



Faculty of Electrical and Electronic Engineering Technology



**DEVELOPMENT OF AN IOT BASED SMART PET CAGE BY USING
A MICROCONTROLLER**

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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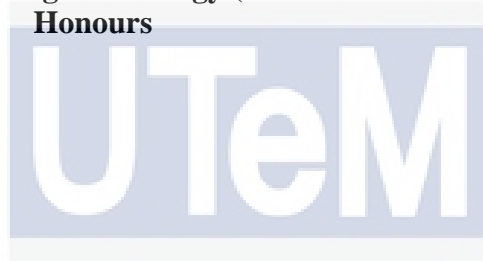
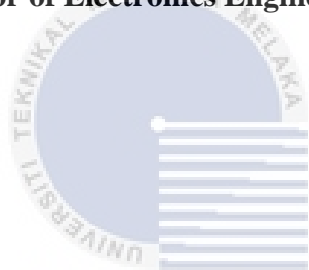
**Bachelor of Electronics Engineering Technology (Industrial Electronics) with
Honours**

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AZIM BIN ZAINAL LUDIN

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



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Faculty of Electrical and Electronic Engineering Technology

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I declare that this project report entitled “Development of IoT Based Smart Pet Cage By Using A Microcontroller” is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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DEDICATION

This thesis is dedicated to Zainal Ludin Bin Mohamad and Rubi Binti Ahmad, my beloved parents for their constant love, encouragement, and inspiration. To my supervisor Encik Ir. Ts. Dr Mohd Fauzi Bin Ab Rahman who never giving up to taught and guide me to complete my project. To my helpful classmate and housemate always keep supporting me.



ABSTRACT

As the number of people who own pets grows yearly, so makes 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. We use IoT technology in this project to create an integrated system that includes a pet food feeder, water dispenser, and litter box, which are the three most important features pet owners will be concerned about when they are busy or away from their pets, especially cats or dogs. With NodeMCU Esp8266, the three subsystems are connected to the local network. Furthermore, the information gathered by each sensor is processed and displayed on a smartphone app. Thus, pet owners can access all information about their pet's food and water consumption. Furthermore, the owner will be able to monitor their pet using a camera that will be installed inside the smart pet cage and connected directly to the apps. Additionally, the application has a controlling function that allows pet owners to dispense food and water anytime and from any location. This project will provide pet owners with an efficient, convenient, and low-cost tool for pet care by incorporating this project's pet care system into a smartphone application.

ABSTRAK

Oleh kerana jumlah orang yang memiliki haiwan peliharaan bertambah setiap tahun, begitu juga permintaan untuk produk penjagaan haiwan kesayangan yang berkualiti tinggi. Ini telah mendorong teknologi Internet of Things (IoT) maju dalam industri ini. Pemilik haiwan peliharaan boleh menggunakan teknologi IoT untuk mengikuti aktiviti haiwan kesayangan mereka dan dari jauh, memeriksa kesihatan haiwan kesayangan mereka dan bahkan berinteraksi dengan mereka. Semua alat penjagaan haiwan kesayangan ini menjadi semakin penting dalam kehidupan pemilik haiwan kesayangan. Terdapat penggunaan teknologi IoT dalam projek ini untuk membuat sistem terpadu yang meliputi dispenser makanan haiwan peliharaan, dispenser air, dan kotak pasir, yang merupakan tiga ciri terpenting. Dengan NodeMCU Esp8266, ketiga subsistem disambungkan ke rangkaian tempatan. Selanjutnya, maklumat yang dikumpulkan oleh setiap sensor diproses dan dipaparkan pada aplikasi telefon pintar. Oleh itu, pemilik haiwan peliharaan dapat mengakses semua maklumat mengenai penggunaan makanan dan air haiwan kesayangan mereka. Selanjutnya, pemilik akan dapat memantau haiwan kesayangan mereka menggunakan kamera yang akan dipasang di dalam sangkar haiwan kesayangan pintar dan disambungkan terus dengan aplikasi. Selain itu, aplikasi ini mempunyai fungsi pengendalian yang membolehkan pemilik haiwan peliharaan membuang makanan dan air pada bila-bila masa dan dari mana-mana lokasi. Projek ini akan menyediakan pemilik haiwan peliharaan dengan alat yang cekap, mudah, dan murah untuk penjagaan haiwan kesayangan dengan memasukkan sistem penjagaan haiwan kesayangan projek ini ke dalam aplikasi telefon pintar.

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LIST OF SYMBOLS



LIST OF ABBREVIATIONS

V	-	Voltage
VCC	-	Voltage Common Collector
GND	-	Ground



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CHAPTER 1

INTRODUCTION

This chapter focuses on making thought and understanding the review of the venture, detailing the objectives, concisely the problem statement and scope and providing the project's outcome. In this way, the structure of the entire undertaking can be decisively imagined.

1.1 Background

People nowadays tend to seek joy in their lives. Some of them will go for outings or holidays, shopping, and many more. Some people keep pets in their homes for their happiness. Ownership is both a joy and a challenge. Once enticed to retain pets, it is impossible to give up one's fondness for them, to the point where pets become a part of the family and a part of life and are impossible to abandon. It is a long-lasting love. According to an article on the Insight website, an online survey done by Rakuten Insight's proprietary panels shows that 59% of the population in Malaysia has pets in their homes. 20% of people in Malaysia have dogs as their pets. Meanwhile, 34% of people in Malaysia choose cats as their pets. This indicates that more than half of the Malaysian population has owned a pet. As a result, a system that focuses on pet care can enable individuals to spend more time doing other things.

1.2 Problem Statement

Nowadays, people tend to have companions such as pets in their houses to avoid being lonesome at their home or to protect their homes. Usually, people in Malaysia will have dogs or cats as their pets, and some of them have exotic pets such as lizards and snakes. These pets need extra care from their owner. Although those pets needing to be taken care of, sometimes the owner may have other things to do such as working, travelling or any other unexpected things to do. Usually, people will ask someone close to look for their pet. It is a traditional way to take care of their pets while they are away. However, it may not only create problems for others, but also not knowing how to care for your pet properly. As a result, some individuals may utilise a more contemporary method, such as a pet feeder that will feed their pet at a time set by the user or a system that will feed their pet automatically when they stand in a certain location.

Most of the time, pet food and water will be exposed to the environment, including dirt and vermin, which may cause contamination. This will result in disease, as well as a slew of other issues. The food or water will soon run out, putting their dogs at risk of famine. The litter box, as we know, needs to be cleaned regularly. Otherwise, it will attract pests and it can end up contracting fungal infections like ringworm or hookworm. And then, if you're in contact with an infected cat, it can easily pass to you.

Although there may be a system on the market that can take care of the pet independently, the pet owner will still need to purchase all of the supplies in order to take care of the pet more conveniently. They will need to acquire pet food, an automated pet door, a pet tracking system, and a monitoring system, for example. All of the various components will not only take up all of the available rooms in the home, but they will also make it more difficult for the user to put everything up on their own. Users must, for example, build their main entrance to allow their pet to pass through, locate someone to wire the camera to watch

their pet, and so on. All of these will raise the cost of adopting a pet in the user's home. As a result, the smart pet cage may help the pet owner address his or her present issue. The all-in-one system will make it simpler for pet owners to care for their pets.

1.3 Project Objective

The purpose of the research is to apply some technologies to existing pet cages and make it able to be remotely monitored. Specifically, the objectives are as follows:

- i) To develop a reliable automatic pet water and food dispensing system, and pet litter box controlling system
- ii) To design an IOT interface that can monitor and control the pet's food and water dispensing as well as the pet's litter box cleaning system via wifi connection.
- iii) To evaluate the reliability and performance of the designed smart pet cage system.

1.4 Scope of Project

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

- i) Smart pet cage acts as a monitoring system for the owner that can be used remotely through smartphones.
- ii) The usage of a camera in smart pet cage serves as a security system that allows the user to keep an eye on their pets at any time.
- iii) Using the technology applied, smart pet cage can control the quality and quantity of food or water.
- iv) The litterbox will be kept clean by the automated operation.

1.5 Contribution of Research

- i) It has a monitoring system for user to monitor their pet's condition remotely and has security features.
- ii) This proposed system provides a moveable system which makes it reliable and easy to use.
- iii) Some tasks can be completed by the user without difficulty and from a distance.
- iv) The system can manage the needs of pets even though owners are not present.

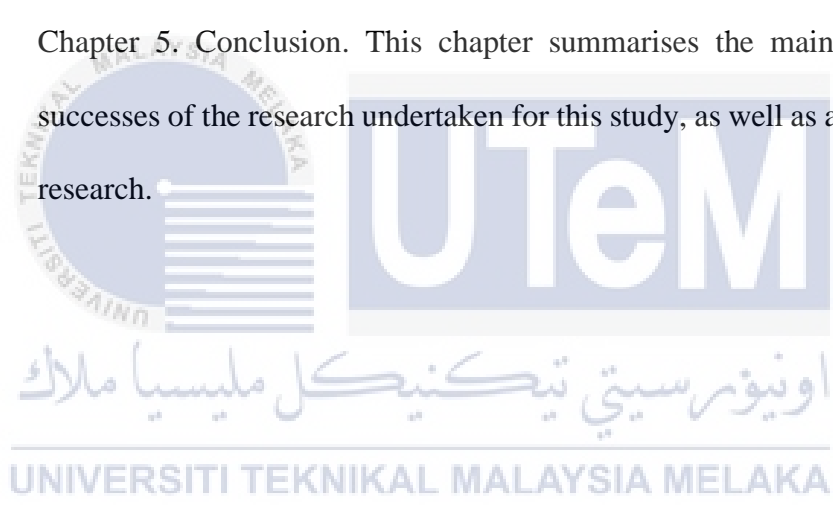
1.6 Thesis Outline

Based on the objectives previously presented and on the approach proposed before, this thesis is made up of five (5) chapters, which contents are summarised as follows:

- i) Chapter 1. Introduction. This chapter presents the background of the study, problem statement, project objectives, scope of the project, contribution of research and thesis outline.
- ii) Chapter 2. Literature review. This chapter begins with a brief review of the smart pet cage's application. This chapter will also summarise and compare several prior projects with similar concepts to this one. It will also cover the project's features, characteristics, and technology.
- iii) Chapter 3. Methodology. The methods employed in this project is described in this chapter. This project's flow is demonstrated to effectively achieve the

purpose. In addition, the hardware used to construct the smart pet cage system is covered in the Hardware Development section, whilst the software and approach utilised in the monitoring system is discussed in the Software Development section.

- iv) Chapter 4. Preliminary result. In this chapter, the developed models are put to the test in terms of system performance and accuracy in real time. The system's functions are being tested to ensure that the desired outcome is achieved.
- v) Chapter 5. Conclusion. This chapter summarises the main findings and successes of the research undertaken for this study, as well as areas for future research.



CHAPTER 2

LITERATURE REVIEW

This chapter focuses on the researcher, journal, article's expertise and philosophy, past analysis and technique comparisons, preliminary analysis and approach comparisons.

2.1 Introduction

In this modern's day, physical monitoring of living things is now possible with just a click of a mobile application interface thanks to the Internet of Things (IoT). It enabled devices to connect and communicate with each other via the Internet with relatively little human intervention. Various systems have been used for both living and non-living topics, and the Internet of Things (IOT) is constantly growing.

2.2 Previous related works

This project includes new features that improve on prior projects and provide additional benefits. With the support of an existing project, a comparison may be conducted by selecting the best of the best and learning from their mistakes in order to produce a superior result. Each project used different components and methods, but the end result was the same: pet cage upgrade. Furthermore, a greater grasp of this existing project was required in order to eliminate needless repetition.

2.2.1 PetCare: A Smart Pet Care IoT Mobile Application

According to [1] Physical monitoring of living things is now possible with just a click of a mobile application interface thanks to the Internet of Things (IoT). It enabled devices to connect and communicate with each other via the Internet with relatively little human intervention. The project involves implementing the Internet of Things (IoT) to create a smart pet care assistant in a mobile application.

Based on research done by [1], the project is about implementing the Internet of Things (IoT) to create a smart pet care assistant in a mobile application. The goal of the project is to create an embedded system for monitoring and caring for domestic pets. The project entails remote meal scheduling, camera service monitoring, room temperature and light sensing, smart pet door control, excrement pad cleaning, and remote music and voice command activation at home while pet owners are at work or engaged in outdoor activities.



Figure 2.1 Food Dispenser Design Mock Up