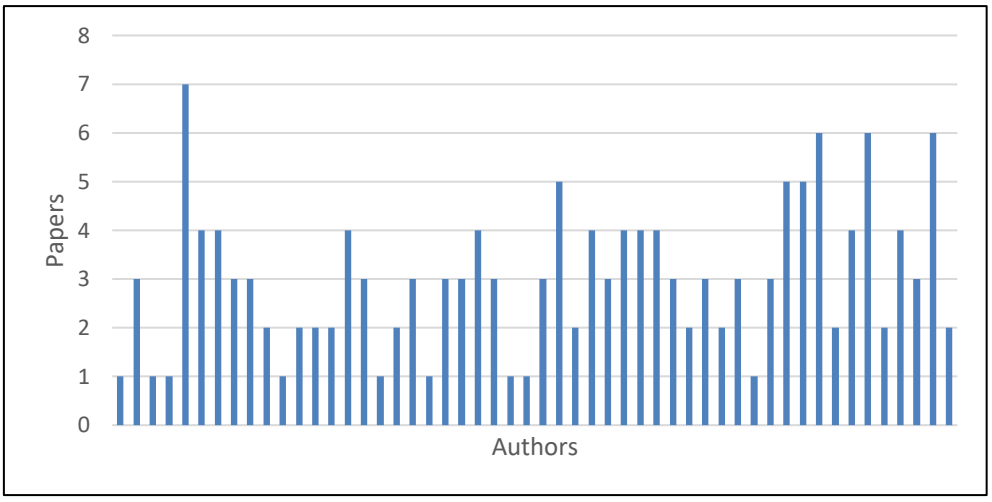


Figure 2.3 The bar graph number of author published

The distribution of the number of references from 2010 to 2022, the yearly average number of references per article grew from 2020 Articles with large number of the development of an IoT.

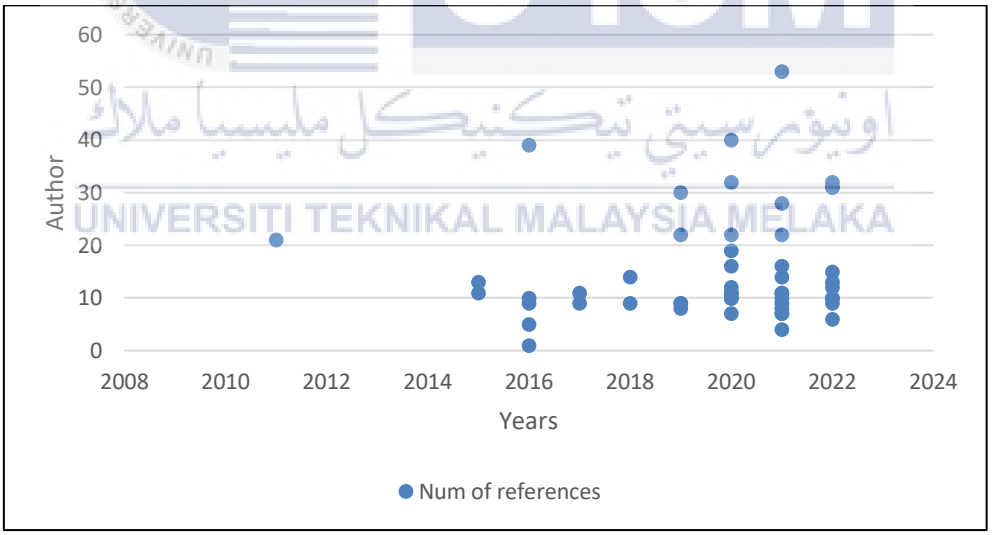


Figure 2.4 The graph distribution

There are total of 10 countries contributing to the literature. According to bar graph, top 3 countries from highest to lowest publishing as following Indonesia (24), India (10) Malaysia (6). This concludes that Indonesia has published the most numbers of papers followed by India and Malaysia.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

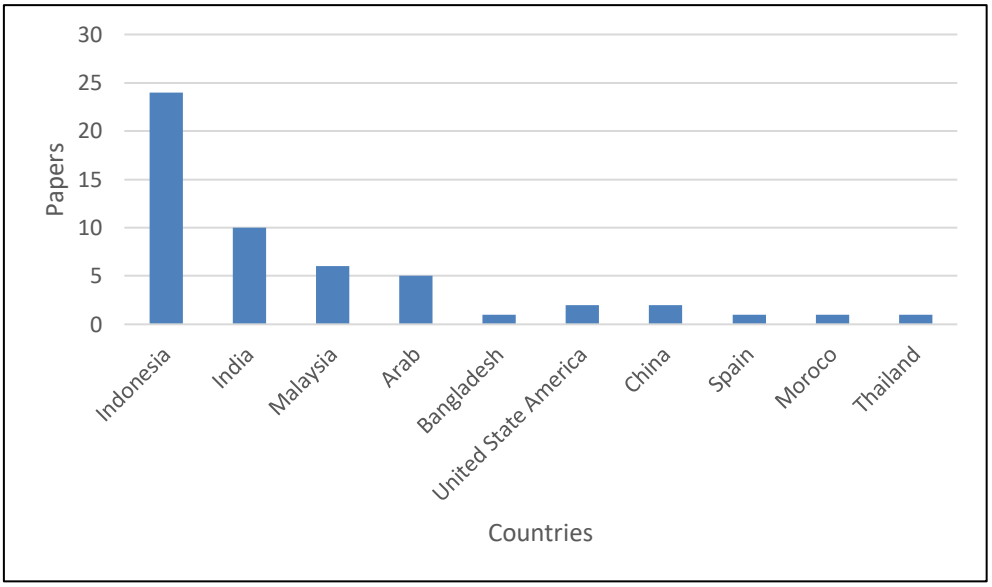


Figure 2.5 The bar graph countries contributing to the literature

The pie chart that shows percentage of distribution of types of papers for papers published from 2010 to 2022. Internet of Things types are leading with 42% followed by automation system 46% and the last is others. Application types are very famous because researchers in different field try this new IoT.

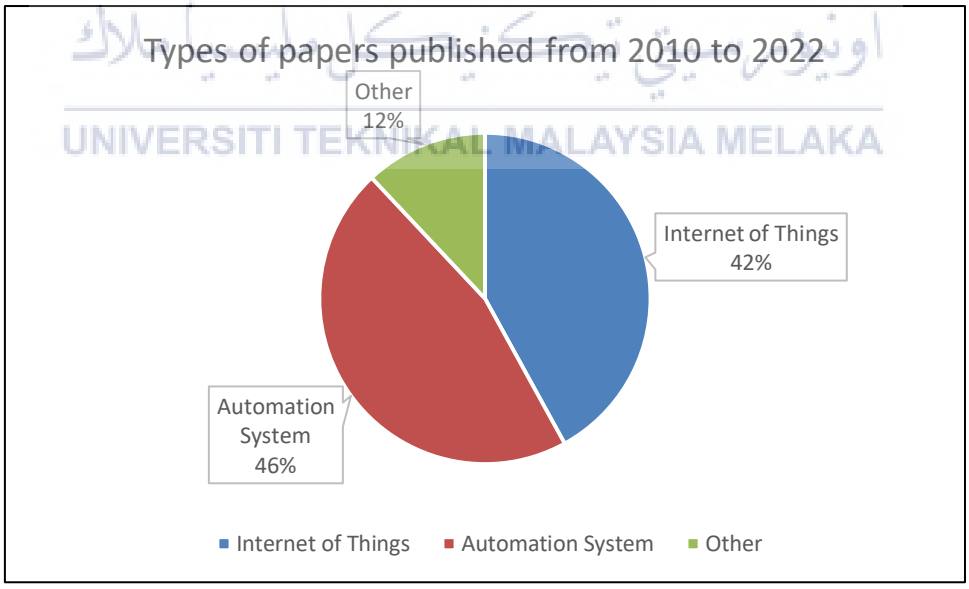
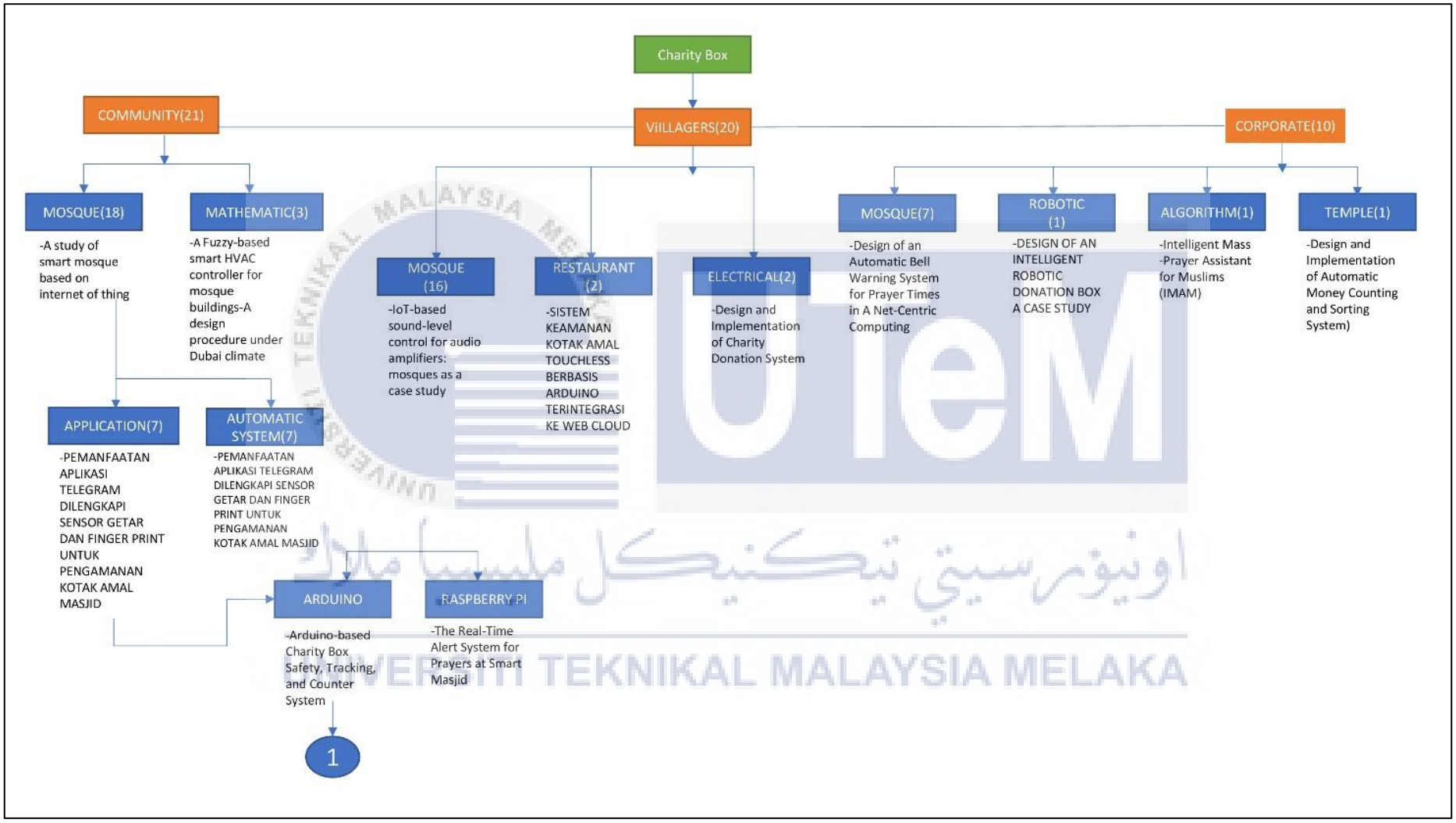


Figure 2.6 The pie chart types of paper published

The k-chart is a new tool used for planning and managing a research project. It uses Tree diagram to organize the whole Issues under study, the Methodology, and the expected Results. A K-Chart provides a more comprehensive view of the research project than a Gantt

chart does. Based on this project the development of an iot based mosque automation and security system it consists of the layer in the project.

UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

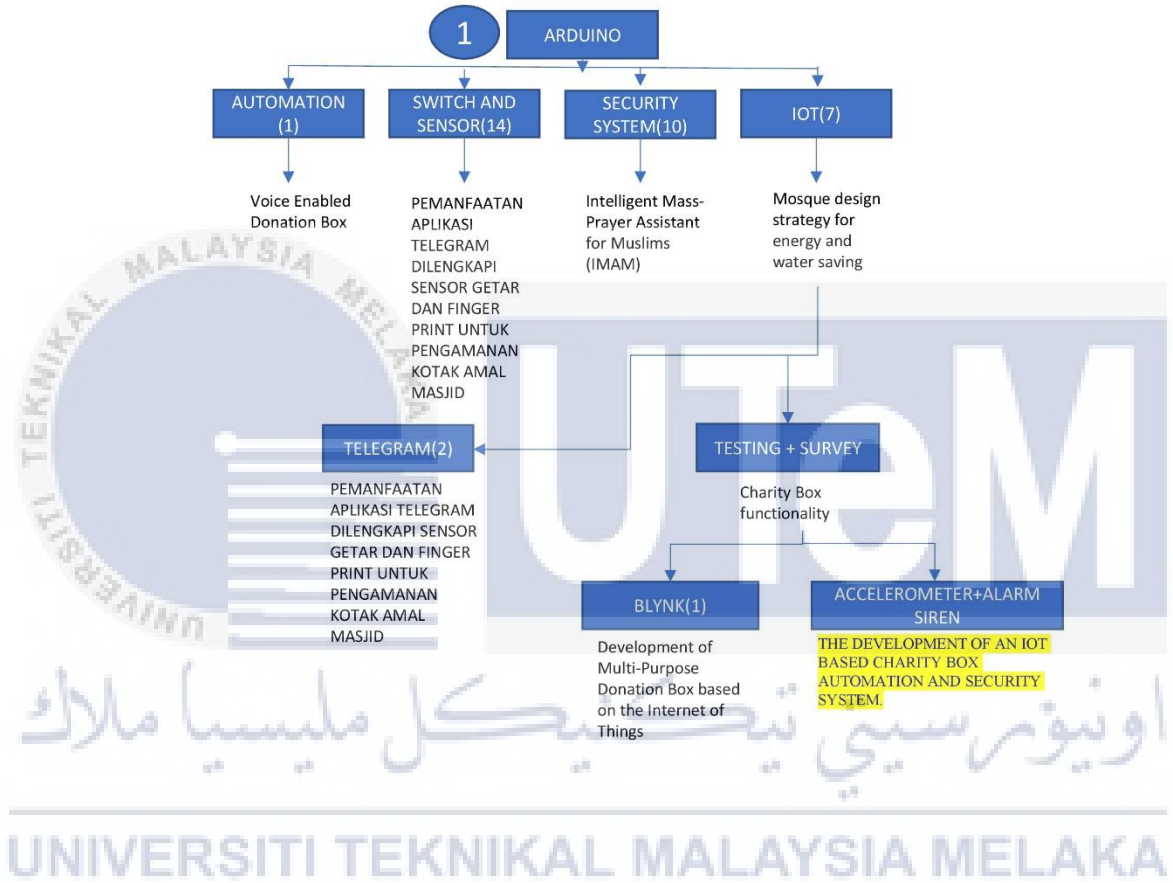


Figure 2.7 K-chart

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

The keywords from papers in year 2010 until 2022 has been extracted and illustrated as Tagcloud for better visibility using the tools wordclouds.com. Around 25 keywords can provide insights into research trends within IoT based automation and security system research and helps to identify specific small research topic of interest. The most word are using is IoT, Security System, WiFi, Automation and others.

Figure 2.8 The tagcloud

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.3 Past Related Research

The studies facts will awareness at the IoT as platform for protection system. Selection of studies substances relies upon on what product and system that used to accumulate the project.

2.3.1 Locker security system using keypad and RFID.

This research is to study aims to set up an impressive security system for lockers at a low cost. The system is composed of four components an Arduino board, RFID reader, RFID tags, and a lock. The Arduino board is the main component of the system and it acts

as the interface between the RFID reader and the lock. The RFID reader reads the tag and sends the data to the Arduino board, which then compares it to the stored password. If the password is correct, the Arduino board will activate the lock, allowing the user to enter. The RFID tags are embedded with unique identification codes, which are used to identify the user. The system can store multiple user tags and passwords. The Arduino board also contains an LCD display, which will show the status of the system and the current user. To make the system more secure, the password can be encrypted and stored in the Arduino board. This ensures that only authorized users can access the locker. The system can also be connected to a security camera, which will record all activity that occurs with the locker. The system can be implemented in various places like offices, schools, and homes. It can be used to secure persona items like wallets, keys, and documents. This system is also beneficial in maintaining security in public places like parks, shopping malls, and airports.

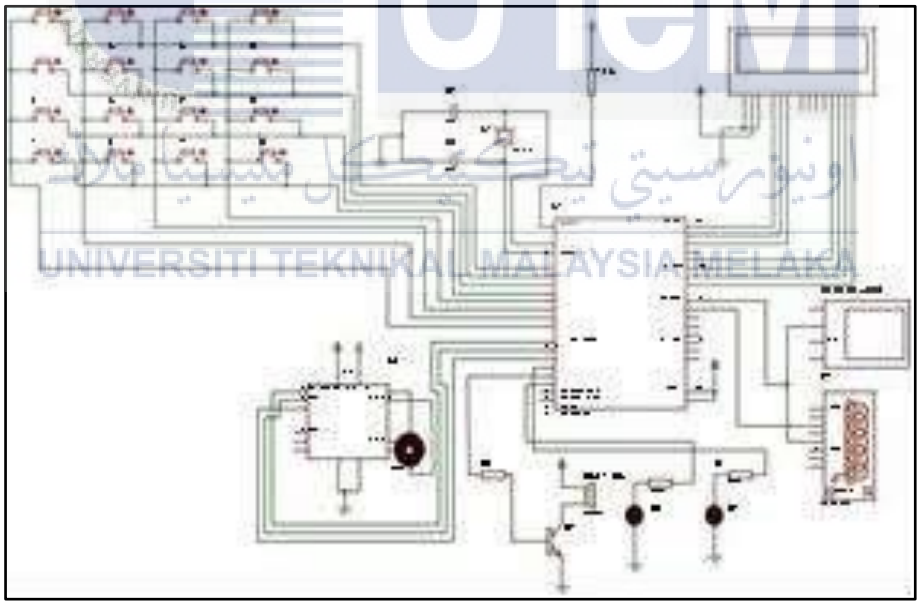


Figure 2.9 Simulation LCD and Keypad interfacing [3]

2.3.2 Internet of Things (IoT) Charity Automation

The Arduino Uno is connected to the website server and securely stores the status of the donation box. The Bluetooth system allows donors to connect to the website server and securely donate money from their phones anytime, anywhere. This system uses a low-level

sensor to detect the level of money in the box and update the status of the box accordingly. The Android application is used to connect the user's phone to the server and allow them to securely donate money. The application uses a secure payment gateway to securely process the donation payments. The user's phone is verified and authenticated by the server before the donation is made. The information from the donation box is securely stored on the server and updated accordingly. The application also provides a secure and convenient way for donors to donate from their phones. The main advantages of this application are its security, convenience, and flexibility. It provides donors with a secure and convenient way to donate from their phones. The low-level sensor ensures that the box is not overfilled and the status of the box is updated in a timely manner. Additionally, the Bluetooth system ensures a secure connection between the donor's phone and the server. This application provides donors with a secure and convenient way to donate money anytime, anywhere.

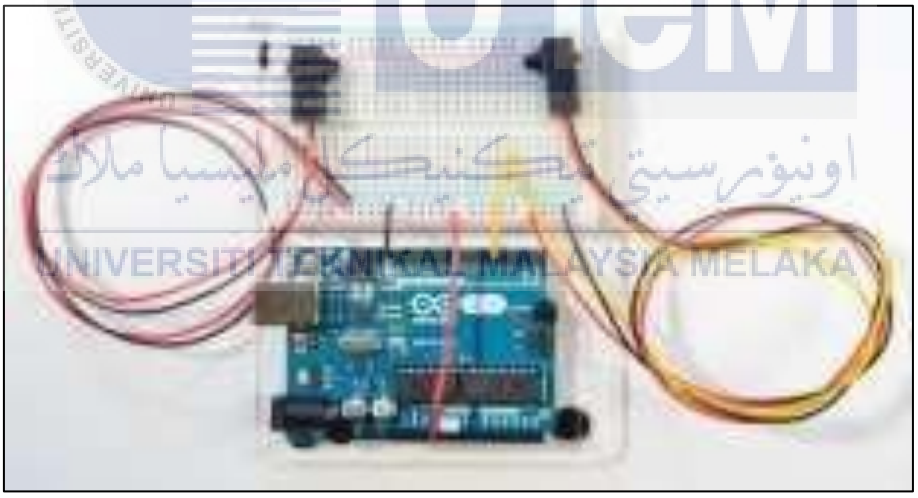


Figure 2.10 The main component of donation box [4]

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

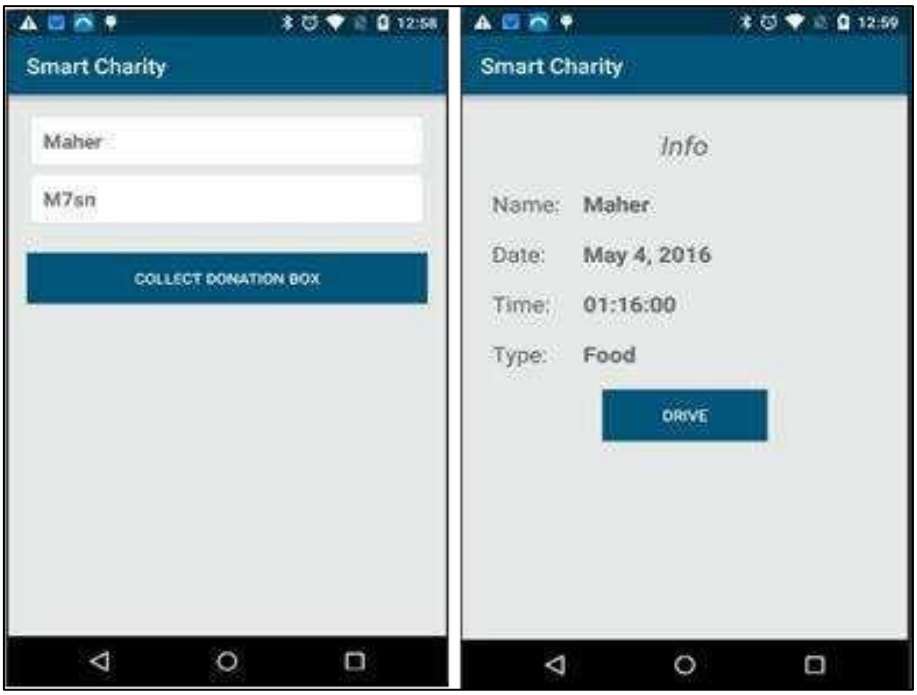


Figure 2.11 The Android page smart charity [5]

2.3.3 The Implementation of AI in Charity Box RFID Based Security System

The improvement of safety security system formosque and Musholla donation box. This project idea of safety to the donation box via way ofmeans of making use of numerous helping sensors so the system will routinely locate, so if there'sdonation box theft the system will send notification to the mosque management. Moreover the system is prepared with an alarm and SMS gateway, this system additionally prepared with RFIDto which could get admission to open the charity boxes.

This software include additives ultrasonic sensor to locate the presence of item in the frontof, the frequency in region above sound wave from 20kHz to 2MHz (B Arsada and B Suprianto, (2017) [8]. In addition, SMS gateway are used that gives SMS transit services. Next, RFID are used forcomputerized identity via way of means of making use of a barcode or magnetic card for data. Theadvantages of this system to keep away from the threat or crime of robbery towards donation box.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

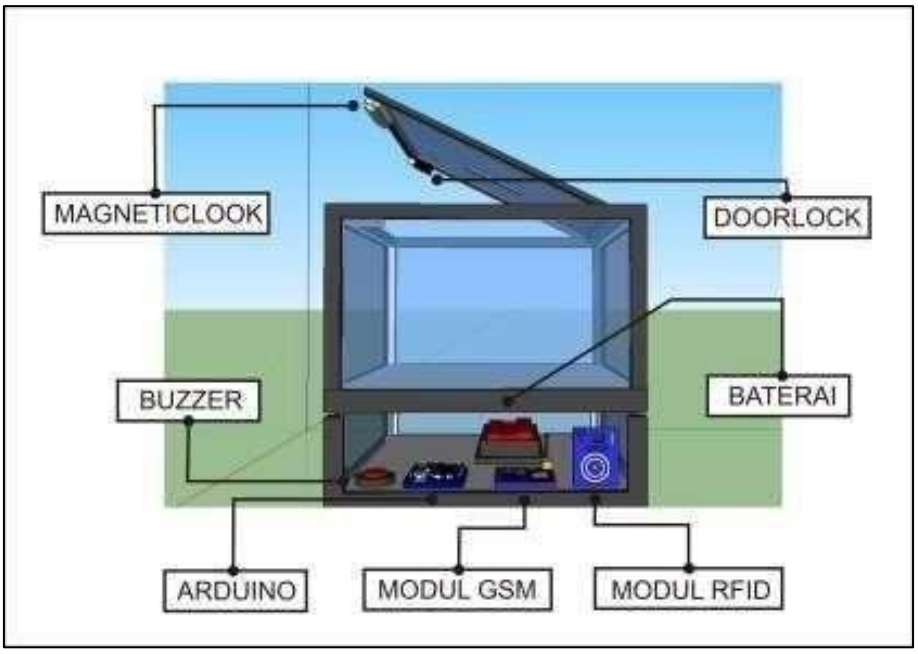
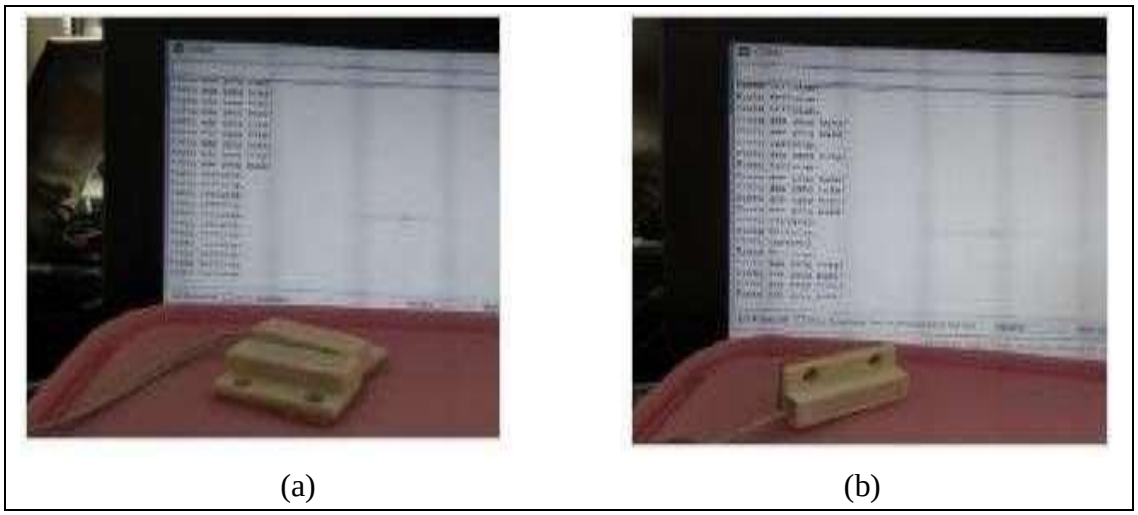


Figure 2.12 The design tool charity box [6]

2.3.4 IoT Theft Detection of the Mosque Charity Box Through Arduino

This project to detect the open and close status of the charity box and sends a signal to the Arduino when the box is opened. The Arduino will process the signal and send a notification message to the administrator's smartphone. The administrator can check the history data in the database server to know the situation of charity box. This project used Arduino R3, IR sensor HCSR501and magnetic switch MC38. The PIR sensor can detect the movement of the human body due tochanges in body temperature by the emitted IR rays. The MC38 magnetic sensor has two jet knifefuses that are less than 3 cm wide and more than 3 cm apart.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA



(a) (b)

Figure 2.13 (a) Normally open and (b) Normally close [7]

(a) (b)

Figure 2.14 (a) Human object not detected (low) and (b) Human object detected (high)with PIR Sensor [8]

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.3.5 Arduino Based Charity Box Safety, Tracking and Counter System

This system can provide information in the form the total of amount money in charity box and the location of charity box. According Tri Raharjo (2021) if the charity box is stolen or in a far location which is 15 meters away from the actual location, the system will send notification to turn on the buzzer [9]. The charity box can only be opened by a mosque management who has a special key. The function of this project uses GPS to locate the charity box on GSM. The advantages of this project is can increase the security of the charity box.

Figure 2.15 Detection of charity box locations [10]

2.3.6 Utilization of Telegram Application for the Security of Mosque Charity Boxes

This project was designed of box equipped with vibration sensor, where vibrations due to touch on the box it trigger it with an alarm in the form buzzer that's sound as well an Arduino based control system that immediately sends a message to telegram application in mosque management smartphone. The charity box equipped with locking system that can give access to open the box. In addition, fingerprint security function associated with the authority to open the charity box. The main component that used is vibration sensor detects the object through its mechanical structure and converting the vibration parameter into electrical signal by physical effect to achieve transferring the non-electrical signal to electrical.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

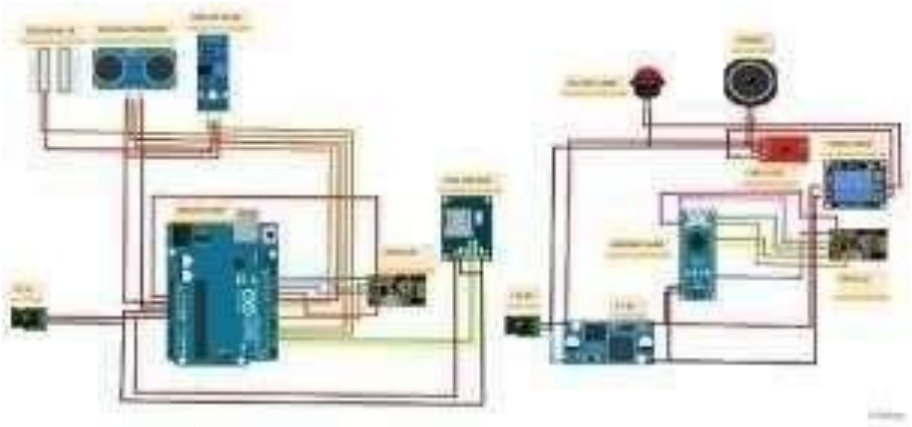
Figure 2.16 Fingerprint sensor [11]

Figure 2.17 Notification on Telegram [12]

2.3.7 Charity Box To Prevent Theft Based On Global System Mobile

Arduino Uno as sensor data processing and NANO project to process receiver data from NRF using GSM module as receiver and transmitter to smartphone. NRF24101 module as transmitter and active alarm data. Three ultrasonic sensors and SW420 vibration sensor are used as distance detectors.

(a)



(b)

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 2.18 (a) Circuit simulation the safety box and (b) The prototype [13]

2.3.8 The Touch Less Charity Box Security

This project design to integrate with a microcontroller and android application for security systems and monitoring charity boxes. The data will sending from GPS to firebase using Nodemcu which it received by the user smartphone, the security of the charity box can be monitored through android application. Nodemcu is an open source IoT platform that includes firmware which is runs on the ESP8266 Wi-Fi. The advantages of this project is to

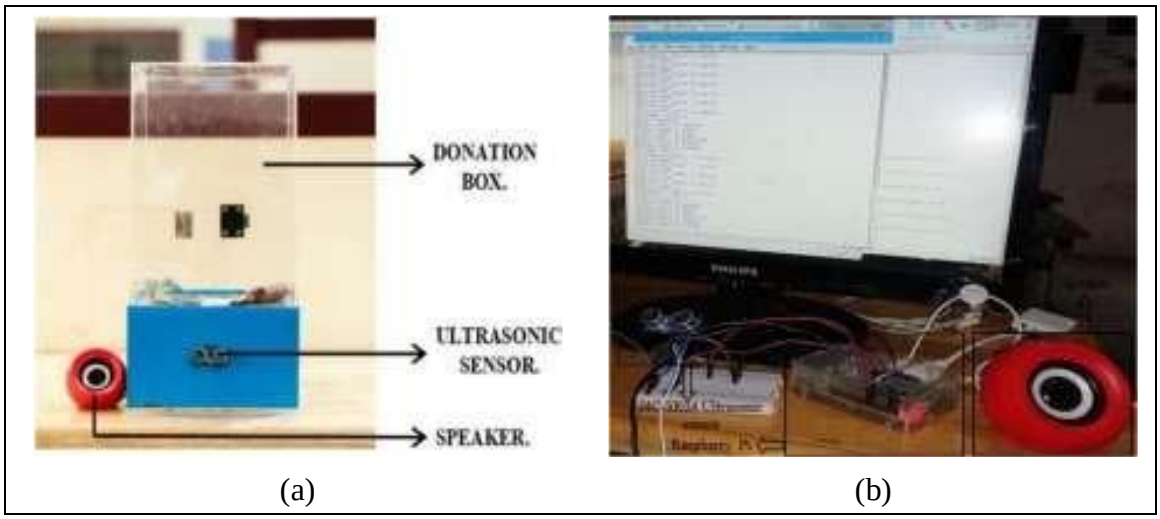
monitoring the location of the charity box via GPS.

Figure 2.19 The prototype charity box [14]

2.3.9 Voice Enabled Donation Box

This project design the voice-empowered box speaks out when it detects an obstacle. When a person approaches or passes by the front of the box within range 90cm, the outputs a verbal request and simulating a human voice. The advantagesof the project is that serves as reminder of the urgency of making charitable donations to the helpless. Therefore, this project uses this technique to recognize voice.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

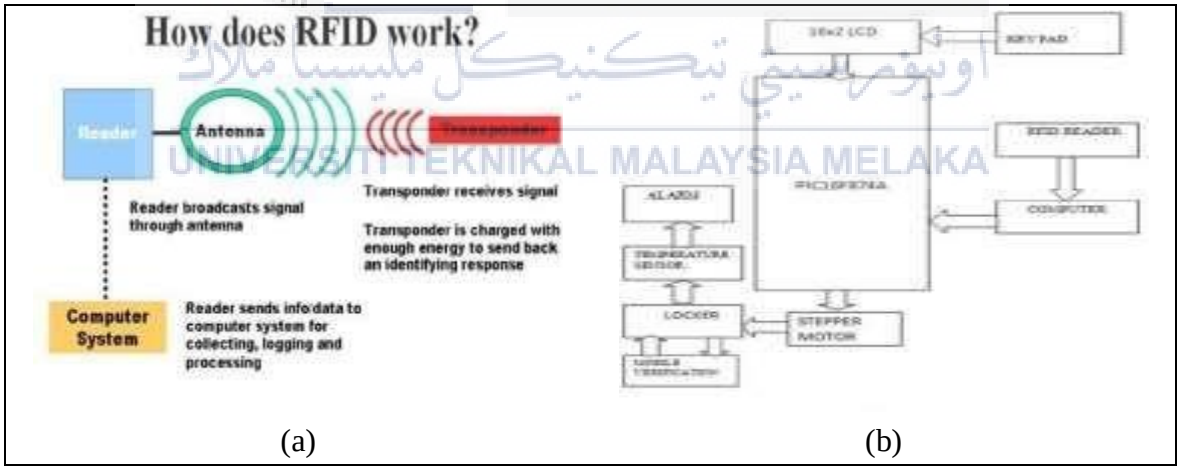


(a) (b)

Figure 2.20 (a) The prototype Donation Box and (b) The hardware testing on board using ArduinoIDE [15]

2.3.10 Advanced Locker Security System

This project to implement the locker system with security system based on major component RFID. Lack of security and waiting time of the customers are the major drawbacks such manual systems. The method that used is after the password verification for the RFID tag details. The locker have keypad for password. By usingGSM technology the customer receivers the random password provided by the server, if the password matches the locker it can be accessed the alarm sounds. The most important of RFID ability to track the location of tagged item and RFID tags operate in three frequency low (30-500kHz), high (10-15MHz) and ultrahigh (850-950MHz). The sim300 module is GPRS in compact plug featuring industry standard interface, The support speed of data GSM up to 9.6kbps where allows the transmission basic data such SMS. The system used come up with advantages where automatic movement of locker allows users to authenticate themselves in real time.



(a) (b)

Figure 2.21 The RFID reader principle working and (b) The hardware testing on board usingArduino IDE [16]

2.3.11 Development of Smart Masjid Display Using Raspberry Pi

This project to develop using raspberry pi and monitor LCD. The project will use a Raspberry Pi as the main processor. The Raspberry Pi will be connected to a 16x2 LCD

display to show the prayer times, date, day, current time and temperature. The Raspberry Pi will also be connected to a GPS module to get the location coordinates and calculate the prayer times. The Raspberry Pi will also be connected to a speaker to provide audio announcements of the prayer times. The Raspberry Pi will also be connected to a camera to capture images and videos of the Masjid. Finally, the Raspberry Pi will be connected to a Wi-Fi module to allow remote access to the Masjid display.

Figure 2.22 The diagram of Smart Masjid Display Using Raspberry Pi [17]

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.3.12 The Real-Time Alert System for Prayers at Smart Masjid

An intelligent masjid with embedded technologies is the key factor so that prayers can be performed correctly and without errors. The technologies inside or outside the masjid can be very helpful for the prayers. Arranging and monitoring people in a crowded masjid is a critical task. The authors have proposed the solution of arranging the rows during the prayer in the masjid. It is necessary to fill the rows starting from the first row behind the Imam. Mostof the counting techniques are based on the registration of people in order to count their number. Counting and ordering becomes inefficient when it is required in real time and when the crowd is dense. The project was propose a technique to monitor and estimate crowd density in real time using infrared technology. The intelligent systems will be developed

based on the number of people in each section. The mosque will be divided into sections and an infrared camera will be assigned to each section. Each section will be programmed to contain a limit number of people. The LED also have been used.

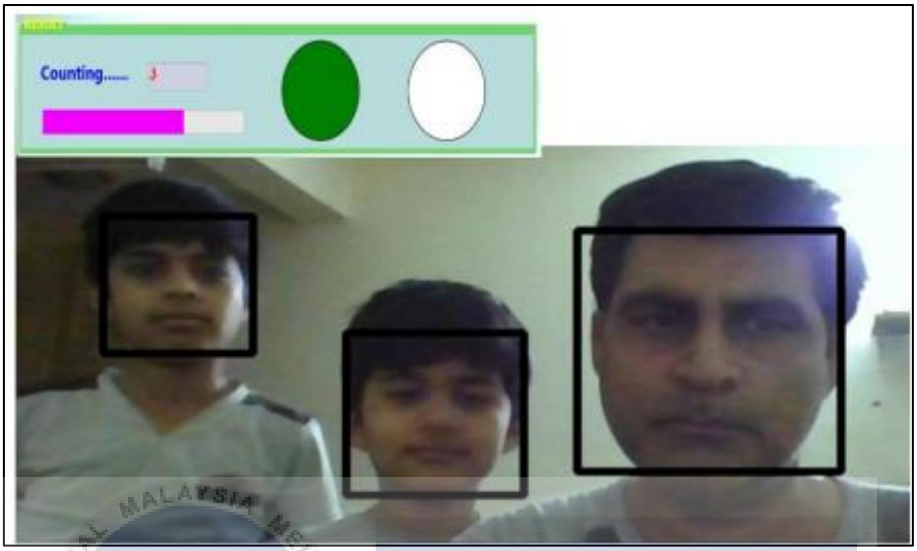


Figure 2.23 Real-Time people counting and shows color [18]

2.3.13 Intelligent Mass-Prayer Assistant for Muslims (IMAM)

The head of prayers (Imam) will lead the prayers follow with the congregation (Mamooms). Imam will recite some verses from the Quran in every Raqa'ah (a part of the prayer). The mamooms, especially the non-Arabic native speakers will face some challenges such as understanding the meaning of the verses knowing the name and the number of the recited Surah. That may result in prayer experiences that are less engaging and lack intense concentration or wholeheartedness among the congregation members. With the advancement in cloud-based speech recognition technology and wearable computing devices an opportunity to develop a system that can instantly translate and display Quran verses into any language can be presented. That does not interfere with the congregation's strict praying physical movements. Although there are some efforts to bridge this gap, the need for a smart and high effective system still exists. Thus, this study aims to develop an integrated intelligent system including a mobile app, far-field microphone, and intelligent eye-glasses.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

The proposed system is expected to be developed and demonstrated at selected learning environment in Sibu, Sarawak. It can enable congregation prayer members to understand deeply the entire Quran recited by the Imam in their language of choice (either English or BM), especially during prayers, providing them with a spiritual experience that is deep, engaging, and meaningful.

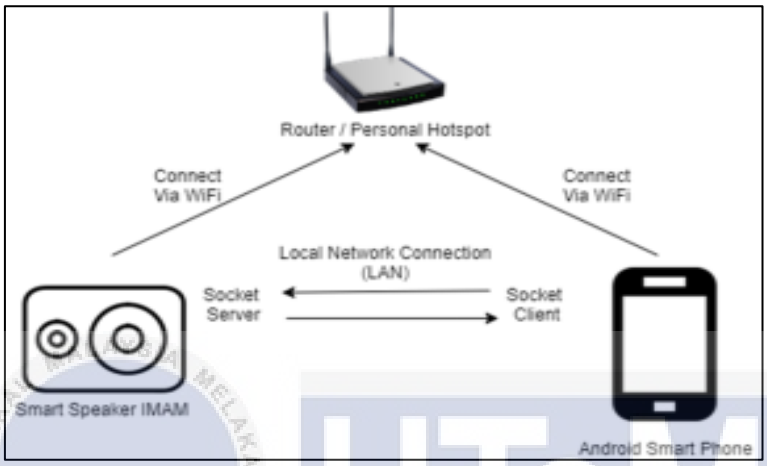


Figure 2.24 The serial communication of IMAM [19]

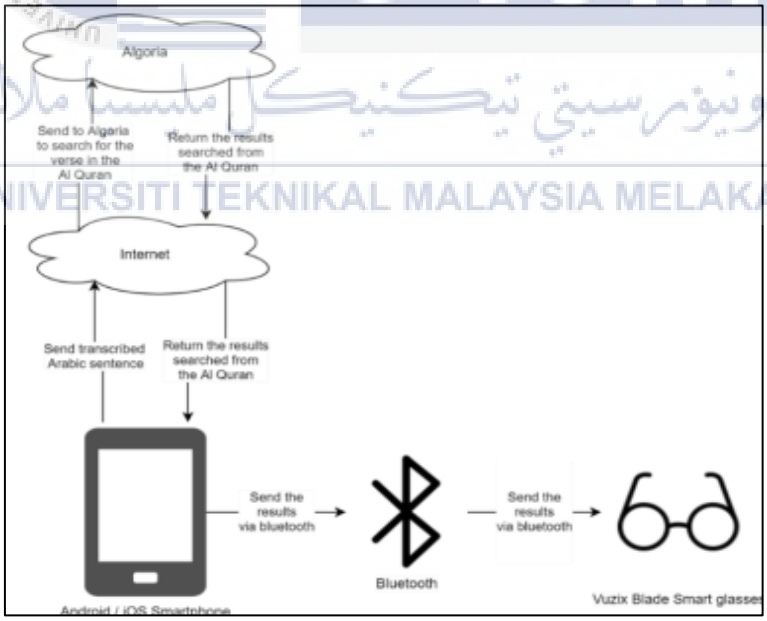


Figure 2.25 IMAM Smart speaker with outer and smartphone and IMAM Mobile Application components and their connections [20]

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.3.14 Prototype System Infaq Box Security Microcontroller

The infaq box is a container used for give a portion of his fortune to donate to people who need or for the benefit the mosque. But at the present time many are rife theft of infaq boxes in mosques that make residents around and the mosque management became restless. Because the contents of infaq box that should be used properly turn out taken by irresponsible people. Next, this project used microcontroller based security system and addition with sensors that can detect the box is no longer safe, also it can be used as technology development that can applied in the infaq box to reduce the rate of theft.

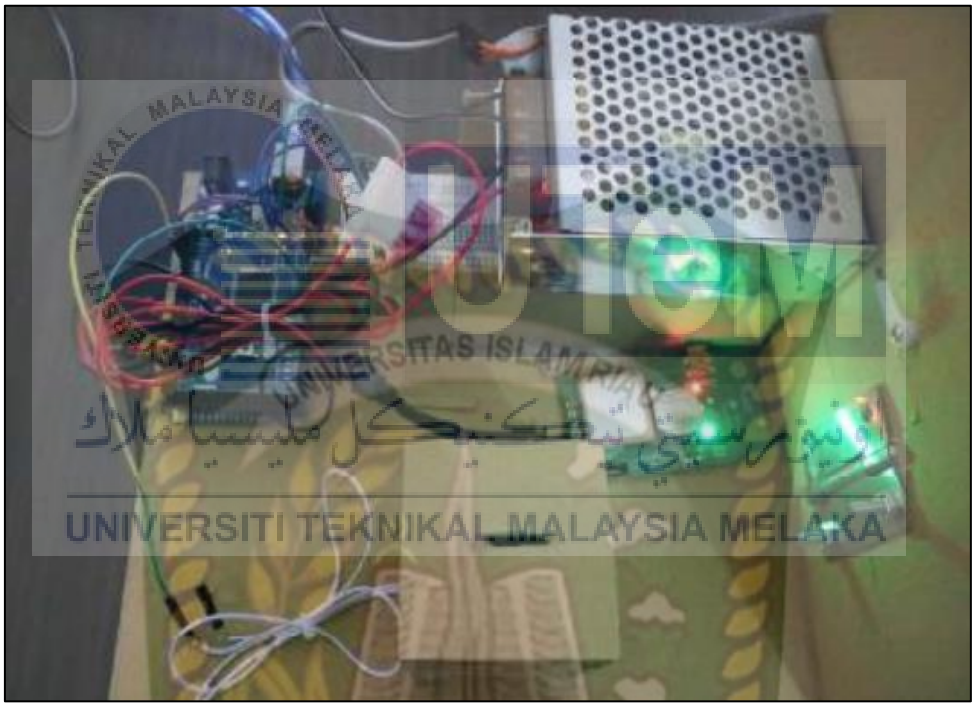

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 2.26 Hardware of infaq box [21]

2.3.15 Design And Implementation Mosque Smart Digital Signage

The use of external displays such as monitors or TV that can display khotib when delivering khutbah can help the congregation be more solemn when the khutbah is recited. To accommodate this, a system displayed khotib when greeting the khutbah using a tool that can detect whether khotib has climbed to the pulpit and delivered the khutbah. Wemos D1

R2 was chosen to be the central processing of the text of whether khotib was on the stand and delivered the khutbah and send the detection data to the local server to set the view to be visualized to the worshippers. The test results of this tool had an average accuracy performance of the sensor reached 99% at a test distance of 1 meter and the data was sent in real-time with the trigger of a change in the status of khotib there and did not exist with an average delay of 43.76ms and an average through “put sensor” of 76.8 kbps from hardware to the server using the HTTP POST protocol.

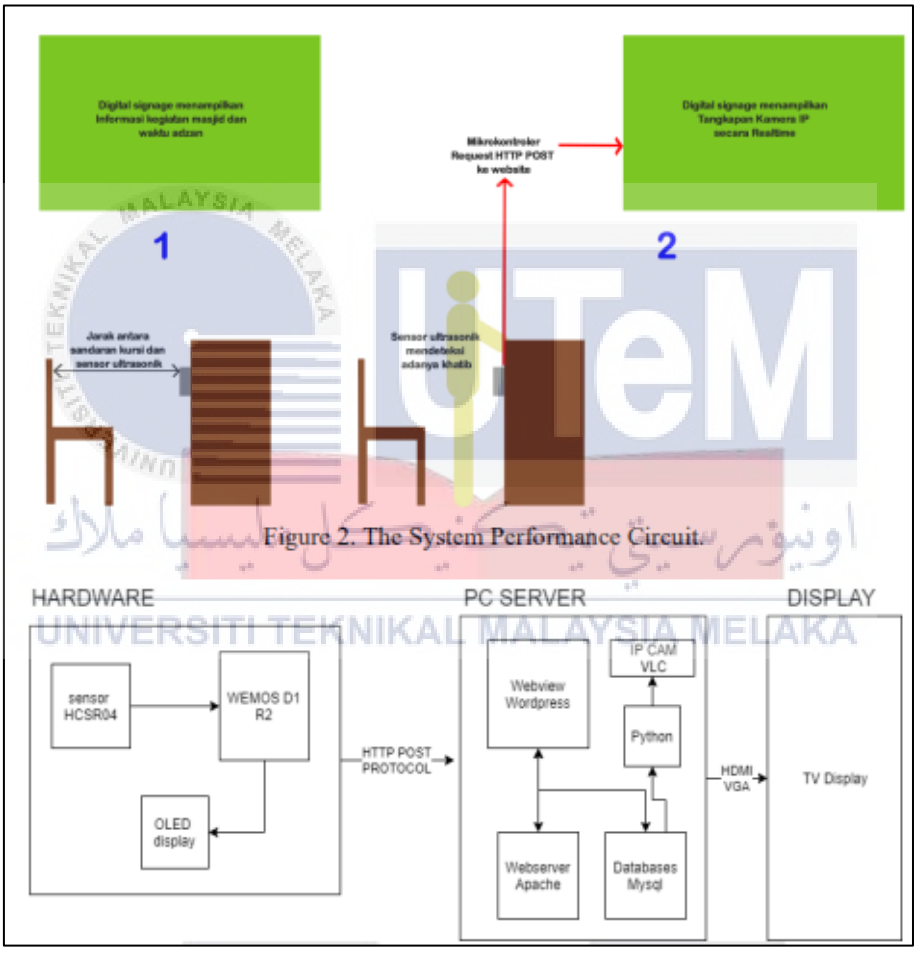


Figure 2. The System Performance Circuit.

Figure 2.27 Block Diagram of project [22]

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.4 Table of the Review Article

Based on the table below, the project system from previous article the project mostly used Arduino UNO as microcontroller it also have advantages and disadvantages.

Table 2.1 Table of the Review Article

No	Title	Component	Advantages	Disadvantages
1.	Locker security system using keypad and RFID	• RFID reader • Atmega16 • Keypad • Buzzer • Motor Driver	• Low cost	• Has 14 digital pin and all project don't require all the pin.
2.	Internet of Things (IoT) charity automation	• Arduino UNO • Wifi shield • IR sensors	• very flexible • it has stable wifi performance	• These sensors have a base detecting distance
3.	The Implementation of Artificial Intelligence in	• Arduino UNO • RFID • GSM module	• Sensing accuracy affected by soft materials.	• Limited rate of information transfer.
4.	Charity box at Mosque and Musholla as RFID based security system.	• Ultrasonic sensor • Buzzer • Doorlock	• It is easily interfered by various heat source sources.	• Lower sensitivity and fewer coverage

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

No	Title	Component	Advantages	Disadvantages
5.	IoT theft detection of the mosque charity box through Arduino R3 with HC SR501 sensor and MC38 sensor.	• Arduino UNO R3 • PIR Sensors • MC38 • Magnetic door lock		
6.	Arduino based charity box safety, tracking and counter system	• Arduino UNO • RFID • SIM808 • Module	• Supports Bluetooth function	• Strong Internet Connection
7.	Utilization of telegram application equipped with vibration sensors and fingerprints for the security of mosque charity boxes.	• Arduino UNO • Fingerprint Sensor • Vibration sensor • Node MCU • Magnet Sensor	• lower energy consumption.	• It may not be compatible with some peripherals.
8.	The safety charity box for prevent the theft based on (GSM)	• Arduino UNO • GSM Sim800 • Ultrasonic Sensor • MC38	• Low cost	• It allow only short range to device.
9.	The touch less charity box security system based on Arduino Web cloud	• Arduino Uno • Web cloud	• easy to operate	• Data leakage.
10.	Voice enabled donation box	• Raspberry pi 2 • Speaker • Ultrasonic sensors	• Many interfaces	• Costly due to use Raspberry pi

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

No	Title	Component	Advantages	Disadvantages
11.	Advanced locker security system	• GSM module • Stepper motor • PIC16f874A • Module vibration	• PIIC16f874A this microcontroller is very convenient to use.	• The microcontroller pin cannot be used for digital I/O
12.	Development of Smart Masjid Display Using Raspberry Pi	• LCD	• Display prayer time, date, day. • More accurate	• Costly due to use Raspberry pi
13.	The Real-Time Alert System for Prayers at Smart Masjid	• Infrared Camera • LED	• More accurate	• Cannot face recognition when people in crowded
14.	Intelligent Mass-Prayer Assistant for Muslims (IMAM)	• SIM800L • Speaker • Router	• Speech recognition	• Need understanding the word
15.	Prototype System Infaq Box Security Microcontroller	• Arduino Mega • Servo • Switch	• Need to top up the credit	• Stable internet connection
16.	Design And Implementation Mosque Smart Digital Signage, Connected With Ip Camera For Sermon	• Wermos D1 • OLED display • PIR sensor	• Advance feature	• Complex

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2.5 Summary

According to several research based mosque security system and automation that uses IoT will give some benefits to users. Nowadays, there are several component which has certain features so that it can be used depend on the situation. In addition, with an IoT users can operate via smartphone. One of the main features in the development of an IoT is use of wireless network of sensors that allow data control by microcontroller. The IoT applications that currently exist generate satisfactory results, but with the passage of market demand it will require a greater number of applications that leads to the use of better technologies and equipment with greater reach, much larger networks and more complex information systems.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 3

METHODOLOGY

3.1 Introduction

In this chapter, defines a specifics the research method that have been used in the obtaining and study of data collected to achieve the main objective of the research, the methodology that used to build an IoT based mosque security and automation system.

3.2 Project Overview

In this Figure 3.1 below shows the flowchart of the Projek Sarjana Muda 1 (PSM). The most important thing in developing a project is to find a supervisor first to be an instructor to facilitate matters not only that but after the supervisor has agreed to supervise then the discussion on the topic appropriate to the degree level. After that, identify the purpose of the project developed, problem statement, scope and also find articles to be used as project reference sources by making comparisons with previous articles. Several studies on hardware and software have been done for the use of this project. Studies on past projects have also been identified for improvement and understanding of the project when to be developed. Selection of hardware and software was also identified for use in the system.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

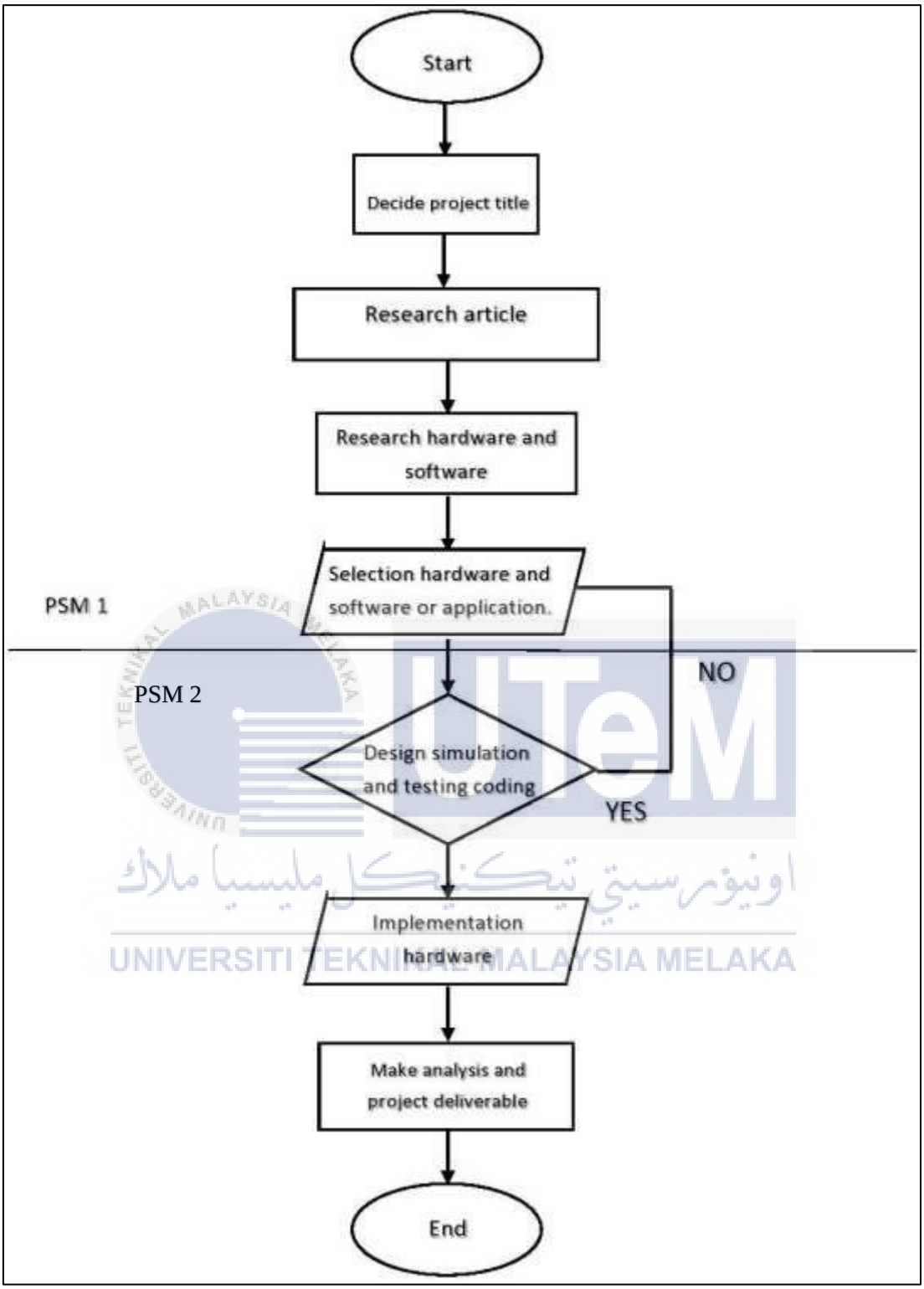


Figure 3.1 Flowchart of the PSM 1 And 2

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

3.3 Project Block Diagram

System design is one of the planning need to be done before implementing the project. Block diagrams are made before a project is carried out in order to explain a work process. In this project contains hardware and software. Block diagrams are sketched to show the overall design. The block diagram of the project is shown as in Figure 3.2. For hardware design there are several components have been used as inputs such as Nodemcu. Nodemcu is used for the purpose of connecting the smartphone for the process of unlocking the solenoid. The Nodemcu also send signals and send data to the application on the smartphone. The project was also developed using Blynk App.

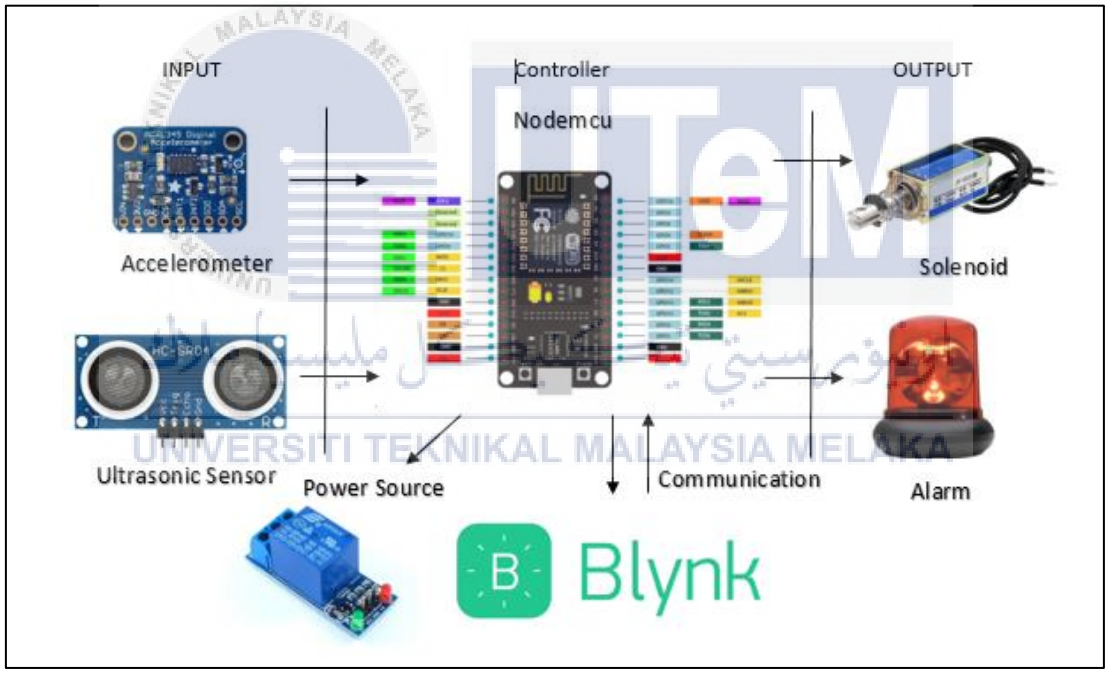


Figure 3.2 Block Diagram of the Project

3.4 Project Parameter

This prototype charity box of this project it sketch using AutoCAD 2015 with 3D style. The dimension have been taken in inches where width 13.58 inches x length 11.81 inches and height 11.81 inches as shown in figure below. The charity box are design with wooden.

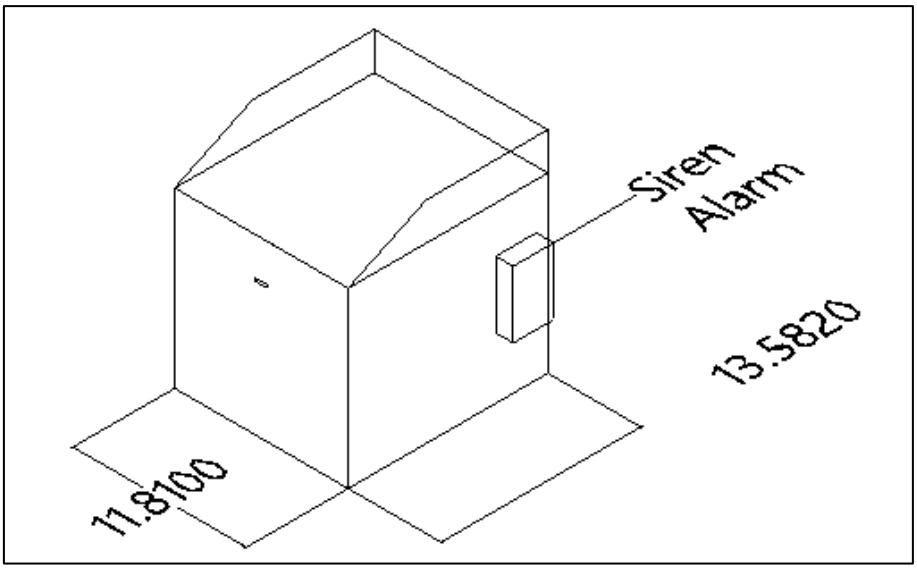


Figure 3.3 Plan Prototype of Charity Box

Figure 3.4 The Charity Box made from wooden

3.5 Project Component

NodeMCU (***N***ode ***M***icro***C***ontroller ***U***nit) is an open-source software and hardware development environment built around an inexpensive System-on-a-Chip (SoC) called the

ESP8266. The ESP8266, designed and manufactured by Espressif Systems, contains the crucial elements of a computer: CPU, RAM, networking (WiFi), and even a modern operating system and SDK. That makes it an excellent choice for Internet of Things (IoT) projects of all kinds.

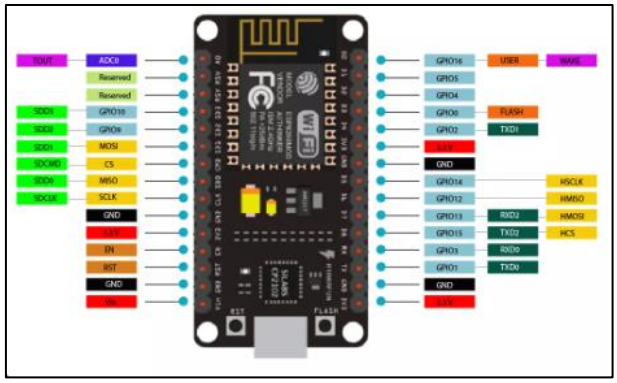


Figure 3.5 Nodemcu pinout [23]

Table 3.1 Specification of Nodemcu

Nodemcu Size	49mm x 26mm
Operating Voltage	3.3V
Input Voltage	4.5V to 10V
Clock Speed	80MHz
Flash Memory	4MB
USB Connector	Micro USB
EPROM	1KB
Digital IO Pins	11
Analog Input Pins	1

In this project used solenoid key where it electromagnetic lock, The main benefit of using solenoid key is that it is a secure, convenient, and reliable way of controlling access to a building. The magnetic lock is strong enough to deter unauthorized access, and it is easy to install and use. Additionally, it does not require any wiring, which makes it easy to install in a variety of locations. Furthermore, the solenoid key is easy to manage and can be programmed to allow access only to authorized personnel. Finally, the solenoid key is a cost-effective solution that can be used in a variety of applications.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 3.6 The Solenoid Key [24]

In this project also used Accelerometer as a sensor to trigger when someone tries to remove the charity box. The accelerometer working to measure the angle of this project by the axis. The functional of this sensor that its convert mechanical energy into electrical energy. When a mass that is actually like a spring is placed on the sensor, it starts to descend at that point.

Figure 3.7 Accelerometer [25]

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 3.8 Ultrasonic sensor [26]

An ultrasonic sensor is an instrument that measures the distance to an object using ultrasonic sound waves. An ultrasonic sensor uses a transducer to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns. In this project the ultrasonic sensor are used to detect obstacle with distance.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 3.9 Alarm Siren [27]

In this project, The Siren Alarm was use to give alert at user when thief occur the siren will sound. The 12v siren alarm is used in this project to notify people if there is a case of theft by notifying the user of the intrusion that occurs at the same time the siren is sounded. Not only that, but this siren is quite loud with a noise level of 115dB, it can be heard in a large mosque.

Figure 3.10 Blynk App [28]

Blynk was designed for the Internet of Things. It can control hardware remotely, it can display sensor data, it can store data, visualize it and do many other cool things. Blynk App allow to create an amazing interface. In this project the interface of Blynk was create with two button switch on and off, the value of sensor also display in digital on the interface.

3.6 Flowchart of the Project

Figure shows the flowchart of the development of an IoT based charity box automation and security system. The systems started by connecting the device to the application. Next, once the device is switch on, the Wi-Fi module is connected with the available Wi-Fi network to ensure that the user can accessing the device through network. Upon the completion, the charity box is always in standby mode. There are several method to operate the charity box which is user open the solenoid key using the application. First method is the user needs to open the Blynk application to opened the solenoid key. By clicking the interface in the Blynk, the user can monitor. However, the second method is suing ultrasonic sensor which it can send email or alert to user if the charity box was full by amount and the user get the alert “Tabung dah Penuh”. After that, “Ada Pencuri” will send notify in Blynk application. Meanwhile, the charity box was break in by someone and the accelerometer will trigger it and alarm siren will on and only the user can off the buzzer.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

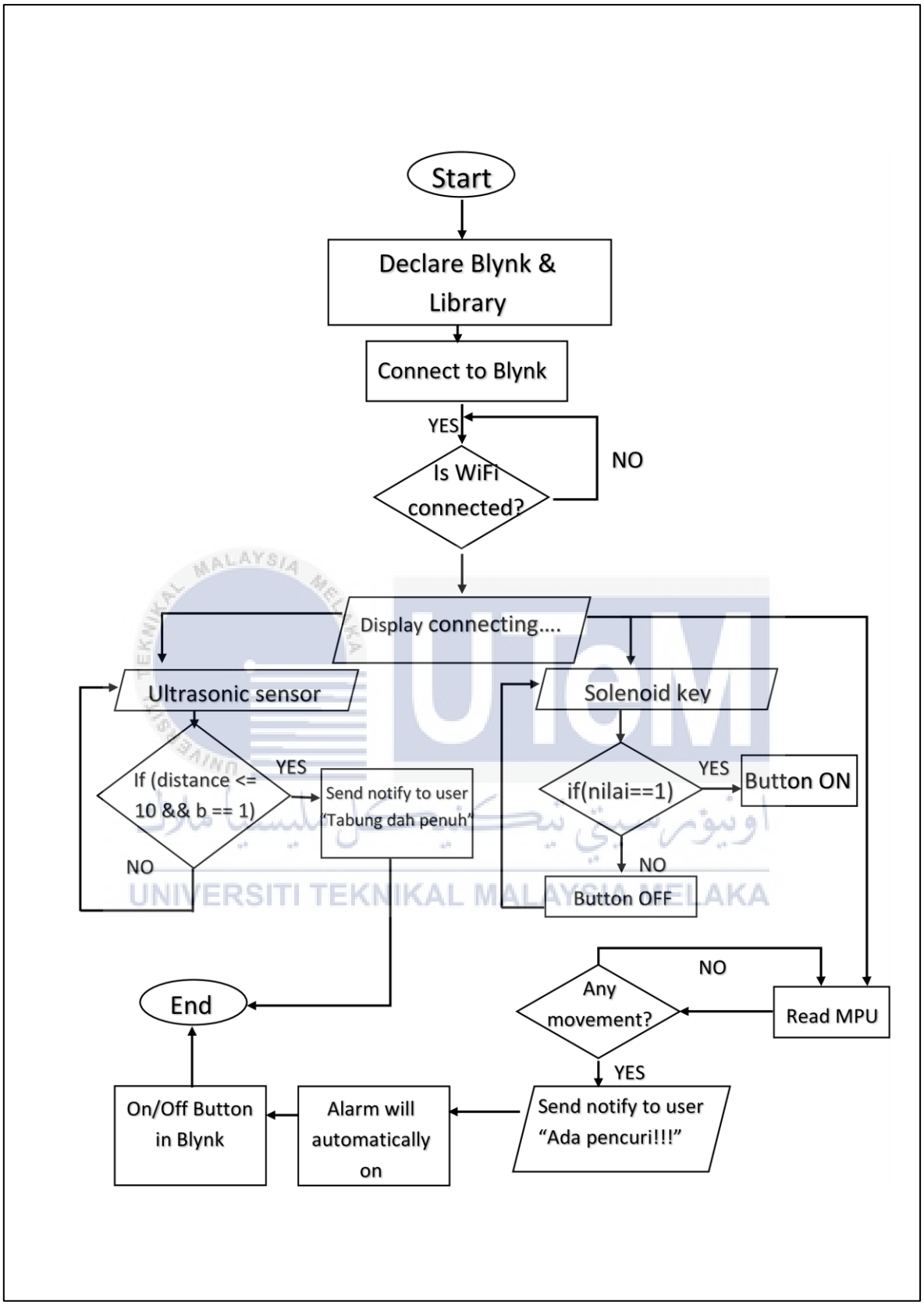


Figure 3.11 Flowchart

3.7 Preliminary Results

In addition, for the initial result, the component involved Nodemcu, Accelerometer, Ultrasonic sensor, Solenoid and Siren. The solenoid are monitor by the user. Before this implementation can be done, the Nodemcu module pin are connected with the digital pin accelerometer, siren and ultrasonic sensor pin also connected the Nodemcu. Then, the completed coding was uploaded to Nodemcu using Arduino IDE software.

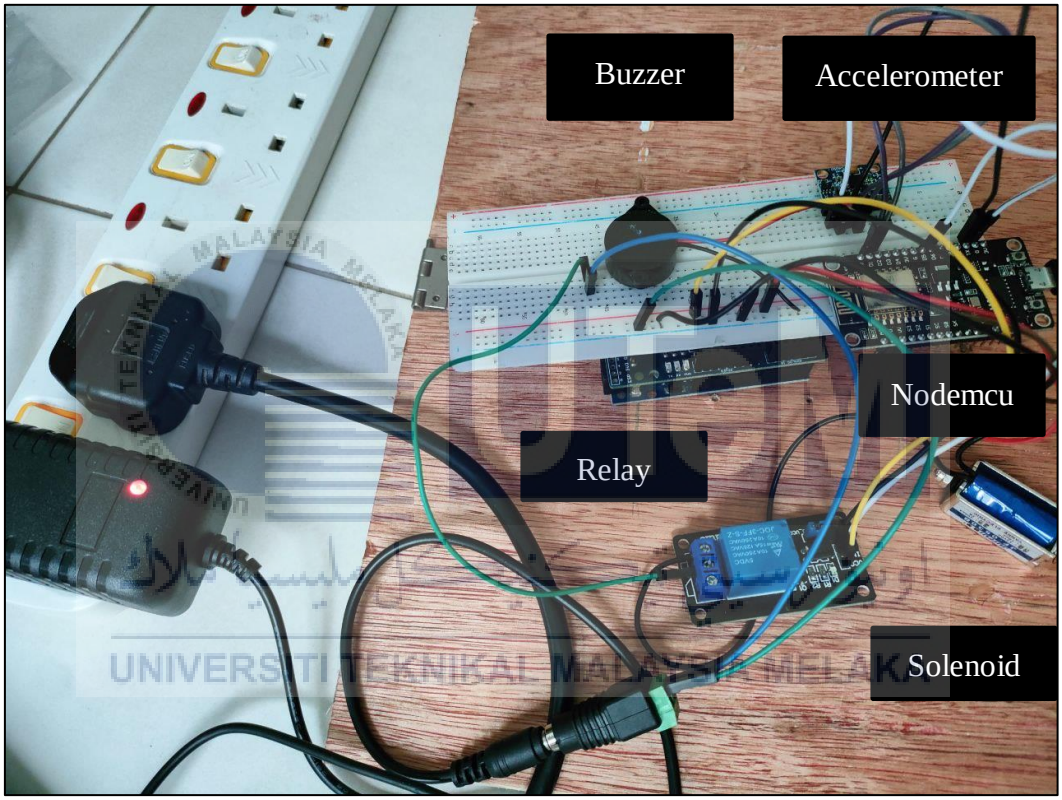


Figure 3.12 Shows the connection hardware for the initial result

3.8 Circuit Layout

This part, it will explain about the circuit and the pin connection of solenoid key with component to the Nodemcu with Blynk App. Figure show the circuit connection for simulation, based on the Figure the Nodemcu module it will be connected to the ground and Vcc to ultrasonic sensor and MPU. The siren alarm pin relay from signal connected to the D0 of Nodemcu module, while pin D1 and D2 connected to MPU (SCL and SDA) also pin

D7 and D8 connected to ultrasonic sensor where pin trigger and echo. Next, the solenoid positive will connected to relay normally closed (NO) and the negative one connected to ground. In addition, the relay are used to because the power of solenoid supply 9- 12V, the pin connection relay will connected to 12V power supply with Vcc.

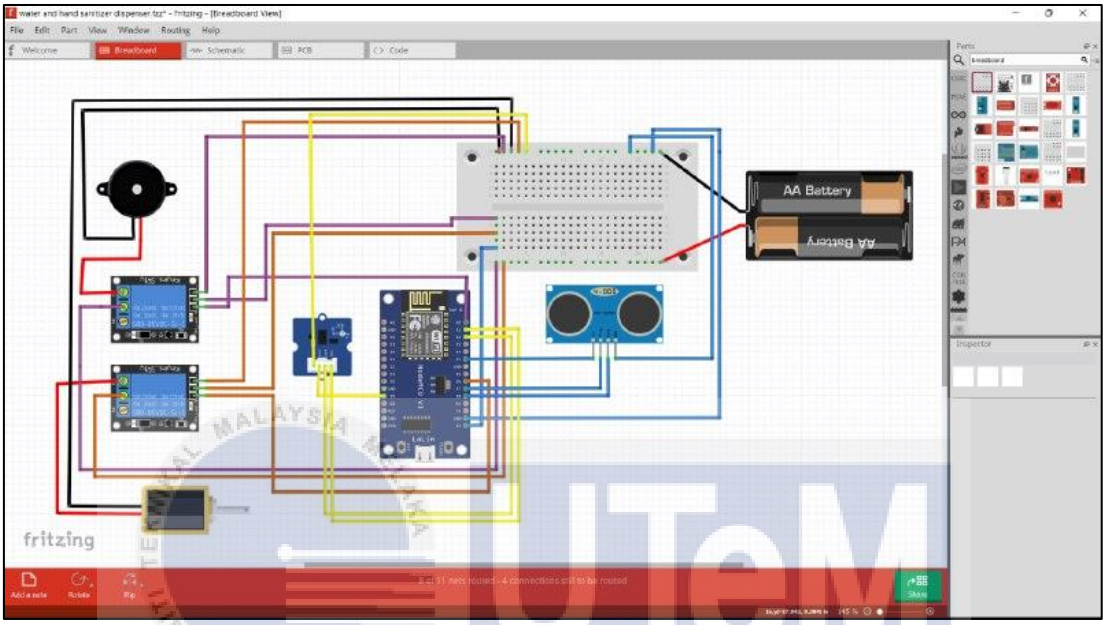


Figure 3.13 Circuit in fritzing

Table 3.2 Pin connection

Components	Component pins	Nodemcu Pins
Solenoid	Normally open relay (+)	D6
	Cathode (-)	GND
Accelerometer	Vin (+)	3.3 V
	SDA	D1
	SCL	D2
	GND	GND
Relay 1	Vin (+)	3.3 v
	GND	GND
	Input	D6
Relay 2	Vin (+)	3.3 v
	GND	GND
	Input	D0
Siren	Normally open (relay) (+)	D0
	GND	GND

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Ultrasonic sensor	Vin	Vin
	Trigger	D7
	Echo	D8
	GND	GND
Battery	Anode (+)	Vin
	Cathode (-)	GND

3.9 Software configuration using Blynk Application

This part explained about the software configuration that has been to build the projects. The software used are Blynk application for mosque automation and security system purpose. As in Figure 3.16, new project has been built in Blynk application and named as 'Mosque Charity Box'. The device is set using Nodemcu so that the application can determine which device will communicate with the system to perform the command given. It is connected to the available Wi-Fi network and communicate through the internet connection. For email notification, email need to be set in email setting as shown in Figure 3.16. So that, the user will get email as the notification if the sensor was trigger. Not only that, the push button setting in Blynk application also need to be set or declare if user want them to turn off or turn on from hardware to the device.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

After that, for Figure 3.17, the declaration of the input as V2 has been done. This virtual pin will read the accelerometer value. Same to Figure, do the declaration of the button solenoid input as V3. For Figure, the alarm will be declared as V4. This virtual pin is as output because it will be controlled by user to turn off the siren. The Figure shows the declaration of V5 for ultrasonic sensor that display the value of distance. Next, figure.3.18 that the front of interface of the Blynk application, After running the Blynk application the user can notify the thievery anywhere as long as both controlling and processing unit is connected to internet network.

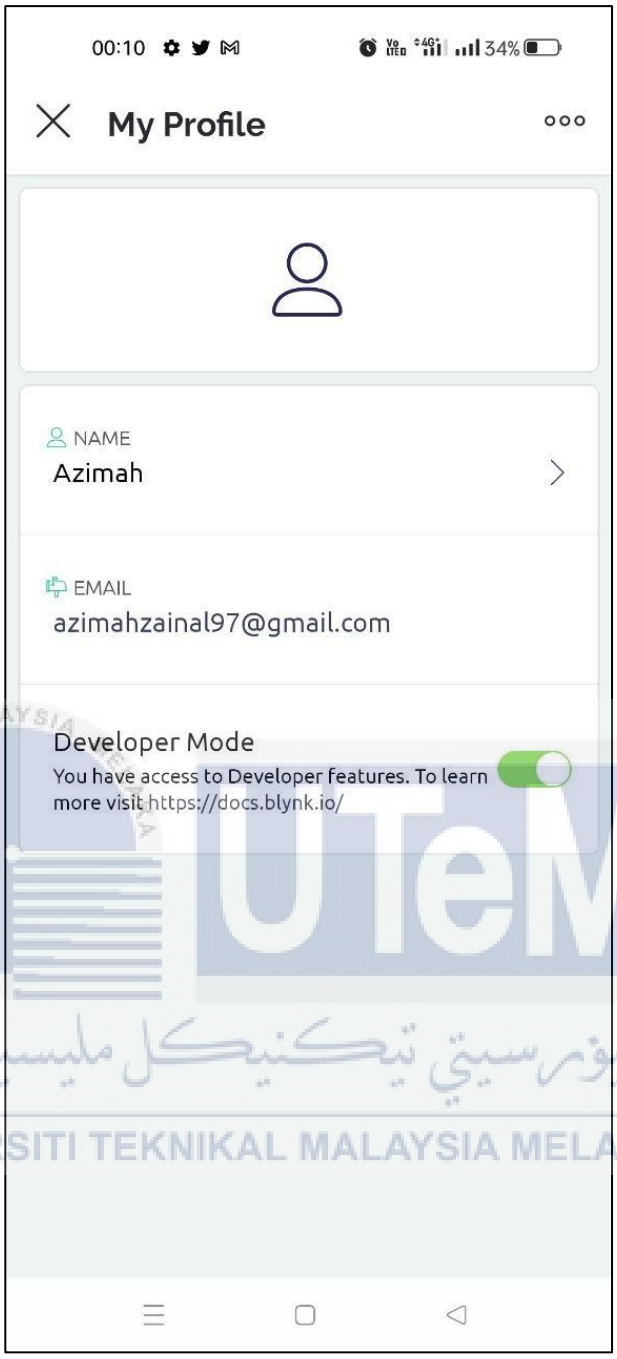


Figure 3.14 The email at setting

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

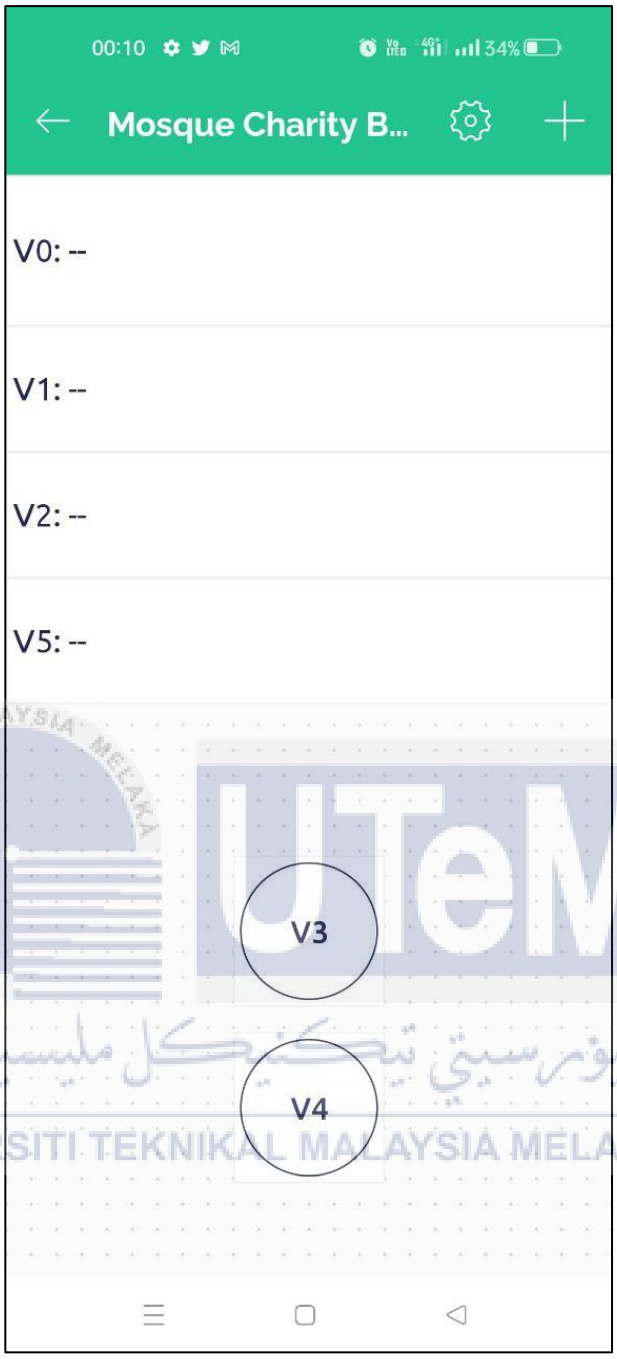


Figure 3.15 Declare the input as V0,V1,V2,V3,V4 and V5

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

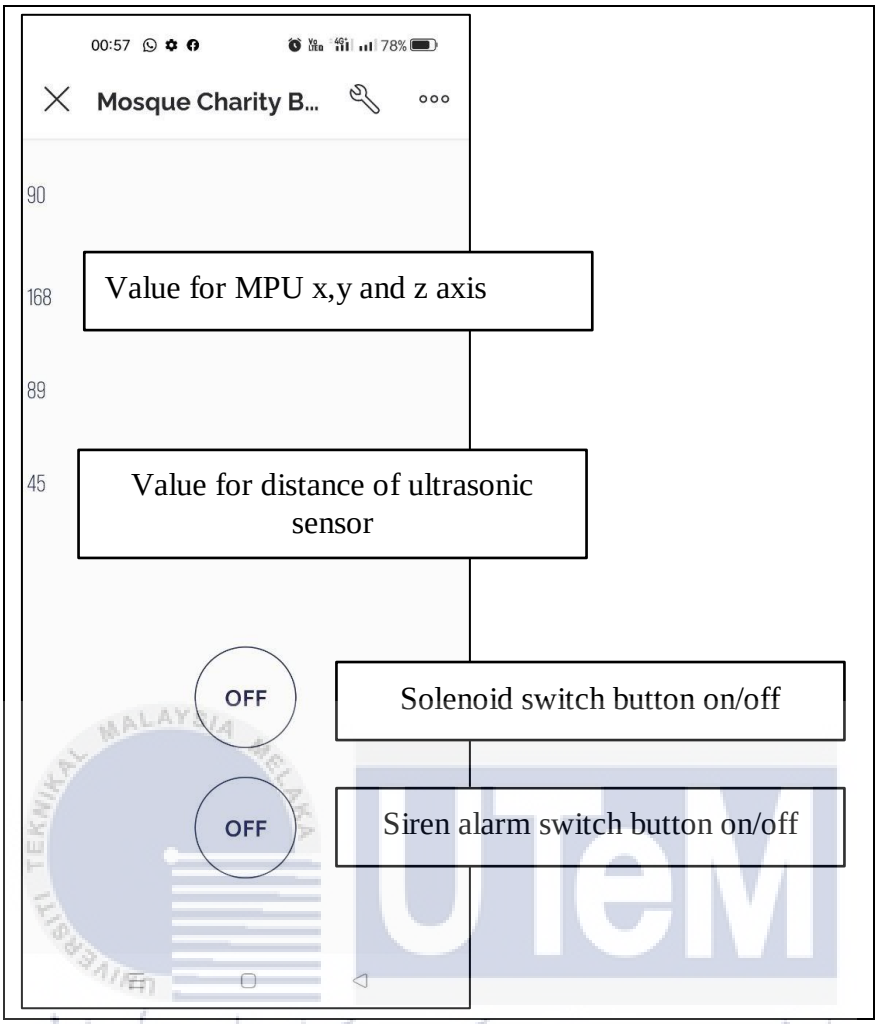
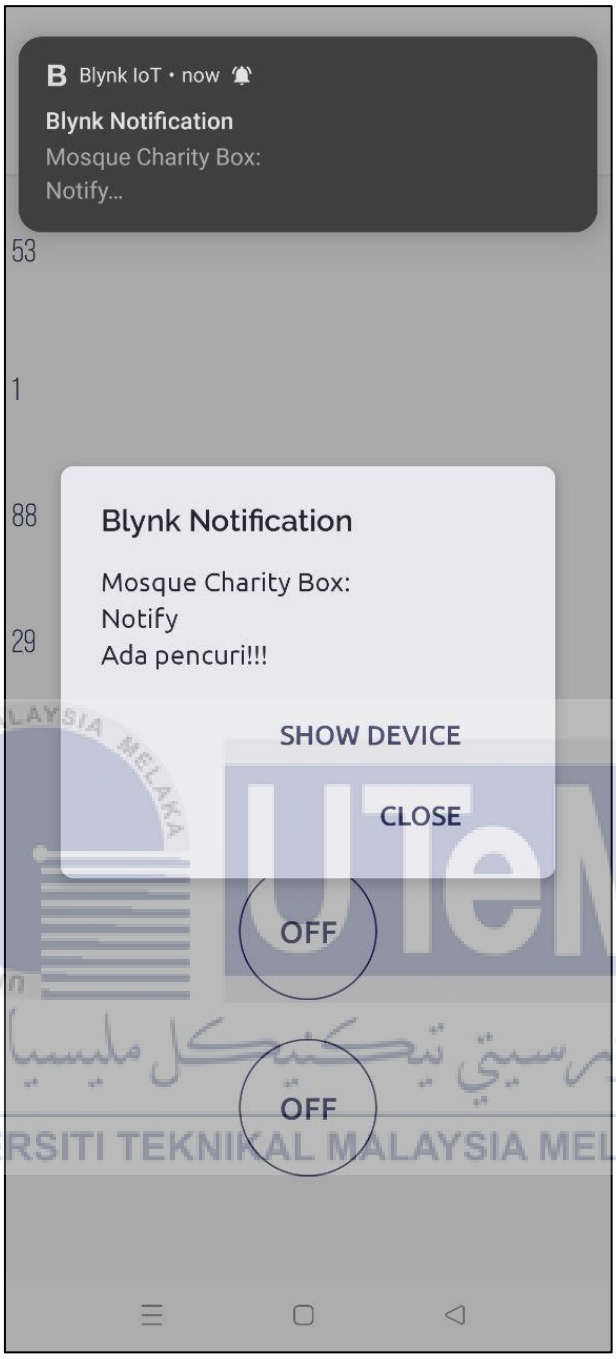


Figure 3.16 The interface of Blynk

UNIVERSITI TEKNIKAL MALAYSIA MELAKA



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 3.17 The notification from Blynk IoT “Ada pencuri!!!” if someone tries to break in.

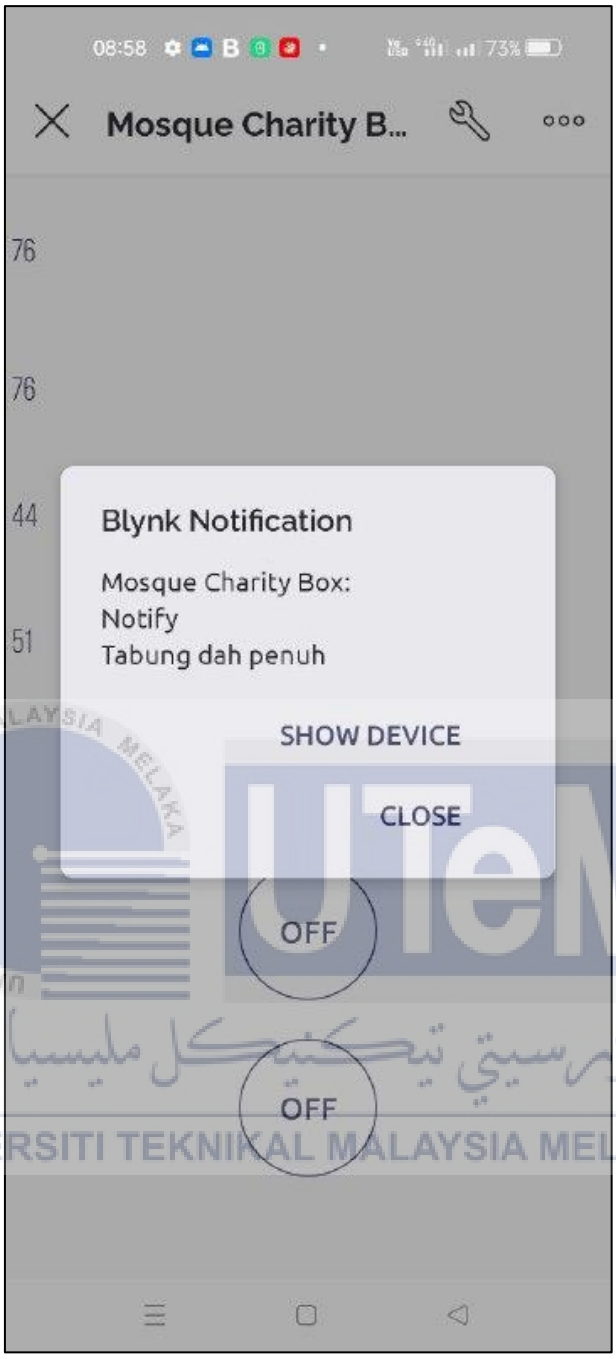


Figure 3.18 The notification from Blynk IoT "Tabung dah penuh" if the amount in charity box was full.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

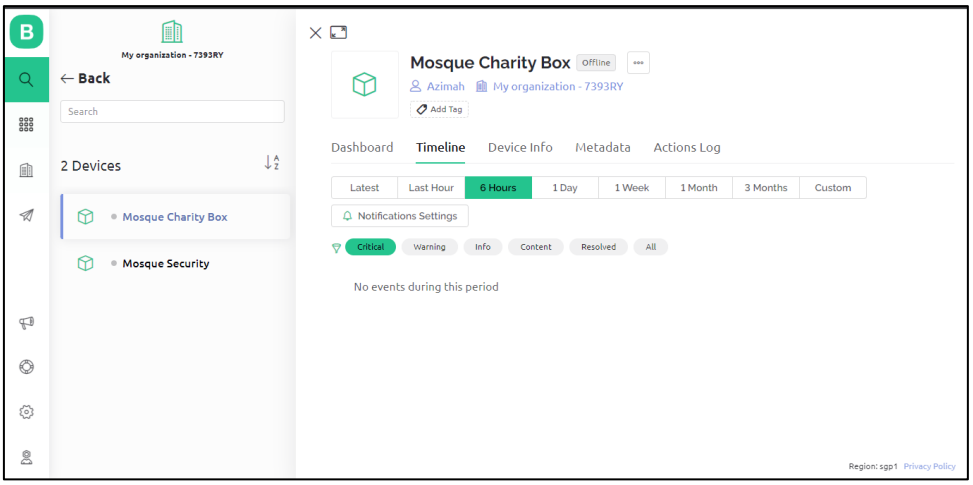


Figure 3.19 The Blynk.Console interface

3.10 Hardware Configuration

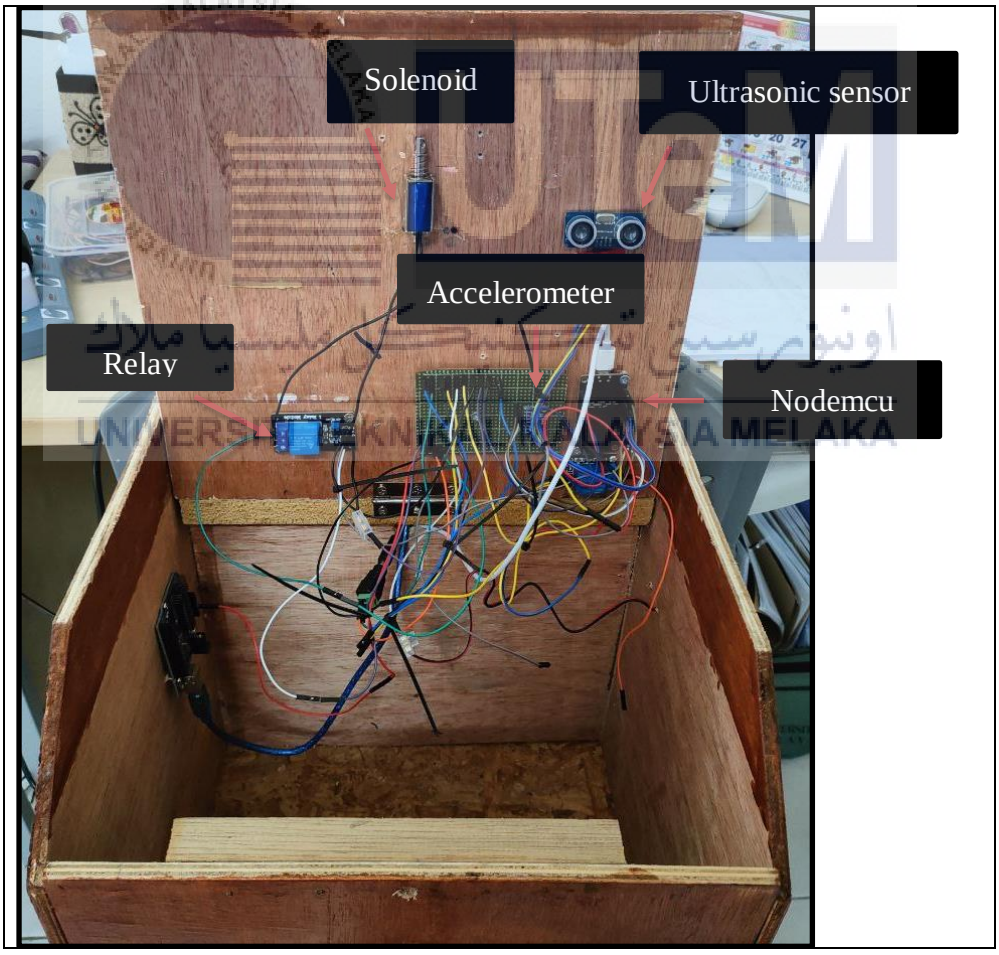


Figure 3.20 Label of the component

Figure 3.21 The electronic charity box

As Figure 3.21, shows the hardware configuration setup for the development of an IoT based charity box automation and security system which consists of Nodemcu module and accelerometer sensor as the input of this system. Then, siren alarm as the output of this system. All the components are connected to the Nodemcu using jumper to enable the microcontroller for executing the process in the system. Besides getting result through the Blynk application, the systems also can be monitored in the computer as it is connected with USB cable.

There is one condition that need to be fulfilled before the Wifi module sending the data as notification to mobile phone. The password and connection of WiFi has been inserted into the coding. After that, the connected to Blynk app, and the accelerometer will trigger when someone try to theft the charity box and the notification and email will send to the user mobile phone. From this, user can know the box has been removed by someone. Once the

accelerometer detected the siren alarm was turn on and only the user can turn off the alarm siren from Blynk.

3.11 Bill material

To develop the product, all the information is included in the bill of materials (BOM). The bill of materials typically includes part description, part names, and the quantities required to build an assembly. Figure 3.24 below show the bill of the material for electronic charity box.

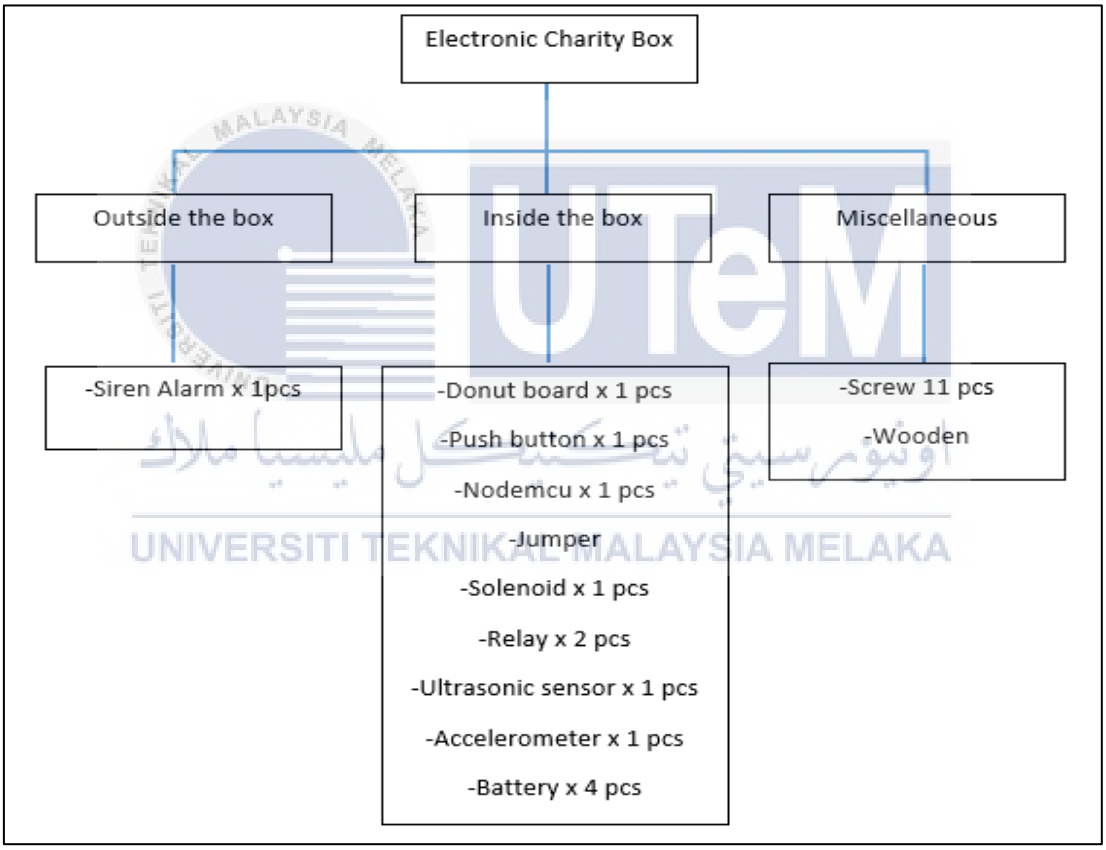


Figure 3.22 Bill of material

3.12 Project Costing of Components

In this part, it will explain costing of the components that are used in this project. Based on the table below it show the name of component that will used, Next the unit of item also are listed with the price of each component. According to the objectives of this

project it prove a charity box build with low cost system less than RM200.00.

Table 3.3 Project Costing of Component

No	Component	Supplier	Unit	Price (RM)
1	Nodemcu	Cytron	1	14.90
2	Solenoid	Shopee	1	17.00
3	Accelerometer	Cytron	1	10.50
4	Relay	Shopee	2	13.00 per item
5	Ultrasonic sensor	Shopee	1	20.00
6	Alarm Siren	Perniagaan elektronik sentral	1	25.00
7	Donut board	Prosine TU	1	2.00
8	Wire jumper	Prosine TU	3 pcs	18.00
9	Wooden	Gerik Hardware	7 pcs	60.00
10	Screw	Hardware TU	10 pcs	3.00
	Total Cost			196.40

3.13 Limitation of Proposed Methodology

This chapter presents the proposed methodology in order to design and develop a new project with device functionality. This project security system need to installation the wire connection in the charity box. Next, the accelerometer sensor used in this project need to set up at proper place with the siren alarm.

3.14 Summary

This chapter summarize the methodology that used in this project in order to design and develop a new project with device functionality. This project software and hardware are being used and for software use Fritzing to design schematic circuit and for hardware Nodemcu. Next, application also used to generate system to the user and it also have tutorial on youtube and website.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents the proposed methodology in order to design and develop a new project with device functionality. This project software and hardware are being used and for software use Fritzing and for hardware Nodemcu are used. Next, Blynk IoT application also used to notify the user and it also have tutorial on youtube and website. According to the objectives 3 to verify the functionality, security and performance of the electronic charity box by performing a set of system testing fully integrated applications have been achieve.

4.2 Realibility testing

Reliability testing is carried to verified and validate quality product is deliver to the user by using a few method which are test at high place and functionally testing.

4.2.1 Place of testing

Table 4.1 show place testing for two parameter which are test for at low and high place which is 0.5 m to examine the structural integrity of the electronic charity box.

Table 4.1 The place of test table

No	The heights	Condition	Picture
1	Ground	Project still function	
2	0.5 m	Project still function but need to setup at proper place.	

4.2.2 Aging Test

Table 4.2 show aging test which the electronic charity box to conditions outside normal service and provides test data within a compressed time frame. Aging Test table.

Table 4.2 The aging test table

No	Condition	Before	After
1	The project is placed outside for nine hour from 8.00am until 5.00pm. Project still function.	 at 8.00 am	 at 5.00 pm

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

4.3 Functionally Testing

On this testing part, the functionality testing were done to make sure the charity box is fully function before being used by the user.

4.3.1 Unit Testing and Integration Testing

In this part, unit testing and integration testing is carried out. Unit testing is a test to check the functionality of a single component of an application. Once all component are developed and integrated with other component then integration testing is carried out to find the issues arise when different modules are interacting with each other to build overall system.

Table 4.3 Unit Testing and Integration Testing

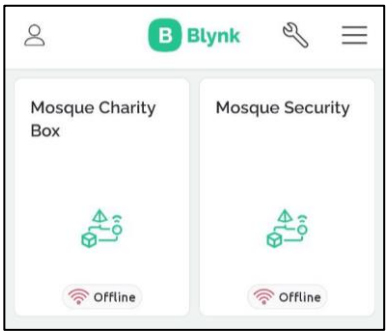
Component	Method list	Expected	Actual
Detect accelerometer	Used angle library coding to detect the angle of movement	Accelerometer detect the angle or movement the from the coding that are set.	Accelerometer send data value of angle
Detect siren alarm	Used the audio coding to put in Arduino IDE	Siren will turn on if detect the movement of charity box.	Siren active when someone tries to break in and send data to Blynk app
Combine the accelerometer and siren alarm	Using the Arduino IDE coding and Blynk app	Both it if will functioning depends on Wifi connection on user's	Both functioning depends on the user's connection.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

4.3.2 Boundary Testing

Boundary Testing Table 4 show the boundary testing of the project. This testing is based on the possible outcome that will appears when the user does not make any connection or even make the connection using all the component that are used and Blynk app.

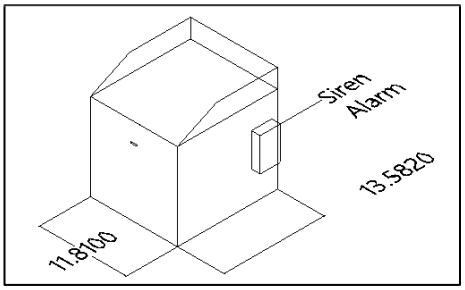
Table 4.4 Boundaring Testing

Description	Actual Outcome
If the mosque management does not connect the WiFi, what will appear on the application?	The application will display OFFLINE on user's smartphone 
Does the siren can heard surrounding on mosque?	The siren alarm can be heard range more than 10 meter
Does if the electronic charity box at higher place and violated by animals such as lizard can affects the sensor?	No, because the charity box are set by coding it trigger at z axis movement.

4.4 Project Design

Table 4.5 show the different between expected design and actual design of the project.

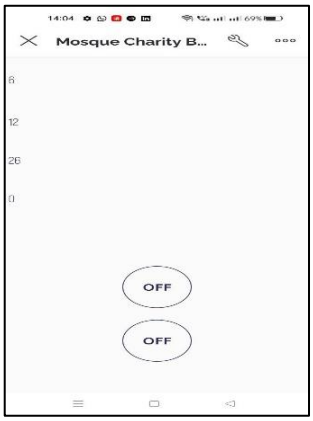
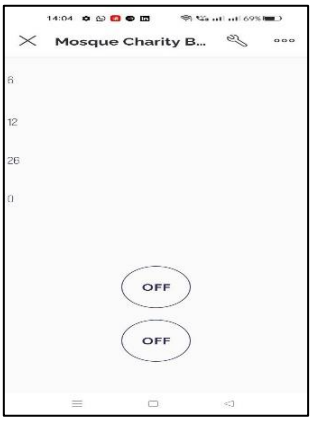
Table 4.5 The comparison of expected and actual project design

Description	Expected Design	Actual Design
Hardware prototype		

4.5 Application Design

Table 4.6 show the different between expected design and actual design of the application.

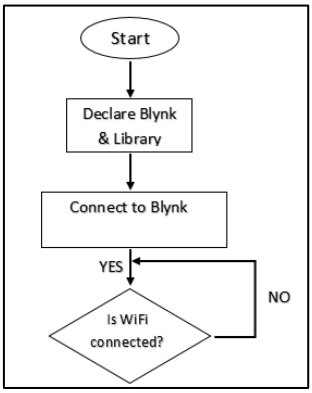
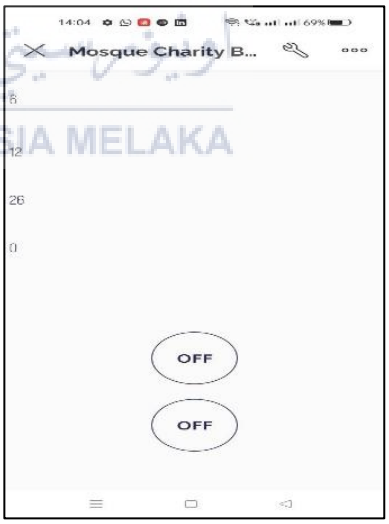
Table 4.6 The comparison of expected and actual application design

Description	Expected Design	Actual Design
Design of main screen		

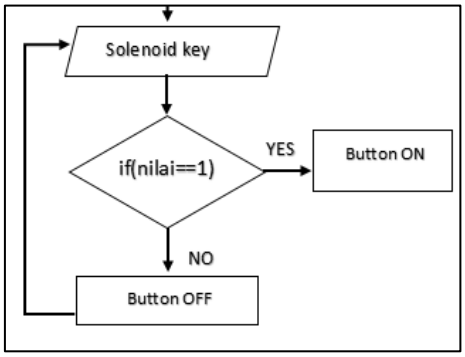
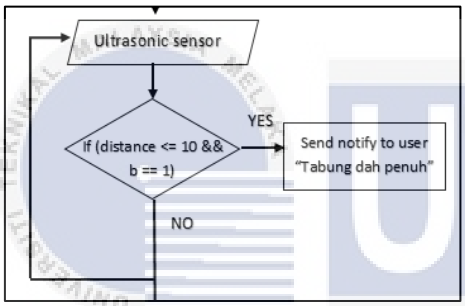
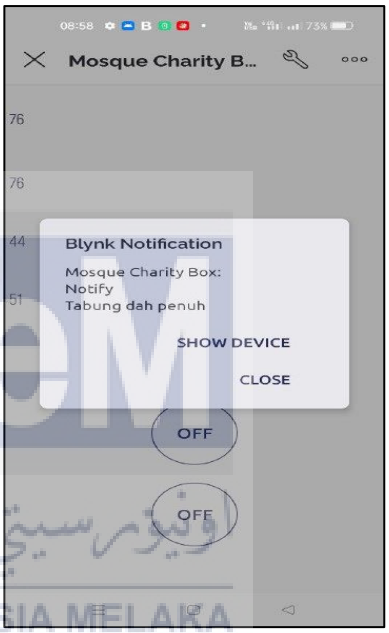
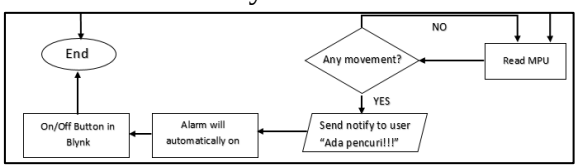
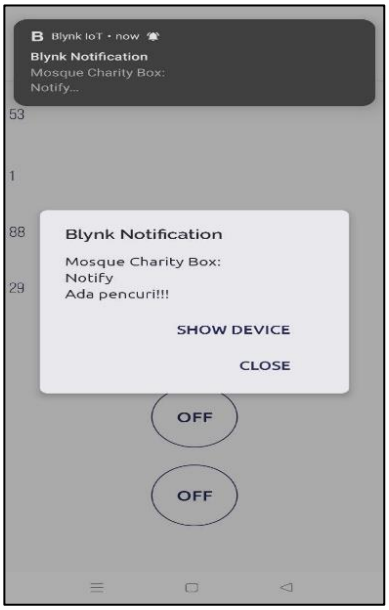
4.6 Design flow of the program based on the scenario

Table 4.7 show design flow of the program for expected and actual design of the project.

Table 4.7 The table design flow program for actual result

No	SCENARIO & FLOWCHART	Actual Result
1	When power supply is connected to the electronic charity box, user need to connect the WiFi to access the electronic charity box. The main screen will display an explanation of the application and a button that required user to connect to the application through WiFi. 	

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

No	SCENARIO & FLOWCHART	Actual Result
2.	When user click button On or Off the solenoid will function 	
3.	When the charity box is full of amount in the box the user will get notify “Tabung dah penuh”.which is the sensor detect the distance of money. 	
4.	When someone tries to break in the charity box or remove the accelerometer sensor will detect the angle of movement and will send notify at the user “Ada pencuri!!!” and the alarm was turn on and user only can off the switch. 	

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

4.7 Results and Analysis

This part explained about the data collection process which include the analysis about the findings from the output collected. These analyses are done to determine the performance or characteristics of the system itself. So that, the project that are completely done are reliable to be used by the consumers or users.

4.7.1 Analysis for ultrasonic sensor

The sensor determines the distance to a target by measuring time lapses between the sending and receiving of the ultrasonic pulse.

Table 4.8 The distance of detection and object obstacle

Distance of detection object (cm)	Object obstacle testing
50	7
100	6
150	5
200	4
250	3
300	2
350	1

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

As figure 4.1 shows the ultrasonic sensor has a range of up to 4 meters or 13 feet and can measure distance up to 3.5 meters or 11.5 feet with an accuracy of 3 mm. It uses sound waves to detect the presence of an object and measure the distance to it. The sensor can be used to detect objects in the dark

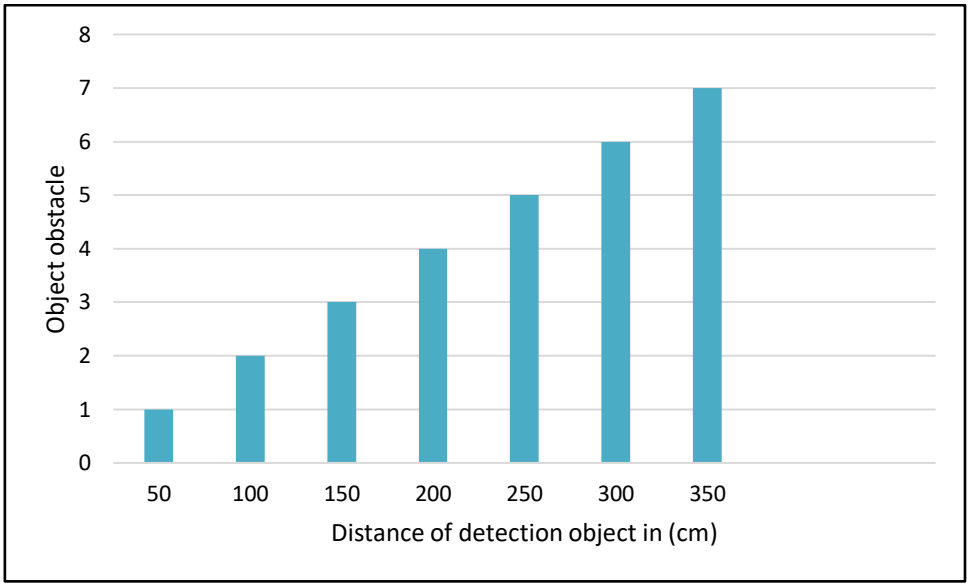


Figure 4.1 The distance of detection object in (cm)

4.7.2 Analysis for accelerometer

From the figure 4.2 the graph shows the angle of the x, y, and z axis over time. The x-axis is represented by a blue line, the y-axis is represented by a green line, and the z-axis is represented by a red line. The graph shows the varying angles of each axis over time.

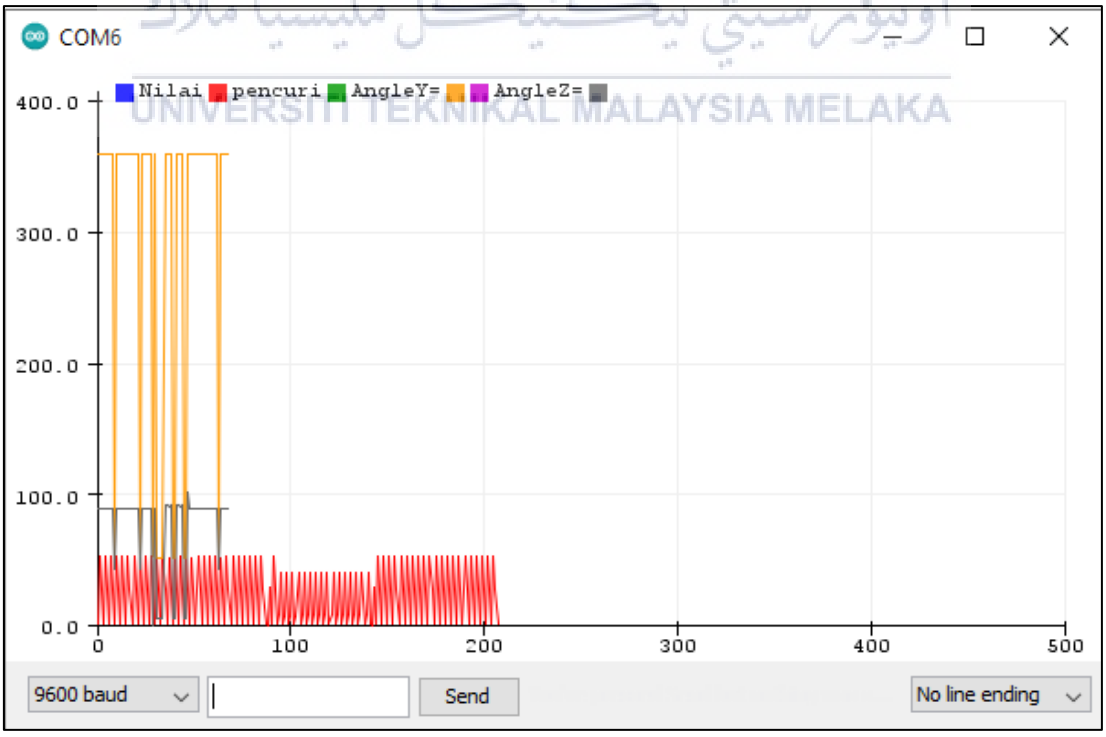


Figure 4.2 The graph analysis for accelerometer

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

From figure 4.3 the graph shows that the amount of money in the charity box increased sharply when someone attempted to break in. The red line significantly above the 100.0 mark, indicating that the attempted theft was unsuccessful. This could be due to an alarm that was triggered, alerting authorities or bystanders to the attempted theft.

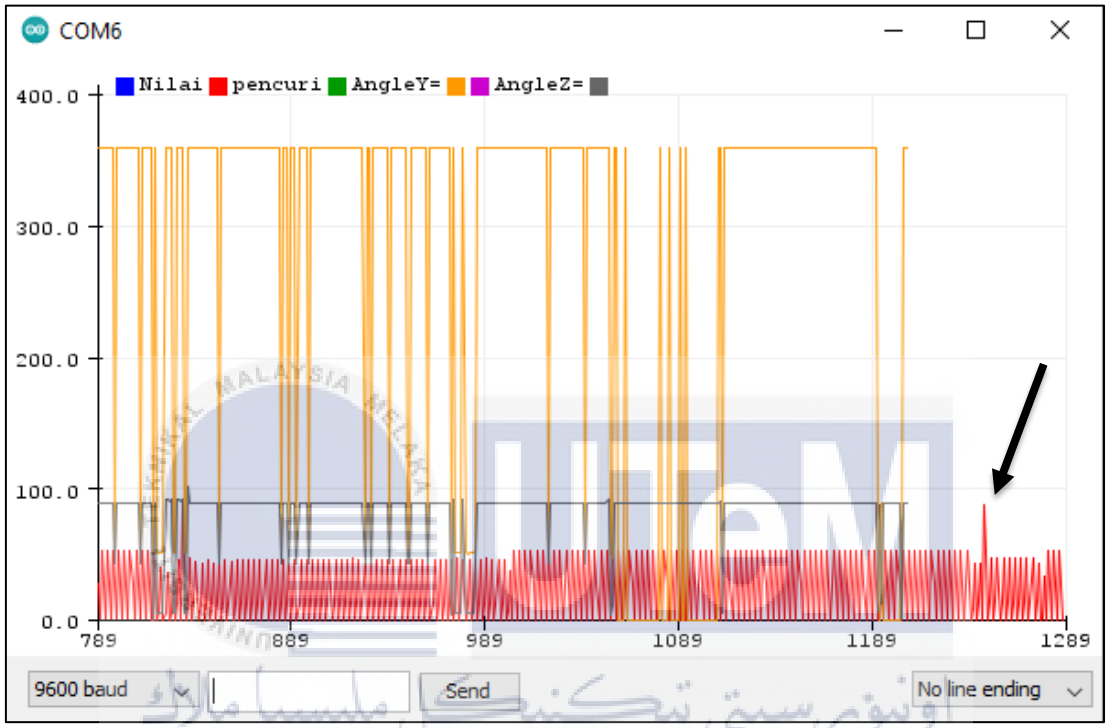


Figure 4.3 The graph of analysis after someone tries to break in the charity box

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

4.8 Result Analysis and Survey Question

The survey is carried out for 53 community, villagers and corporate for this project. This survey is carried out to obtain the feedback and to examine the effectiveness of the electronic charity box. The charity box has been exposed to them with the age from teen to elderly person mostly of them have bachelor degree education background and mostly of community more interested in online banking donation type.

4.8.1 Question 1 Are internet facilities at every mosque need to be improved?

Figure 4.4 show that is about 47.2% person is agree improving the internet facilities at mosques can help the mosque management to be more efficient and organized, as well as to facilitate better communication between mosque staff and members. Furthermore, with improved internet access, mosques can make use of digital tools to better serve their members and the wider community. This can include providing online resources such as educational materials, religious information, and even virtual prayer services. This will also make it easier for mosques to connect with their members and to keep them informed of news and events. Finally, improved internet facilities can also provide an avenue for mosques to fundraise and use donations to support a variety of noble causes.

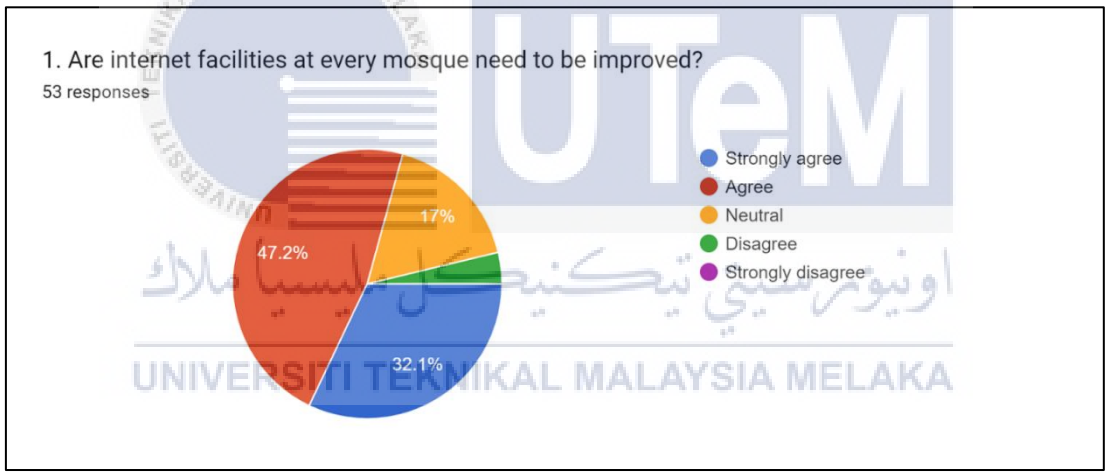


Figure 4.4 The pie chart Question 1

4.8.2 Question 2 Does the mosque management need to bring their smartphone everytime?

The figure 4.5 show the pie chart of community neither agree or disagree that the mosque management need to bring their smartphone everytime on mosque. The smartphones can be beneficial for the mosque management in terms of handling activities. However, we strongly believe that these devices should be turned off or set to silent mode during prayers, so as to not disrupt the concentration and spiritual connection of the worshippers.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

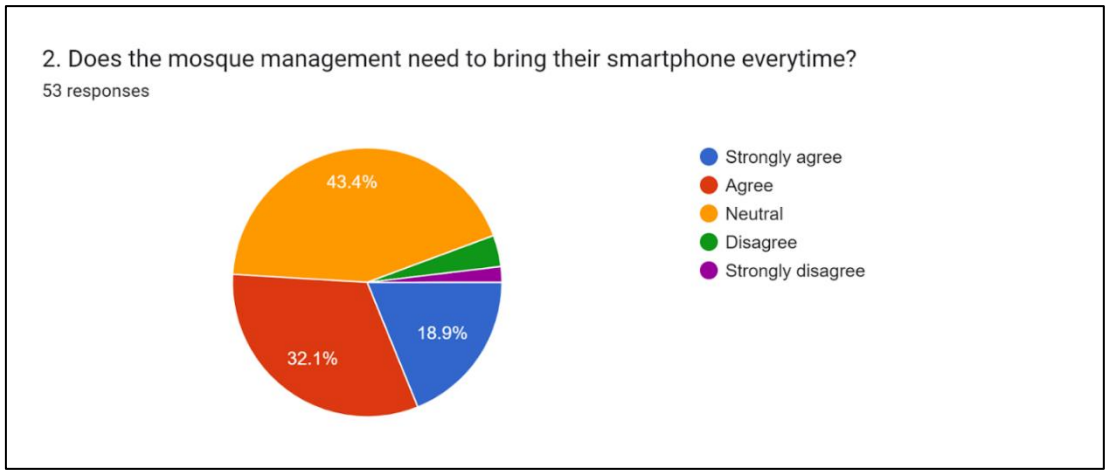


Figure 4.5 The pie chart Question 2

4.8.3 Question 3 Do you agree if charity box is installed on every mosque?

Figure 4.6 show 49.1% the community agree if the electronic charity box is installed on every mosque. If the electronic charity box was installed in every mosque, we believe it can reduce the theft occur, Additionally, electronic charity boxes can be programmed to accept only specific denominations of currency, making it difficult for thieves to take large amounts of money. Furthermore, donors can be assured that their donations are securely recorded and accounted for, and can even receive confirmation of their donations, which can help to build trust and encourage more donations. While 37.7% are strongly agree with these development.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

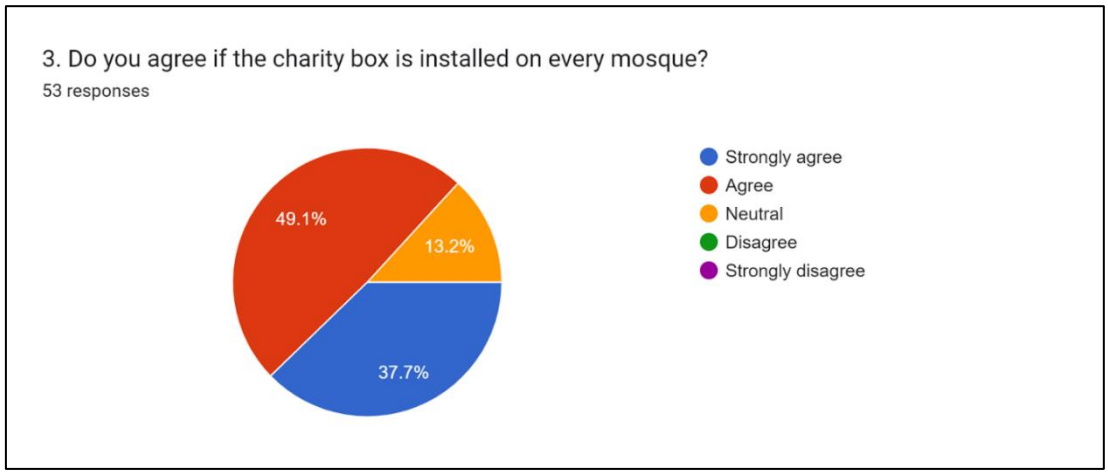


Figure 4.6 The pie chart Question 3

4.8.4 Question 4 Does the electronic charity box help reduce the cases of break in mosque?

Figure 4.7 show the 45.3% community strongly agree the electronic charity box help reduce the cases of break in mosque, according article Andi Setiawan (2021) the cases the increase in the number of thefts of charity boxes at the Grand Mosque of Arumsari Cirebon district from one case per month to three cases per month. So, the ideas of these project can secure the system.

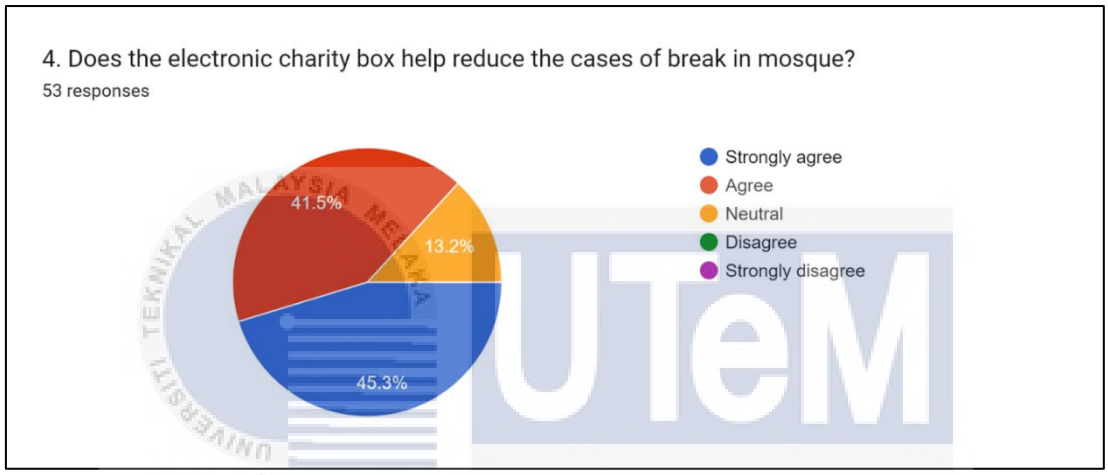


Figure 4.7 The pie chart Question 4

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

4.8.5 Question 5 Does the electronic charity box motivate the community towards donation?

Figure 4.8 the data show 43.4% community was agree the development of the electronic charity box motivate the community towards donation is agree by the community, We believe if the electronic charity box can motivate the community to donate by making the process of donating easier and more convenient. It also provides users with a visual representation of how their donations are being used and helps to create a sense of community as people can see how their donations are helping others.

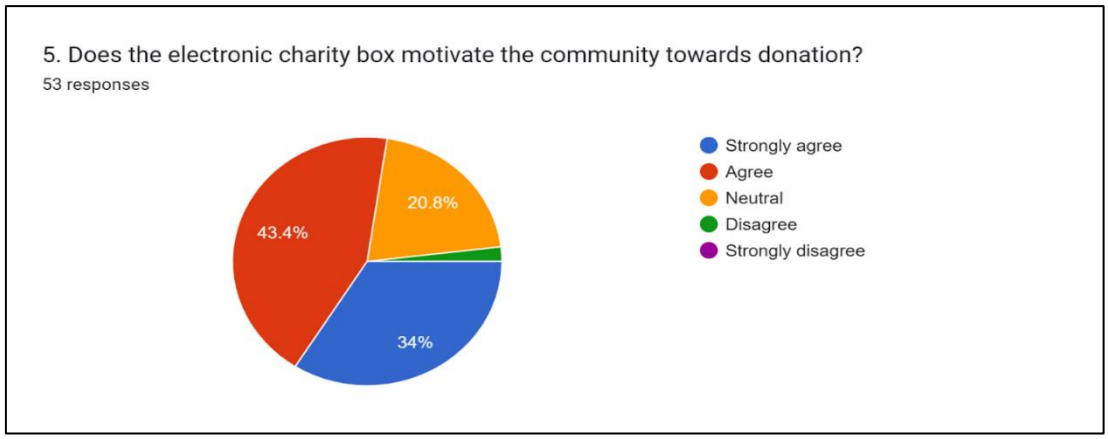
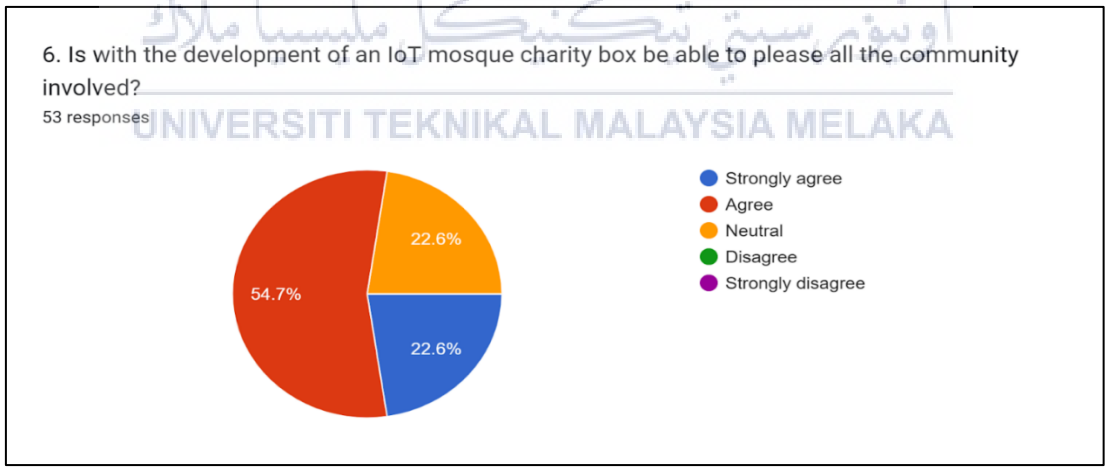


Figure 4.8 The pie chart Question 5

4.8.6 Question 6 Is with the development of an IoT mosque charity box be able to please all the community involved?

The figure 4.9 show the data 54.7% the community mostly agree with the development of an IoT mosque charity box be able to please the community involved. Not only that but with the implementation on mosque it also can save a lot mosque management time in handling the activities.



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 4.9 The pie chart Question 6

4.8.7 Question 7 Does the electronic charity box guarantee safety?

The figure 4.10 show 54.7% the community was agree the electronic charity box guarantee safety if the system was designed by some feature. The feature recommendation

would be an alarm system that is connected with the camera. Whenever the camera detects any unusual activity, it could trigger an alarm system which could alert the authorities or security personnel. Additionally, the alarm system could also be connected to a monitoring system, which can alert the charity organization whenever there is an attempted break in. This would ensure that the charity organization is always aware of any potential security threats and can take steps to prevent them.

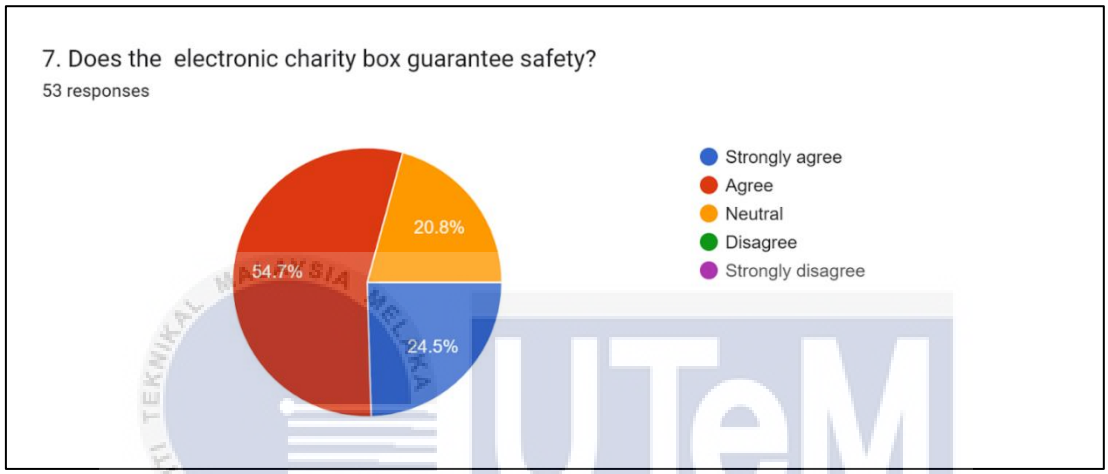


Figure 4.10 The pie chart Question 7

4.8.8 Question 8 Do you agree the electronic charity box build in compatible with android smartphone?

The figure 4.11 show 54.7% the data survey by community was agree if the charity box was built in compatible with android smartphone. This can help with energy efficiency, increased safety, as well as maintenance and monitoring. For example, a person can monitor their home security system from their smartphone from anywhere.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

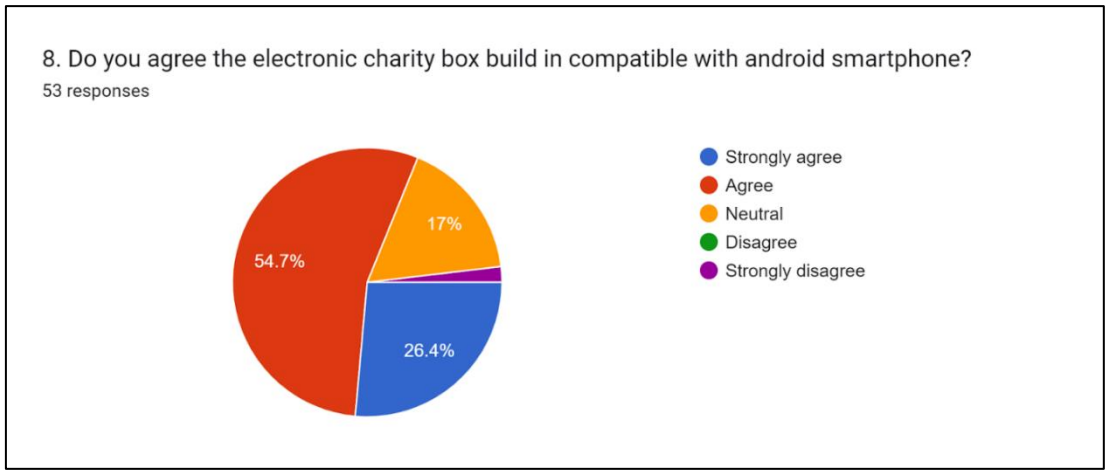


Figure 4.11 The pie chart Question 8

4.8.9 Question 9 Do you agree the electronic charity box build in low cost system?

The figure 4.12 show 47.2% the community was agree the electronic charity box build in low cost system. We believe the charity box are too expensive nowadays with the security system, so with these project the management can cut the cost.

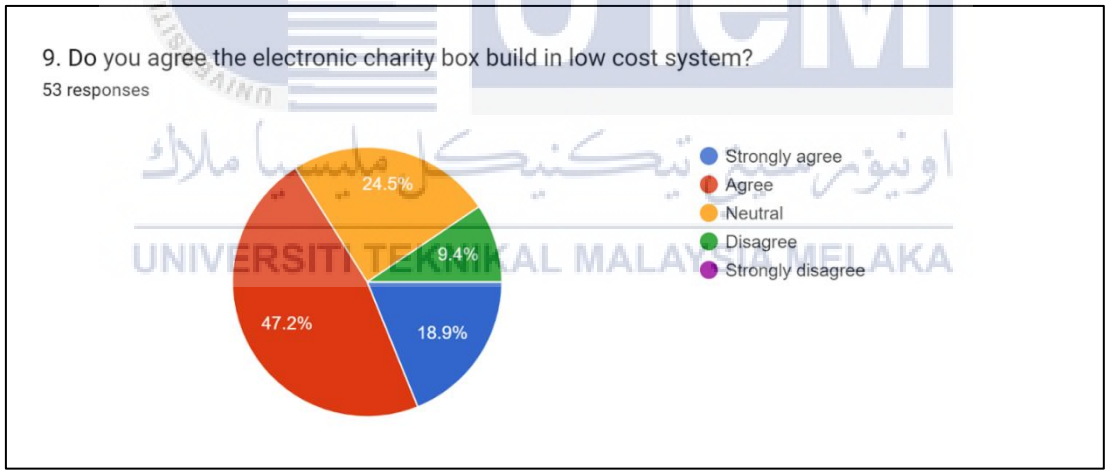


Figure 4.12 The pie chart Question 9

4.8.10 Question 10 Do you agree the electronic charity box make the mosque management can leave the mosque without worried?

Figure 4.13 show 49.1% the community are agree with the electronic charity box make the mosque management can leave the mosque without worried, We believe, these automation and security using this system the mosque management can have peace of mind that their donations are being managed properly, and can focus on other important activities.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

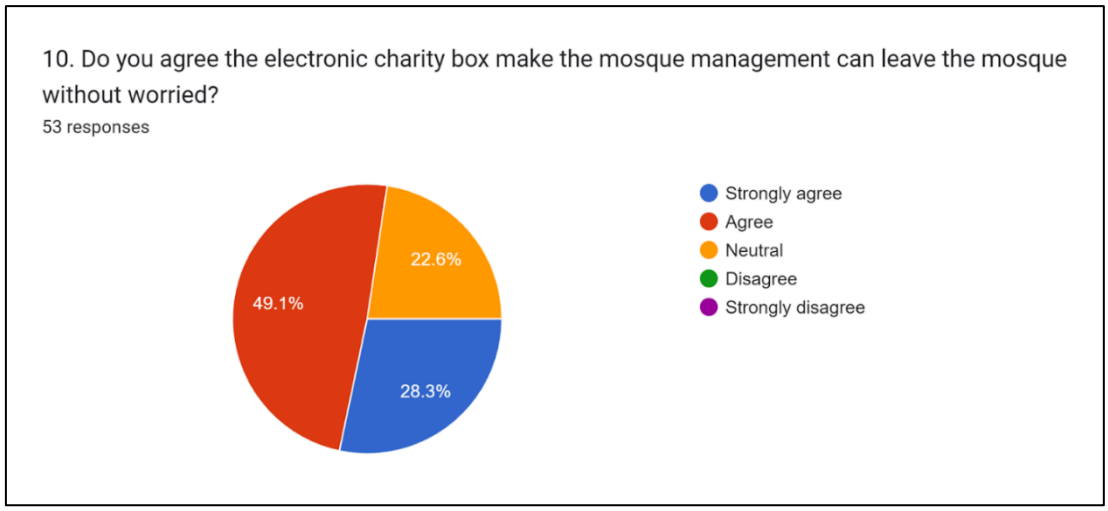


Figure 4.13 The pie chart Question 10

4.8.11 Question 11 Do you agree the charity box can only be accessed by the mosque management?

Figure 4.14 the 47.2% community agree the electronic charity box can be accessed by the mosque management, We believe the charity box are control from mosque management it more safer, It is possible to create an IP address that is reserved for the mosque management only. This can be done by configuring access control lists (ACLs) or network address translation (NAT) to limit access to the network. This will allow only those who are authorized to access the network and should provide an extra layer of security for the charity box. Additionally, it may be beneficial to configure a firewall to limit incoming and outgoing traffic to only certain services and protocols.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

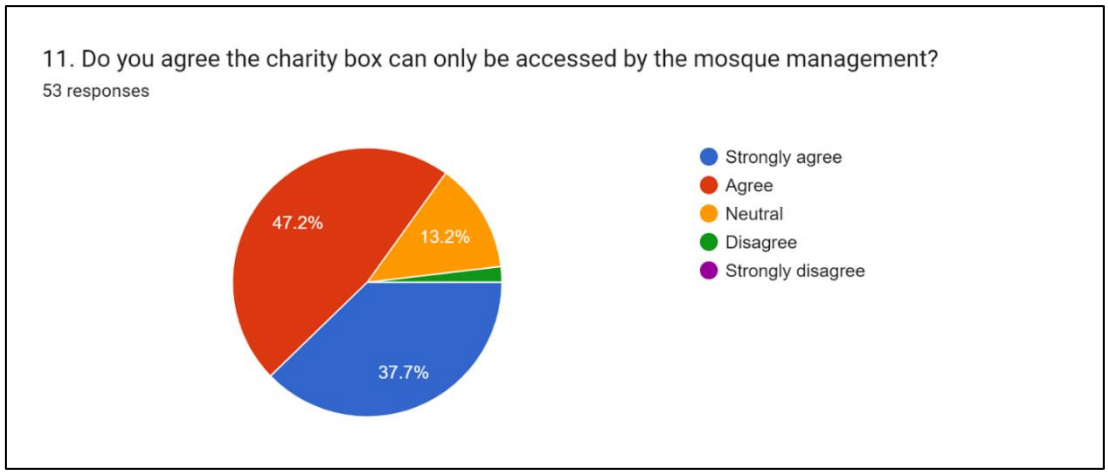


Figure 4.14 The pie chart Question 11

4.8.12 Question 12 Does the siren alarm disturb the mosque pilgrimage during the prayer?

The figure 4.15 the show 37.7% the community are agree the alarm can disturb the mosque pilgrimage during the prayer, So for the some feature work maybe the electronic charity box can be adding a timer with an automatic off switch for the alarm would make it much easier for charities to control when their electronic charity boxes are operating. This would also make it more difficult for thefts to occur, as the alarm would be automatically disabled when the timer runs out. Additionally, this feature could also help charities monitor activity around their boxes by allowing them to set a timer for specific times of day, or even days of the week. This would make it easier for them to track when donations are coming in and when theft may be taking place.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

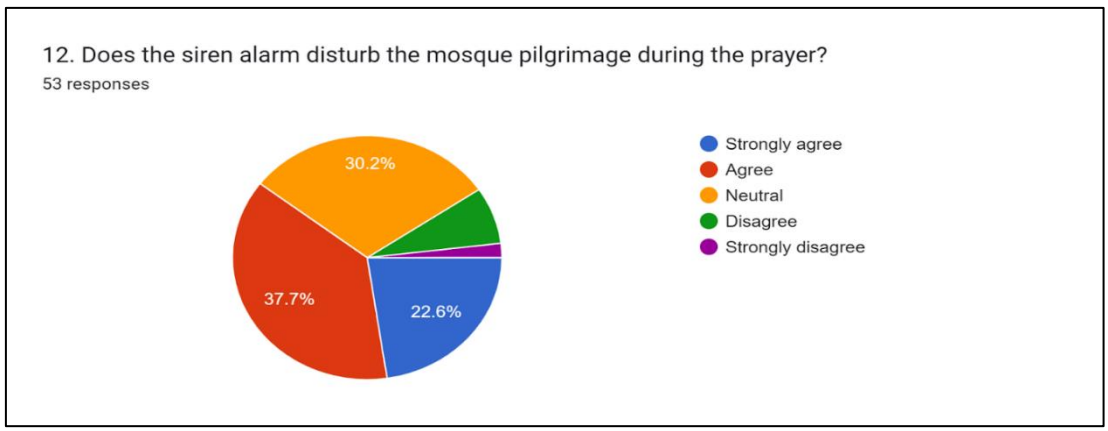
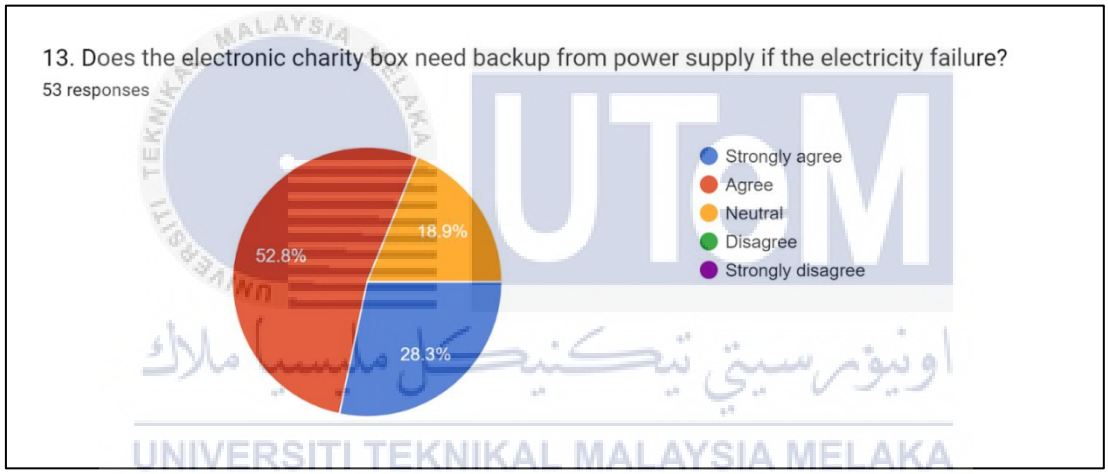


Figure 4.15 The pie chart Question 12

4.8.13 Question 13 Does the electronic charity box need backup from power supply if the electricity failure?

Figure 4.16 show 52.8% the community are agree the electronic charity box need backup from power supply if the electricity are failure, It is possible to add a long lasting battery to the electronic charity box, however this would need to be regularly maintained and replaced as needed. Additionally, an uninterruptible power supply (UPS) can be installed to provide backup power in case of an electrical outage. The UPS would need to be sized to provide the necessary power for the electronic charity box during the outage period.



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Figure 4.16 The pie chart Question 13

4.8.14 Question 14 Does the electronic charity box need to be installed at higher place?

The figure 4.17 show 45.3% the community mostly agree the electronic charity box are setup at the higher place, it is possible to set up the electronic charity box at a higher place in order to avoid any potential violence from animals like cats. This can be done by using a bracket or a stand to mount the box at a higher level. This will ensure that cats and other animals cannot physically access the box and cause any damage. Additionally, it is recommended to cover the box with a protective cover or casing to further protect the box

from any potential harm.

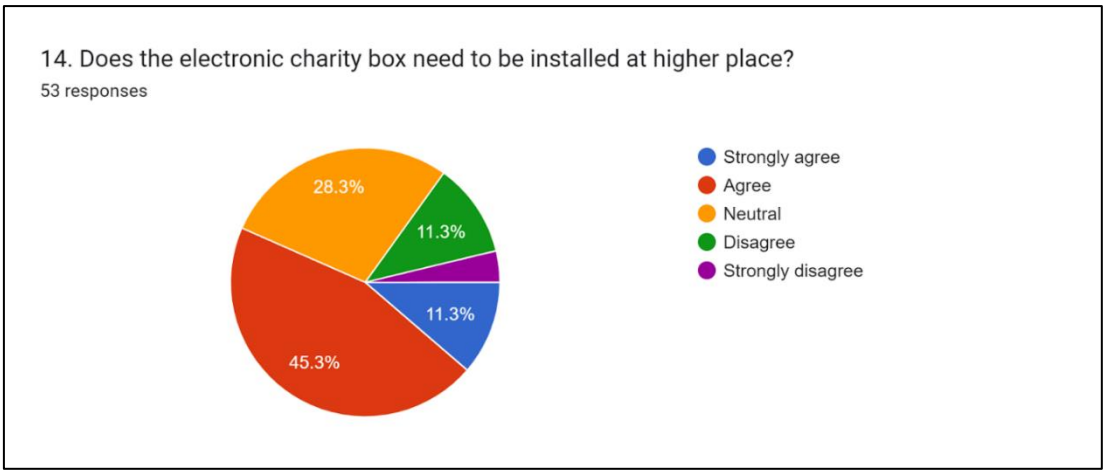


Figure 4.17 The pie chart Question 14

4.8.15 Question 15 Is the electronic charity box suitable with the community consisting of senior citizens?

The figure 4.18 show the community neither agree or disagree the electronic charity box is able to be used by senior citizens without the need for an android smartphone. It can be operated with a simple RFID card. This is beneficial as it is easier to operate and understand for those who are not familiar with the technology.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

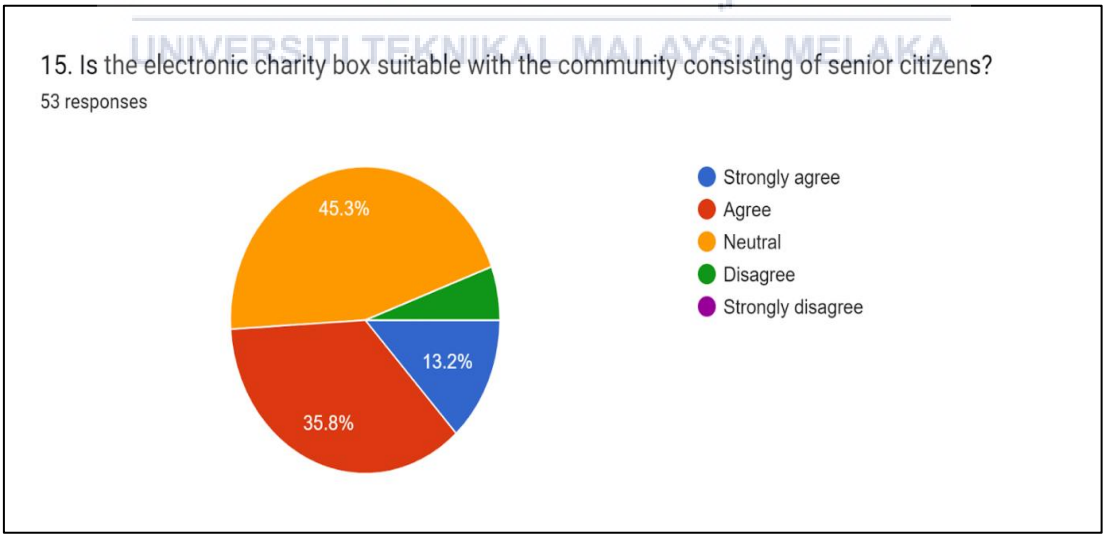


Figure 4.18 The pie chart Question 15

Figure the graph shows that the majority of respondents agree with the implementation of electronic charity box on mosque with automation and security system.

This is followed by the results indicate that the implementation of electronic charity box on mosque with automation and security system is widely accepted and appreciated by the community.

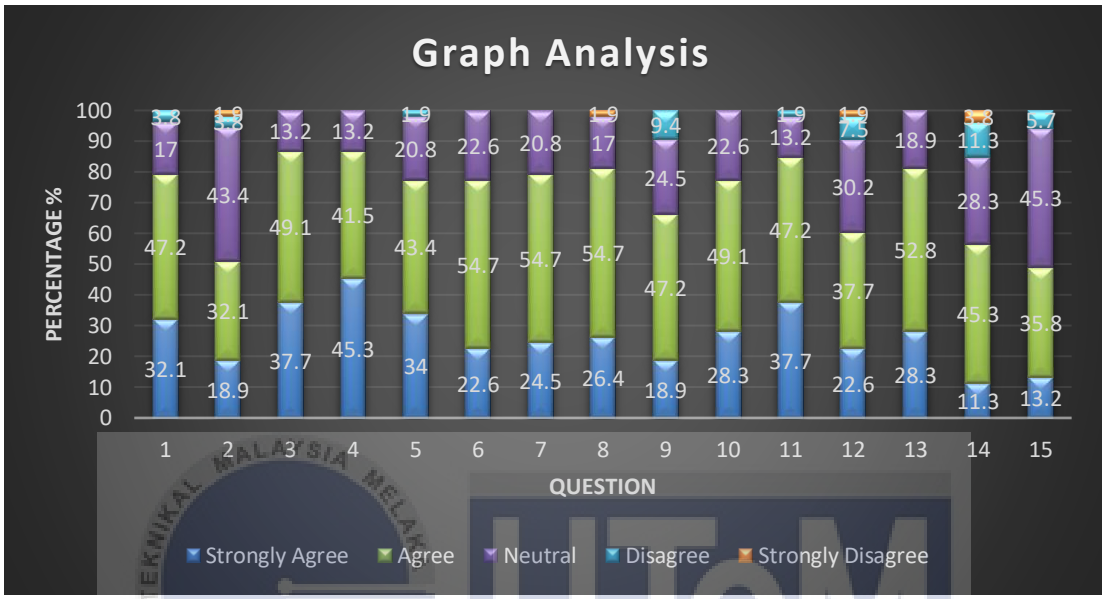


Figure 4.19 The graph analysis from respondents

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

As a conclusion this project based mosque automation and security system used application as basic Internet of Things in order to achieve the project objectives. This project to develop a security system that can secure the charity box in the mosque with Application that can opened and close the key, In addition this project it build low cost and portable. The estimated cost is less than RM 200.00 and use android smartphone as application since in the modern era mostly people have their own smartphone to communication. This project also consist accelerometer sensor that can trigger it when someone try to break in the charity box and automatically the alarm or siren will sound with the following objectives and it will come with the prototype.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

5.2 Future work

For make this project better, there is some future work that can be implemented to this system. The future work required more research so that it can well to the system. Firstly, the future work will be added by another type of sensors to the system. The sensor that will be added such as vibration sensor, and RGB sensor color. From this combination, the better mosque automation and security system can be done which can give an alert to user if someone tries to break in the box.

Next, bigger size battery can be used for a better endurance system which can support the system if there no have an electricity supply. In addition, the battery also like a backup

supply when the absence of electricity. So, the system can be used without worriedly the user to leave the charity box.

Besides that, for the better monitoring, an IP camera can be placed near to the charity box. This feature act like CCTV but might increase the cost of the projects. The IP camera can either record the video or capture the picture of the moving so that the user can monitoring the charity box at home.

Finally, above are some recommendation that can be done to this project to increase it functionality as well as the efficiency. Once the innovation process applied, it will contribute additional features which provide a better system in future.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

REFERENCES

[1] Hidayah, (2022), "Donation Collection During Fridays Prayer 50% Increases Since theMosque Reopened".

[2] R. Meor, (2022) "Cases of Breaking the Charity Boxes in Melaka, Malaysia up to 163%".

[3] M. Salma, (2019) "Locker Security System Using Keypad and RFID," University of Omar Al-Mukhtar.

[4] Noor Zaman, (2017), "Applications Internet of Things (IoT) the main component" International Journal of Advanced Computer Science and Application, Vol 8, No. 2.

[5] Noor Zaman, (2017), "Applications Internet of Things (IoT) the android page smart charity box" International Journal of Advanced Computer Science and Application, Vol 8, No. 2.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

[6] Defnizal and Ernes R. N. (2020), "The Implementation of Artificial Intelligence in Charity Box at Mosque and Musholla as RFID Based Security System, Vol 5, No. 5.

[7] Setiawan, A., Purnamasari, A. I., Nuris, N. D., Ali, I., & Narasati, R. (2021). IoT: Theft detection of the mosque charity box through Arduino R3 with HC-SR501 sensor and MC-38 sensor Normally open and close. *IOP Conference Series: Materials Science and Engineering*, *1088*(1), 012085. https://doi.org/10.1088/1757-899x/1088/1/012085.

[8] Setiawan, A., Purnamasari, A. I., Nuris, N. D., Ali, I., & Narasati, R. (2021). IoT: Theft detection of the mosque charity box through Arduino R3 with HC-SR501 sensor and MC-38 sensor human object not detected. *IOP Conference Series: Materials Science and Engineering*, *1088*(1), 012085. https://doi.org/10.1088/1757-899x/1088/1/012085

[9] Yudantoro, T.R. (2019), "Arduino–Based Charity Box Safety, Tracking, and Counter System".

[10] Yudantoro, T.R. (2019), "Arduino–Based Charity Box Safety, Tracking, and Counter System" detection of charity box locations.

[11] Wisjhnuadji, T.W, Narendro, A. and Raditya, M. (2020), "Utilization of Telegram Applications Equipped with Vibration Sensor and Fingerperints for Security of Mosque Charity Boxes," Universitas Pembangunan Nasional Veteran Yogyakarta.

[12] Wisjhnuadji, T.W, Narendro, A. and Raditya, M. (2020), "Utilization of Telegram Applications Equipped with Vibration Sensor and Fingerperints for Security of Mosque Charity Boxes, notification on telegram" Universitas Pembangunan Nasional Veteran Yogyakarta.

[13] Nugroho, A and lmasri. (2021), "The Safety Charity Box to Prevent Theft Based on Global System Mobile (GSM)," Universitas Pembangunan Nasional Veteran Yogyakarta, Vol.9 No. 3.

[14] R. Hafizh, (2021), "The Touchless Charity Box Security and Web Cloud Based Arduino".

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

[15] Megalingam, R.K and Gunduboyina, R.S. (2020), “Voive Enabled Donation Box”. Idral. F, (2018), “Conceptual Design for an Anti-Thief Donation Box”.

[16] Srinivasan, R. Metillda, T. Surendran, D. Kopinath, K & Sathiskumar, P. (2015) “Advanced Locker Security System,” International Conference on Information Engineering,Management and Security.

[17] Mohammad O.A. Aqel, Ahmed Issa, Doaa Abu Nada, Saher Draz, (2018) “Development of Smart Masjid Display Using Raspberry Pi”, International conference on Promosing Electronic Technologies.

[18] Tanweer Alam , Moath Erqsous, (2020), “The Real-Time Alert System for Prayers at Smart Masjid”, Scientific Journal of Infomatics.

[19] Ahmad Lutfee Mohd Lasa, Nuraini Daud, Bakri Madon, Mohammed A. Saleh, Mohammad Suffian Abdul Kadir, Vanden Michael(2018), “Intelligent Mass-Prayer Assistant for Muslims (IMAM) the serial communication”, BORNEO JOURNAL OF SCIENCES AND TECHNOLOGY (BJoST).

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

[20] Ahmad Lutfee Mohd Lasa, Nuraini Daud, Bakri Madon, Mohammed A. Saleh, Mohammad Suffian Abdul Kadir, Vanden Michael(2018), “Intelligent Mass-Prayer Assistant for Muslims (IMAM) smart speaker with outer”, BORNEO JOURNAL OF SCIENCES AND TECHNOLOGY (BJoST).

[21] Kurniawan, P. (2020). PROTOTIPE SISTEM KEAMANAN KOTAK INFAK BERBASIS MIKROKONTROLER SKRIPSI.

[22] Anin Miftharizа Assegaf , Rendy Munadi, Doan Perdana(2021) DESIGN AND IMPLEMENTATION MOSQUE SMART DIGITAL SIGNAGE, CONNECTED WITH IP CAMERA FOR SERMON.

[23] NodeMCU ESP8266 specifications, overview and setting up. (2022, March 25). Make-It.ca. https://www.make-it.ca/nodemcu-details-specifications/

[24] How does a solenoid work? (n.d.). Electricsolenoidvalves.com. https://www.Electricsolenoidvalves.com/blog/how-does-a-solenoid-work/#:~:text=A%20solenoid%20works%20by%20producing,into%20mechanical%20motion%20and%20force

[25] Agarwal, T. (2019, June 24). Working principle and applications of accelerometer sensor. ElProCus - Electronic Projects for Engineering Students. https://www.elprocus.com/accelerometer-sensor-working-and-applications/

[26] Agarwal, T. (2020, May 15). What is the principle of ultrasonic detection: Latest applications. ElProCus - Electronic Projects for Engineering Students. https://www.elprocus.com/ultrasonic-detection-basics-application/

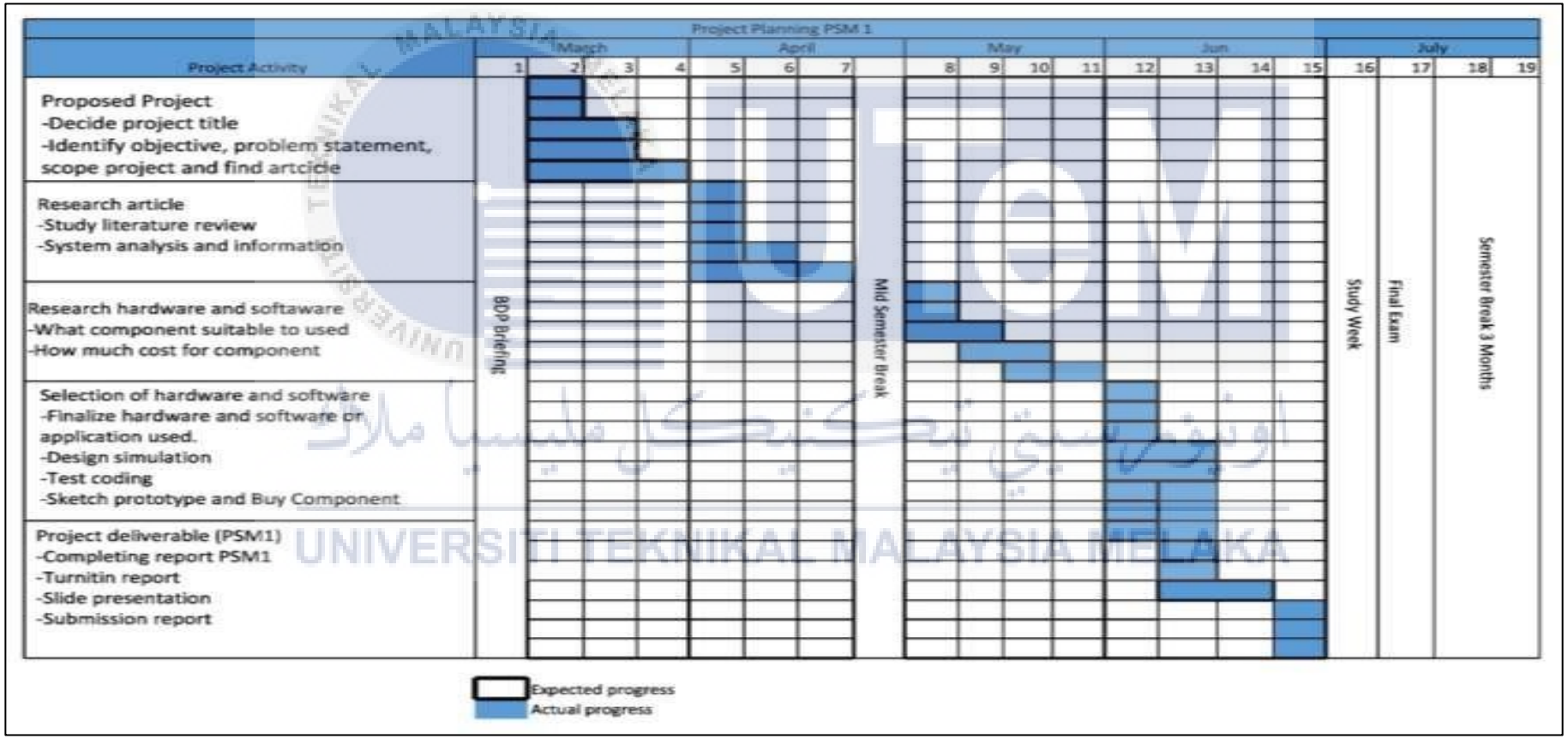
[27] Dc 12v 24v small indoor strobe siren alarm siren piezo siren color optional. (n.d.). Made-in-China.com.https://cnsumring.en.made-in-china.com/product/YsFmSMpcEWVu/China-DC-12V-24V-Small-Indoor-Strobe-Siren-Alarm-Siren-Piezo-Siren-Color-Optional.html.

[28] Notifications (Alerts). (n.d.). Introduction - Documentation. https://docs.blynk.io/en/getting-started/notification-management.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

APPENDICES

Appendix A Gantt Chart PSM 1 and PSM 2



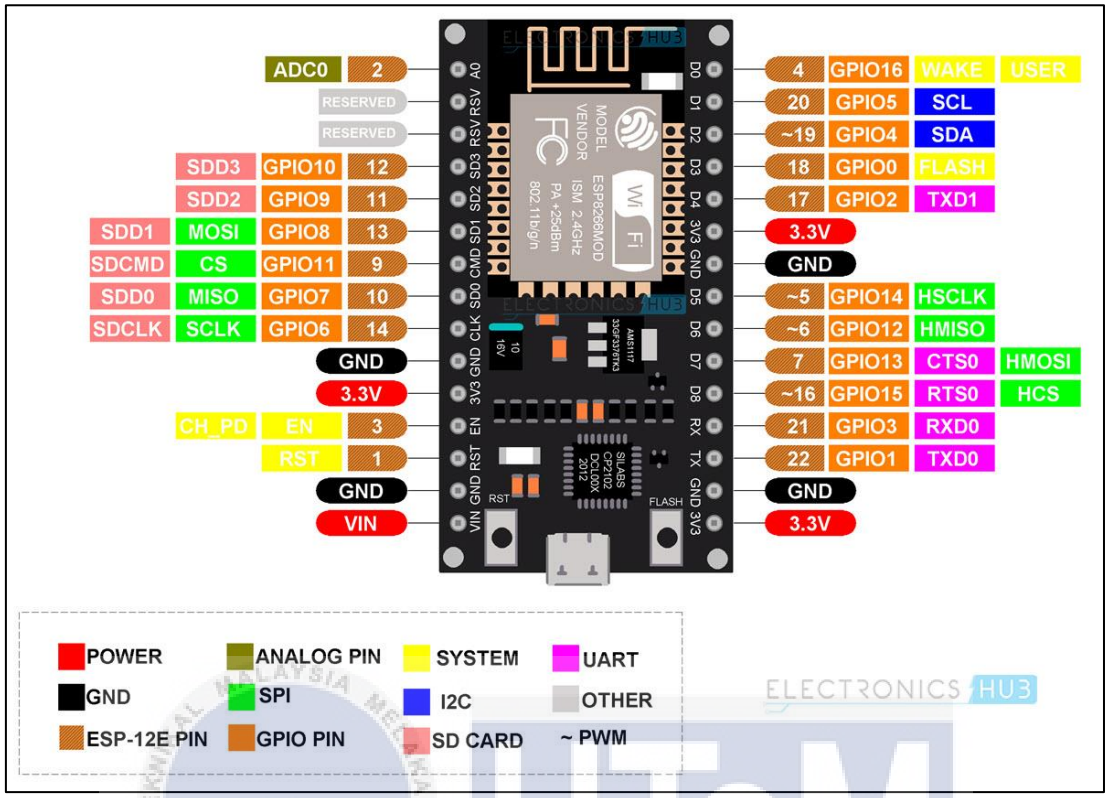
Gantt chart project planning PSM 1

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Gantt chart project planning PSM 2

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Appendix B Nodemcu Pin



ELECTRONICS HU3
UTeM
اونيۏرسيتي تيکنيکل مليسيا ملاک
UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Nodemcu Datasheet

Pin Category	Name	Description
Power	Micro-USB, 3.3V, GND, Vin	Micro-USB: NodeMCU can be powered through the USB port 3.3V: Regulated 3.3V can be supplied to this pin to power the board GND: Ground pins Vin: External Power Supply
Control Pins	EN, RST	The pin and the button resets the microcontroller
Analog Pin	A0	Used to measure analog voltage in the range of 0-3.3V
GPIO Pins	GPIO1 to GPIO16	NodeMCU has 16 general purpose input-output pins on its board
SPI Pins	SD1, CMD, SD0, CLK	NodeMCU has four pins available for SPI communication.
UART Pins	TXD0, RXD0, TXD2, RXD2	NodeMCU has two UART interfaces, UART0 (RXD0 & TXD0) and UART1 (RXD1 & TXD1). UART1 is used to upload the firmware/program.
I2C Pins		NodeMCU has I2C functionality support but due to the internal functionality of these pins, you have to find which pin is I2C.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Appendix C Survey Questions

The Development Of An IoT Based Charity Box Automation And Security System satisfaction survey.

The purpose of this survey to find out the implementation the electronic charity box on mosque, This project also consists solenoid key and open it with Blynk app, The sensor was include accelerometer and ultrasonic sensor with alarm siren as the loud noise making device.

Please (/)

Name: _____

Age: 12-17 years old ( ) 18-24 years old ( ) 25-45 years old ( )
46-60 years old and above ( )

Education: High School ( ) Diploma ( ) Bachelor's Degree ( ) Master's Degree ( )
Ph.D ( )

Type of donation: Cash ( ) Online banking ( ) Others: _____

No	Survey Question	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
1	Are internet facilities at every mosque need to be improved?	5	4	3	2	1
2	Does the mosque management need to bring their smartphone every time?	5	4	3	2	1

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

No	Survey Question	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
3	Do you agree if the charity box is installed on every mosque?	5	4	3	2	1
4	Does the electronic charity box help reduce the cases of break in mosque?	5	4	3	2	1
5	Does the electronic charity box motivate the community towards donation?	5	4	3	2	1
6	Is with the development of an IoT mosque charity box be able to please all the community involved?	5	4	3	2	1
7	Does the electronic charity box guarantee safety?	5	4	3	2	1
8	Do you agree the electronic charity box build in compatible with android smartphone?	5	4	3	2	1
9	Do you agree the electronic charity box build in low cost system?	5	4	3	2	1
10	Do you agree the electronic charity box make the mosque management can leave the mosque without worried?	5	4	3	2	1

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

No	Survey Question	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
11	Do you agree the charity box can be only accessed by the mosque management?	5	4	3	2	1
12	Does the siren alarm disturb the mosque pilgrimage during the prayer?	5	4	3	2	1
13	Does the electronic charity box need backup from power supply if the electricity failure?	5	4	3	2	1
14	Does the electronic charity box need to be installed at higher place?	5	4	3	2	1
15	Is the electronic charity box suitable with the community consisting of senior citizens?	5	4	3	2	1

UNIVERSITI TEKNIKAL MALAYSIA MELAKA