



Faculty of Electrical and Electronic Engineering Technology



**THE DEVELOPMENT OF AN IOT-BASED AUTOMATION SYSTEM
FOR PET-HOTEL MANAGEMENT SYSTEM**

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AIMAN BIN BUANG

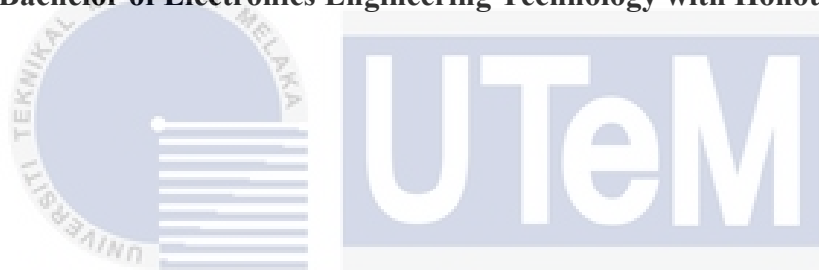
Bachelor of Electronics Engineering Technology with Honours

2023

**THE DEVELOPMENT OF AN IOT-BASED AUTOMATION SYSTEM FOR PET-
HOTEL MANAGEMENT SYSTEM**

AIMAN BIN BUANG

**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

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : The Development of An IoT-based Automation System for Pet Hotel Management System

Sesi Pengajian : 2022/2023

Saya **Aiman Bin Buang** mengaku membenarkan laporan Projek Sarjana

Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (✓):



SULIT*

(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)



(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)



TIDAK TERHAD

Disahkan oleh:



(AIMAN BIN BUANG)

Alamat Tetap:
No 26, Jalan Mempelam 3, Taman Kota
Jaya, 81900, Kota Tinggi,
Johor



(AMAR FAIZ BIN ZAINAL ABIDIN)

AMAR FAIZ BIN ZAINAL ABIDIN
Pensyarah
Fakulti Teknologi Kejuruteraan Elektrik & Elektronik
Universiti Teknikal Malaysia Melaka

Tarikh: 15 Januari 2023

Tarikh: 16 Januari 2023

DECLARATION

I hereby, declared this report entitled The Development of An IoT-based Automation System for Pet Hotel Management System is the result of my own research except as cited in references.

Signature

:



Student Name

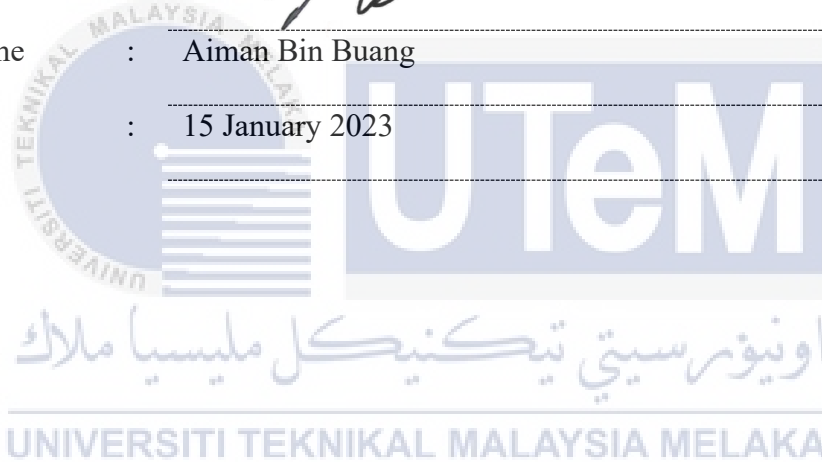
:

Aiman Bin Buang

Date

:

15 January 2023



APPROVAL

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

Signature

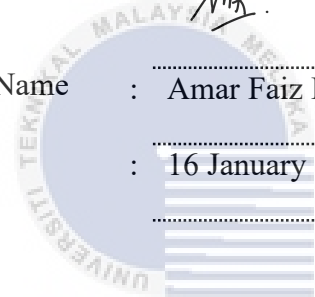
: 

Supervisor Name

: Amar Faiz Bin Zainal Abidin

Date

: 16 January 2023



اونيورسيتي تيكنيكل مليسيا ملاك

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEDICATION

This report is dedicated to my beloved parents who educated and supported me throughout the process of doing this project. I also wanted to say thank you to my supervisor and my friends who have encouraged, guided and inspired me to complete this project.



ABSTRACT

As the number of people who own pets grows each year, so does the demand for higher-quality pet care products. This has pushed the Internet of Things (IoT) technology forward in this industry. Pet owners can use IoT technology to follow their pets' activities and whereabouts from afar, check their pets' health, and even interact with them. All of these smart pet care gadgets are becoming increasingly important in the lives of pet owners. In this project, we use Internet of Things (IoT) technology to create an integrated system that includes a pet food feeder, water dispenser, and litter box, which are the three most important features that pet owners worry about when they are busy or away from their pets. NodeMcu modules connect the three subsystems to the local network. In addition, the data collected by each sensor is processed and displayed on a smartphone app. Thus, pet owners may access all information about their pet's food and water consumption, as well as defecation timing, duration, and frequency, from a single interface. Additionally, the application has a controlling function that allows pet owners to dispense food at any time and from any location. The application displays an overall statistics chart with the stated values that updates over time.

ABSTRAK

Apabila bilangan orang yang memiliki haiwan peliharaan tumbuh setiap tahun, begitu juga permintaan untuk produk penjagaan haiwan peliharaan berkualiti tinggi. Ini telah mendorong teknologi Internet of Things (IoT) ke hadapan dalam industri ini. Pemilik haiwan peliharaan boleh menggunakan teknologi IoT untuk mengikuti aktiviti dan lokasi haiwan peliharaan mereka dari jauh, memeriksa kesihatan haiwan peliharaan mereka, dan juga berinteraksi dengan mereka. Semua alat penjagaan haiwan peliharaan pintar ini menjadi semakin penting dalam kehidupan pemilik haiwan peliharaan. Dalam projek ini, kami menggunakan teknologi Internet of Things (IoT) untuk mencipta sistem bersepadu yang merangkumi pengumpan makanan haiwan peliharaan, dispenser air, dan kotak sampah, yang merupakan tiga ciri paling penting yang dibimbangkan oleh pemilik haiwan peliharaan apabila mereka sibuk atau jauh dari haiwan peliharaan mereka. Modul NodeMcu menghubungkan tiga subsistem ke rangkaian tempatan. Di samping itu, data yang dikumpulkan oleh setiap sensor diproses dan dipaparkan pada aplikasi telefon pintar. Oleh itu, pemilik haiwan peliharaan boleh mengakses semua maklumat tentang penggunaan makanan dan air haiwan kesayangan mereka, serta masa buang air besar, tempoh dan kekerapan, dari satu antara muka. Selain itu, aplikasi ini mempunyai fungsi kawalan yang membolehkan pemilik haiwan peliharaan mengeluarkan makanan pada bila-bila masa dan dari mana-mana lokasi. Aplikasi ini memaparkan carta statistik keseluruhan dengan nilai yang dinyatakan yang dikemas kini dari masa ke masa.

ACKNOWLEDGEMENTS

I would especially like to thank Allah SWT for giving me the opportunity to complete my Projek Sarjana Muda (PSM). This report serves as a token of my sincere gratitude to Universiti Teknikal Malaysia Melaka (UTeM) for providing me with the opportunity to pursue a Bachelor of Engineering in Electrical and Electronic Technology (FTKEE). I also want to express my gratitude to my supervisor, En. Amar Faiz Bin Zainal Abidin, for his support throughout the day as I worked on my final project and wrote my report, which is titled The Development of An IoT-based Automation System for Pet Hotel Management System. He was directing me to complete this job with entire devotion and attention thanks to his ongoing support and interest. My sincere gratitude is extended to my valued family and friends who have always encouraged and helped me to complete my endeavour. I'm grateful for their spiritual support and the consideration they shown me during this process. May God bless you for your kindness and goodwill.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

TABLE OF CONTENTS

	PAGE
DECLARATION	
APPROVAL	
DEDICATIONS	
ABSTRACT	i
ABSTRAK	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	i
LIST OF TABLES	iii
LIST OF FIGURES	iv
LIST OF APPENDICES	vi
CHAPTER 1 INTRODUCTION	1
1.1 Background	1
1.2 Problem Statement	3
1.3 Project Objective	4
1.4 Scope of Project	5
1.5 Project Contribution	6
CHAPTER 2 LITERATURE REVIEW	7
2.1 Introduction	7
2.2 Related Research	12
2.2.1 Implementation of an IoT based Pet Care System	12
2.2.2 Intelligent Pet Monitor System	13
2.2.3 Implementation of Smart Pet Care Applications in an IoT Based	13
2.2.4 Pet Humanization	14
2.2.5 Weight controlled pet feeding system	14
2.2.6 Intelligent water dispensing system for pets	15
2.2.7 Internet of Things for Human - Pet Interaction	16
2.2.8 Smart Pet House	17
2.2.9 Pet Feeding Control System	19
2.2.10 Remote controlled and GSM based automated pet feeder	20
CHAPTER 3 METHODOLOGY	21
3.1 Introduction	21
3.2 Project Overview	21
3.3 Project description	24
3.4 Block diagram	25

3.5 Project Layout	26
3.6 Circuit Layout	27
3.6.1 Connection	28
3.6.1.1 Circuit Connection	28
3.7 Flowchart	30
3.8 Component Overview	35
3.8.1 Selection of Components & Components Functions	35
3.9 Project Costing	37
CHAPTER 4 RESULTS AND DISCUSSIONS	38
4.1 Introduction	38
4.2 Reliability testing	38
4.2.1 Ageing test	38
4.3 Functionality testing	39
4.3.1 Unit testing and integration testing	39
4.4 Comparison between expected and actual result	41
4.4.1 Project Design	41
4.4.2 Application design	42
4.4.3 Design flow of the program based on the scenario	44
4.4.4 Design flow for pet feeder choice	46
4.4.5 Design flow for camera choice	49
4.5 Result analysis and survey questions	50
CHAPTER 5 CONCLUSION AND RECOMMENDATIONS	56
5.1 Conclusion	56
5.2 Future Works	57
REFERENCES	58
APPENDICES	60

LIST OF TABLES

TABLE	TITLE	PAGE
Table 3.3	Connection table for NodeMcu	28
Table 3.4	Connection table for HX711	29
Table 3.5	Connection table for servo motor SG90	29
Table 3.6	List of components with its functions	35
Table 3.7	List of costing components and materials used	37
Table 4.1	Ageing Test table	39
Table 4.2	Unit Test table	40
Table 4.3	Comparison of expected and actual project design table	41
Table 4.4	Comparison of expected and actual application design table	42
Table 4.5	Design flow of program based on scenario for starting screen	44
Table 4.6	Design flow of program based on scenario for pet feeder choice	46
Table 4.7	Design flow of program based on scenario for camera choice	49

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 1.1	Transmission lines and a beautiful sunset [1]	2
Figure 2.1	Common type related article and publication journal	7
Figure 2.2	Bar Chart for number of research paper by year	8
Figure 2.3	Pie Chart for number of research paper by country	9
Figure 2.4	Bar Chart for number of authors paper by research paper	9
Figure 2.5	Scatter Chart for number of references by year	10
Figure 2.6	K-Chart for pet hotel management system	11
Figure 2.7 :	Weight controlled pet feeding system. [6]	15
Figure 2.8	Diagram of overall system architecture design [8]	17
Figure 2.9	GUI for the monitoring system [9]	18
Figure 2.10	Pet Feeding Control System [10]	19
Figure 2.11	Remote controlled and GSM based automated pet feeder [12]	20
Figure 3.1	Flowchart of the Final Year Project (FYP 1 and FYP)	23
Figure 3.2	Block diagram of project	25
Figure 3.3	2D sketch layout of the project	27
Figure 3.4	Schematic Circuit for the project	28
Figure 3.6	Flowchart for booking apps	32
Figure 3.7	Flowchart Pet Feeder Choice	33
Figure 3.8	Flowchart for Camera Choice	34
Figure 4.1	Pie chart for question 1	50
Figure 4.2	Pie chart for question 2	51
Figure 4.3	Pie chart for Question 3	52
Figure 4.4	Pie chart Question 4	52

Figure 4.5 Pie chart for Question 5	53
Figure 4.6 Pie chart for question 6	54
Figure 4.7 Bar chart question 7	54
Figure 4.8 Pie chart question 8	55



LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix A	Gantt Chart of Final Year Project 1	60
Appendix B	Gantt Chart of Final Year Project 2	61



CHAPTER 1

INTRODUCTION

1.1 Background

In 2019, there are 6 million dogs and 5 million cats in Malaysia, but dog ownership is 398,000 and cat ownership is 658,000, indicating that cats are more popular in the country.

According to the Department of Statistics Malaysia, approximately 69.7% of Malaysia's working-age population (15-64 years) has acquired pets, mostly cats and dogs, by 2020. According to a 2021 study on the impact of pets on the mental health of Malaysian working-class people, pet owners had significantly higher levels of mental wellbeing than people without pets, and they felt they could cope better with adverse situations and experienced significantly more positive emotions during the lockdown than people without pets. [1]

This shows that more than half of people have owned a pet, which could result in the construction of various types of pet hotels. Consequently, an IoT-based automation system may be able to address these problems by offering a more dependable and precise method of pet care. However, such a system would need to follow all applicable rules and standards, be dependable, and be simple to use.

The objective of this project is to create an IoT-based automated system for managing pet hotels that may increase pet care's precision, effectiveness, and convenience while also adhering to the relevant norms and specifications. Scheduled feeding, which enables the system to be set to dispense a certain amount of food at a specific time, is one potential feature of such a system. Create an on-demand feeding that, for instance, uses a smartphone app to activate the food dispenser when needed. The device may also be set up to only deliver a certain amount of food each time it is triggered, preventing pets from becoming overfed.

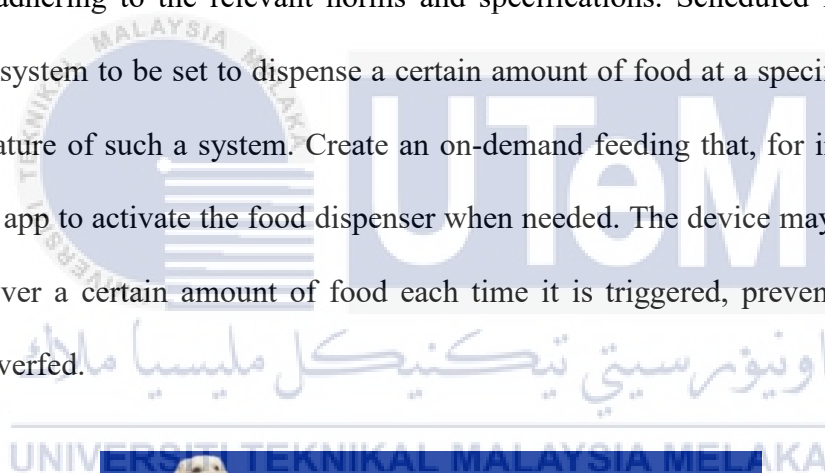


Figure 1.1 Transmission lines and a beautiful sunset [1]

1.2 Problem Statement

At least one pet is in their home nowadays. The pet can be common, such as a cat or dog, or odd, such as a hedgehog or lizard. However, while most pets require extra attention, their owners may be preoccupied with other activities such as travelling, working, or any other unforeseen activity. Most people will seek a buddy to assist them in caring for their pet in the traditional manner. However, it may not only cause problems for others, but it may also not know how to properly care for your pet. As a result, some people will use a more contemporary approach, such as placing their pet at a pet hotel while they are abroad for better care.

Nowadays, practically every neighbourhood has a pet hotel that is completely licensed, or there will be someone who offers a pet hotel service out of their own home. The problem is that after the pet is delivered there, the owner might be concerned about how the personnel are treating their animals. Each pet hotel has its own facilities and equipment for handling the various pets, hence some pet hotels will have unique methods for handling each pet at their location. The pets will feel awkward if their daily routine is different from what it is used to with their owner. This will be the concern for the pet owner which is wandering around in their minds when they send their pet to pet hotels. There are several situations where pets refuse to even eat their food—not because it is bad—but rather because of the environment in which they were cared for by the personnel.

1.3 Project Objective

The project's major goal is to create a pet hotel system that allows for wireless contact between the care system, the pet, and the user so that the user may look after their pet even if they have send the pets to pet hotel. This project consist of several features like automatic pet feeder, monitoring camera, schedule feeding, manual feeding through apps, and booking systems. It can be broken down into various sub-objectives to achieve step-by-step:

- a) To design an automation pet hotel system board using EasyEDA for the circuit layout, to sketch a 2D project layout using ArtFlow, to construct an automation pet hotel system board with NodeMcu as the controller, and to program the embedded system using Arduino IDE.
- b) To build a low cost automation pet hotel management system for the community. The price for the system is around RM200 which is installed at 16x13x14 inch cage for early stage testing.
- c) To verify the functionality of the system by performing a set of testing which based on a checklist. This will be done by testing the accuracy of weight sensor which is HX711 and Load Cell in controlling the servo motor in the food dispenser to open when the weight is below 50 grams or close when the food weight is above 150 grams.
- d) To validate whether the automation pet hotel system is successful by carrying out a survey that consists of eleven questions. The respondents include of students as well as those who are in love about taking care of pets.

1.4 Scope of Project

To make sure that the project will stay within the boundaries of the budget, the scope is documented. The scope will be operational so that we can make sure those activities are moving forward in the right way to accomplish the goal. The key issue with this project's development is that customers will constantly require an internet connection in order to use apps to interact with the automation system. This is due to the fact that the NodeMcu can only connect to WiFi that has been programmed using the Arduino IDE. Because the administrator cannot manage the booking system through the apps, the apps will only be designed for user usage. However, administrators can manually examine the information using MIT App Inventor or Firebase. Users cannot select a reservation date; they can only select the number of rooms they wish to reserve using the booking system. Users must personally verify how many rooms they request to the pet hotels in order for them to confirm their reservation.

Some pets could occasionally refuse to consume the food that has been dropped by the automatic pet feeder. Since some animals don't like to eat cold food, the pet food that the animal didn't consume will need to be manually disposed of. The food dispenser is connected to the cage's bowl using a plastic hose and a filter funnel. The narrow end insertion of the filter funnel and hose design prevents anything except dry, small-sized pet food from coming through.

A bowl will be placed on top of a load cell that has been combined with an acrylic plate at the weight sensor. The smallest force that two load cells can consistently detect is referred to as the load cell attached to the HX711 module with the highest sensitivity. The weight sensor must be calibrated while the bowl is empty when the project is turned on in

order to provide an accurate weight value afterwards. If the pet tries to enter the bowl in that situation, the weight sensor will detect an uncertain weight throughout the calibration process, which will result in an inaccurate reading for the duration of the calibration that can affect the entire function of the weight scale. The weight sensor value can only be viewed using a serial monitor in Arduino IDE because no LCD is used to display the weight for user and administrator.

Some crucial elements, including a watering dispenser, a waste disposal system, and a pet health monitoring system, won't be present in the prototype. This is due to the requirement that the project's development budget not exceed RM200.

1.5 Project Contribution

The care and welfare of pets in a hotel setting could be improved in a variety of ways with the help of an IoT-based automation system for pet hotel management. The ability to provide care more accurately and efficiently is one possible contribution. Many of the chores involved in taking care of pets in a hotel, such feeding might be automated with the aid of an IoT system. By doing so, users might be able to lower the possibility of human mistake and guarantee that their dogs are getting consistent, excellent treatment.

The ease and security for owners who leave their pets at pet hotels may also be improved by this approach. Owners might receive the opportunity to watch their pet from a distance using a smartphone app or other interface. Owners may feel more at ease while away from their pet as a result of this. Overall, the care and welfare of pets in a hotel setting might be significantly improved by an IoT-based automated system for pet hotel management.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The success of this project depends on the results of several investigations and enquiries. For this research, information and studies were obtained from a variety of sources, including books, articles, journals, and websites. All of this information was used in this project as a guide to make sure it could be completed in the allotted time. All of the research and data were based on key issues that were connected to this project.

This section examines a few thesis and publishing journals from the IEEE Xplore website in accordance with the parameters provided in Figure below. "Pet Feeder," "IoT," and "Pet Hotel" are a few keywords that are used to search related information. This review of the literature is concerned with the IoT and pet hotels-related pet feeding. Nine of the thirty articles about pet feeders that were selected centre on IoT ideas.

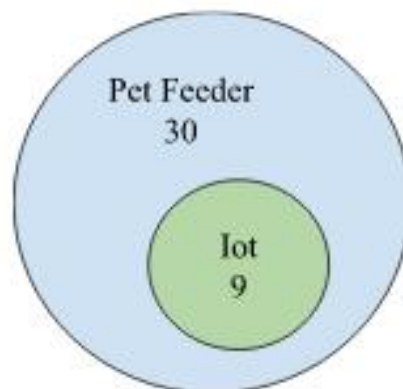


Figure 2.1 Common type related article and publication journal

Figure 2.2 indicates the growth of research papers from 2015 to 2022. This demonstrates that more research articles are produced each year. This number demonstrates that the total number of papers published increases year over year. In 2020, there were the most research articles published, and in 2017, there were the least.

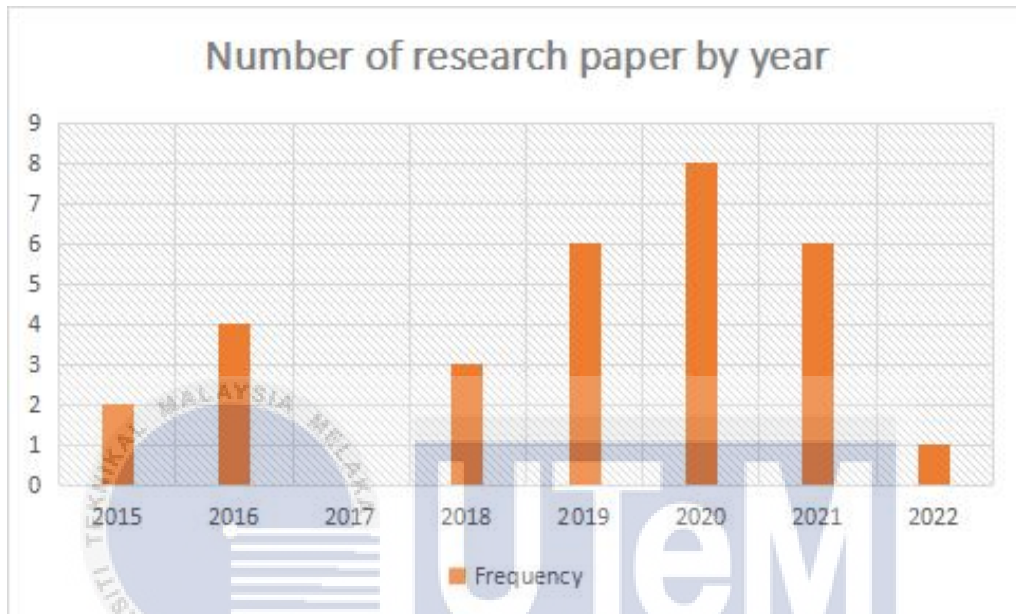


Figure 2.2 Bar Chart for number of research paper by year

Figure 2.3 shows the growth research paper by country from 2015 to 2022. This research study has contributions from a total of 14 nations. India has the most research papers published globally, as shown in Figure 2.3. This demonstrates how important India is to the development of an IoT pet feeder system.

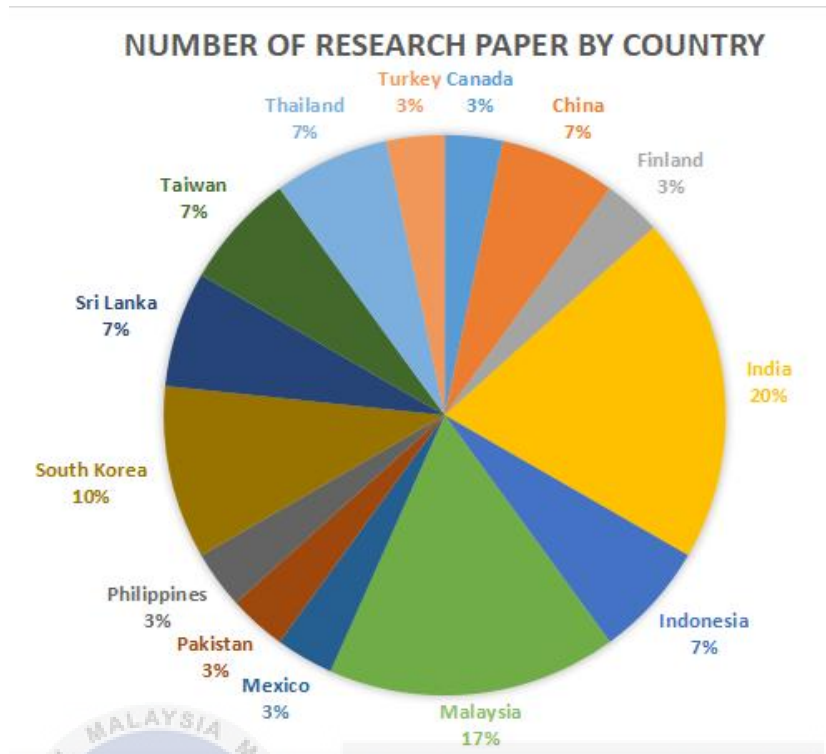


Figure 2.3 Pie Chart for number of research paper by country

Authorship distribution shows the number of authors involved in a published paper, the Figure 2.4 demonstrates the authorship distribution of the IoT Pet Feeder article. From the figure, the majority of published papers were produced by two authors and followed by one authors and three authors.

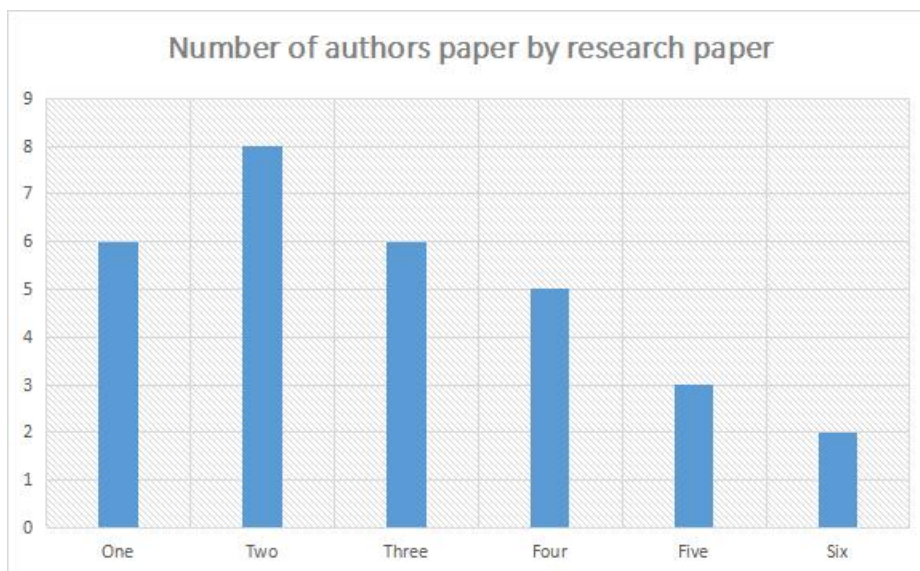


Figure 2.4 Bar Chart for number of authors paper by research paper