UNIVERSITI TEKNIKAL MALAYSIA MELAKA

SMART CAT FEEDER USING IOT

This report is submitted in accordance with requirement of the Universiti Teknikal Melaka (UTeM) for the Bachelor of Electronics Engineering technology (Telecommunications) with Honours.

By

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DECLARATION

I hereby, declared this report entitled “Smart Cat Feeder using IoT” is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Electrical and Electronic Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronic Engineering Technology (Telecommunication) with Honours. The member of the supervisory is as follow:

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DEDICATION

To my beloved parent Mohamad Adhar bin Kasim and Rohaida binti Zainol Abidin, also to my supervisor Puan Norlezah and Puan Dayanasari who sacrified and work hard as I did to make this work possible

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ABSTRACT

Smart Cat Feeder using IoT is one of the new feeding cat technologies. It helps the owner of the cat to take care of the cat although they are not at home. The owner can still give their cats a meal even if they are not at home. Smart Cat Feeder using IoT is built to help cat owners keep their cats. This is one of the cat feeders that use RFID and IoT applications to drop down food from the feeder to the bowl. Other than that, as a role to achieve the objective which is able to analyse the system designed in term of its functionality. Likewise, this automatic feeder makes it easy for the cat owner to check how much food their cat eats. This is because of the suitable amount of food given to the cat depends on the programming of the servo motor to control position and speed. As a cat lover, cat owners must also know about cats requiring right meal management. Occasionally, life responsibilities prevent cat owners from taking proper care of their cats and sometimes cat owners do not expect far from home. By using this feeder, the user can feel confident that the beloved cat will be cared for and eaten on time, whenever necessary.

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ABSTRAK

Bekas makanan kucing pintar menggunakan IoT adalah salah satu teknologi memberi makan kucing yang baru. Ia membantu pemilik haiwan untuk menjaga dan masih boleh memberikan kucing mereka makan walaupun mereka tidak berada di rumah. Bekas makanan kucing pintar menggunakan IoT dibina untuk membantu pemilik kucing menjaga pemakanan kucing mereka. Ini adalah salah satu pengumpan kucing yang menggunakan aplikasi RFID dan IoT untuk menurunkan makanan dari bekas makanan ke mangkuk. Selain itu, sebagai peranan untuk mencapai objektif iaitu untuk menganalisis system yang dirancang dari segi fungsinya. Begitu juga, bekas makan automatik ini memudahkan pemilik kucing untuk memeriksa berapa banyak makanan kucing mereka makan. Hal ini kerana jumlah makanan yang sesuai untuk kucing bergantung kepada pengaturcaraan motor servo untuk mengawal kedudukan dan kelajuan. Sebagai pencinta kucing, pemilik kucing juga perlu tahu mengenai kucing yang memerlukan pengurusan makanan yang betul. Kadang-kadang, tanggungjawab hidup menghalang pemilik kucing daripada menjaga kucing mereka dengan betul dan kadang-kadang pemilik kucing tidak menjangkakan jauh dari rumah. Dengan menggunakan bekas makanan ini, pengguna boleh merasa yakin bahawa kucing yang disayangi akan dijaga dan makan tepat pada waktunya, apabila perlu.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

IoT	-	Internet of Things
RFID	-	Radio Frequency Identification
IP	-	Internet Protocol
MQTT	-	MQ Telemetry Transport
RTC	-	Real Time Clock
LCD	-	Liquid Crystal Display
LED	-	Light Emitting Diode
SDK	-	Software Development Kit
LDR	-	Light Dependent Resistor
GPIO	-	General-Purpose Input/Output
GSM	-	Global System for Mobile Communications
IDE	-	Integrated Development Environment
PMW	-	Pulse Width Modulation
USB	-	Universal Serial Bus
ICSP	-	In Circuit Serial Programming
SRAM	-	Static Random-Access Memory
EEPROM	-	Electrically Erasable Programmable Read-Only Memory
GPRS	-	General Packet Radio Services
3G	-	Third generation
LTE	-	Long-Term Evolution
IEEE	-	Institute of Electrical and Electronics Engineers

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TCP/IP	-	Transmission Control Protocol/Internet Protocol
ISM BAND	-	Industrial, Scientific, and Medical Band
UHF	-	Ultra High Frequency
SPI	-	Serial Peripheral Interface
NTC	-	Negative Temperature Coefficient

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter focused on the creation of the frameworks on this project. Basically, these include the objectives that needed to be achieved by the researcher. It includes the main information such as problem statement, objectives of this study and scope of work.

1.2 Background

Almost half of Malaysian households have cats. This has been proved by Dalia Research, which placed Malaysia sixth in the world, with 40% of its population having at least one cat in 2017. Malaysia and UAE share their first position in Asia. In Southeast Asia, Malaysia is in the first rank.

Nowadays, feeding these cats can sometimes be time consuming because of the owner need go to work, school and holiday. The Smart Cat Feeder using IoT soles this issue by reducing the amount of time the cat owner spends on feeding the pet.

The existing cat feeders need to be handled manually by the owner when to feed their cat. The schedule of feeding becomes difficult when the cat owner always out of home and no time to feed their pet regularly. Smart Cat Feeder using IoT is an innovation technology of the existing cat feeder in the market. It has been constructed to help the cat owner in taking care of their feline. It encourages healthy eating habit with the good meal for cat.

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This project uses IoT which it can be control by using smart phone. This project also uses RFID technology to dispense a predetermined amount of food into a tray automatically if the cat come closer to the feeder. Several experiments have been done to identify the performance of the Smart Cat Feeder. It resulted that the product can perform accordingly and help pet owner to monitor their cat with proper meal management.

1.3 Problem statement

Nowadays, cat owners occasionally, there is no time to see their cats regularly because of work or trip. Nearly every family in Malaysia has a cat, although they are busy with their work. Owning a cat these days is not easy as it is necessary to take care of those cat when the owner is not at home. Rushing for work and other preference effects to the time limitations when feeding their cat and having to feed their cat daily becomes a burden on the owners of the cats. Also, think about the fact that, even when they are not at home, the owner must want to make sure that their cat is fed at the same time every day. Cats are very used to a schedule, whether it is realized by their owners or not. The owner cannot expect another person to follow their schedule.

Moreover, financial is also one of the problems. It because if the owner wants to go for long vacation or work trip, they sent their cat to cat hotel for their nursery. This will cost a lot of money.

Therefore, a new invention has emerged as the solution to this problem that is the use the Smart Cat Feeder using IoT. Instead of asking neighbours or friends to feed the cat, the owner can now feed their cat every time and anywhere without going home by simply clicking inside a smartphone application to feed their cat. This could help

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the owners of cat to provide their pet with good diet management and help cat to have a healthy life.

1.4 Objective

From the problem statement explained above, there are several objectives that need to be completed at the end of this project. The main objectives of this project are:

1. To build and develop a low-cost cat feeder based on Internet of Things (IoT) technology that uses Arduino compatible based ESP8266 which is Wemos D1 and sensors.
2. To analyse the system designed in term of its functionality.

1.5 Scope of work

This scope of work focuses on cat at home that provides only the food and not water. In this project, Wemos D1 work together with RFID sensor and Wi-Fi module. Cat will use the wireless RFID that attached at their neck collar to active the motor to drop down the food into the bowl if the cat owners forget to give their cats a meal. However, the owner can feed their can by using Blynk application. To carry out this design, both software and hardware will be implemented together.

1.6 Rational of study

This Smart Cat Feeder using IoT is the automatic cat feeder that user can be control using smart phone. However, this feeder also can be operated using RFID that attached to the collar of the cat neck. This feeder can help the cat owner to keep monitor their cat's meal. Besides that, this feeder features help the cat owner to control their cat's meal by only click the provided interface on the smart phones. This project

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contributes a lot as the cat owner no need to worry about their cat's meal if they not home.

The cat owner is able to control the cat feeder from the long distance range as long as both user and system is connected with the internet connections. This feeder will become important because will be able to give the benefits for both pets and their owner. The reason is that the cat can get feed on time and the owner can also save time and energy. Last but not least, this project also focuses on Wemos D1's performance, which depends on the programming and servo motor. The project's goals will be achieved through the good performance of Wemos D1 and servo motor.

From the implementation on this project, the cat owner can take a relief as the project had helped the priority issues that commonly become a burden for them to perform better daily activities.

1.7 Expected result

For the IoT technology part, the system should able to control the cat feeder such as their meal by using smart phone. The remote process can be done everywhere as long as the user and the processing unit are connected with the internet network. The software that used to control the feeder is Blynk application, while for the processing unit, ESP8266 Wi-Fi module is used in this project to ensure the connection with the internet connection. This Wi-Fi module was embedded to the main board which is Wemos D1.

For the feeder part, the system is equipped with RFID, temperature and humidity sensor. For the RFID, if cat comes to eat almost to the feeder, it must be detected. After RFID reader detect the tag, servo motor will rotate drop down the food

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depends on servo motor programming to control speed and position. Furthermore, the cat's body temperature will be detected by temperature and humidity sensor. If cat's foot touches the sensor, the temperature will be measured and Wemos D1 will process the signal and display it through Blynk application and can be monitored and checked the health of their cat by the user.

For the application, user can feed their cat only use this application. By clicking the interface in the Blynk application. Using this application, the user also can monitor their cat health and get notification if their cat was eaten.

1.8 Cost involved in project

Table 1.1 shows the list of the components that are used to build the project. The aim is to make a smart cat feeder that is cost-effective in term of designing and developing the project for testing knowledge on related fields.

Table 1. 1: Project component cost.

No	Product	Price per Unit (RM)	Quantity (pcs)	Total (RM)
1	Wemos D1	25.50	1	25.50
2	Servo Motor	6.20	1	6.20
3	RFID module	11.90	1	11.90
4	Temperature and humidity sensor (DHT11)	6.20	1	6.20
5	Breadboard	6.00	1	6.00
6	Jumper wire (1 set)	3.50	1	3.50
Total				59.30

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1.9 Thesis organization

This thesis includes five chapters. Chapter 1 is the introduction covering the project overview, problem statement, objectives, scope of work, rational of study, initial result and thesis organisation of the project.

Chapter 2 presents the Literature review on related theories and previous related work to this project. The theories include the discussion and overview of the smart cat feeder using IoT that covered both hardware and software.

Chapter 3 is the methodology that includes the project processes of planning and implementation. The flow chart is elaborated in detail under planning so that the project flow can be better understood. Implementation includes discussion on the methodology of testing used in this project.

Chapter 4 consists of result and discussion. It covered the experiment results from the project. This chapter will also discuss the findings observed from the results. So, the students can deliver the finding based on theoretical and experimentally.

For Chapter 5, this part covered the conclusion and future work of the projects. This chapter concludes the thesis and suggestion of future development.

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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter consists of three section which explain about the related previous researches relevant to smart cat feeder using IoT. Next, the description of the common technologies used for this project. While for the hardware or project parts, this chapter explain on how the wireless technologies are selected and contributed in this project.

2.2 Past related research

For this part, there will be an overview about the existing of the previous project that are done by researchers. The references came from the various authorized and reliable source such as books, journals, articles and websites. Besides that, this part also includes the advantages and disadvantages of the previous projects over this project.

(Wu, Cheng and Lin, 2018) developed a remote pet feeder control system via MQTT Protocol where allows user to observe the home situation of the pet as shown in Figure 2.1. Remote control system on toy cars equipped with IP camera, food and water. It allows the owner to not only accept images captured by remote cameras through smart mobile devices, but also to control their movement through the MQTT protocol to achieve pet feed purposes and water supplements. The implementation and design of the project are done by using two elements which is Android application, Eclipse Mosquitto, is installed on a microcomputer (Raspberry Pi) that is regarded as a MQTT server. The Figure 2.1 shows the proposed scheme structure of the project.

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There are some advantages of this remote pet feeder control system where the system is low cost as the component that used is easy to find in the market as well as cheap price. Besides that, the proposed remote-control system is not only a pet monitor but also considered as a pet feeder. In addition, compared with existing one's smart pet feeder, it is portable and interactive, which can be increase interaction between owners and pets. In other hand, there is a disadvantage from this project which is the food and water supplement is limit for one time use only.

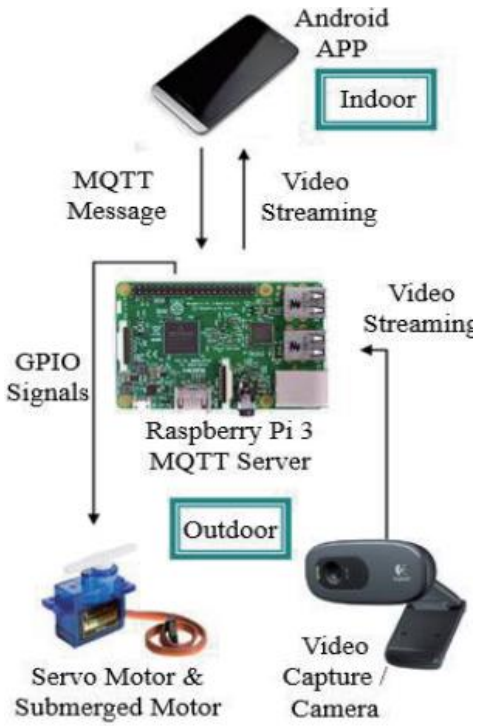

Figure 2. 1: Proposed scheme structure of the project (Wu, Cheng and Lin, 2018)

(Tiwari *et al.*, 2018) developed an automatic pet feeder using Arduino. This work is about a pet food machine automatically for a minimum period of eight hours when the owner is busy working. This is an automatic pet feeder powered by Arduino, using auger, and can be programmed with two nutritional meals with a quantity of consumers setting food with a battery backed up internal clock.

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