

**PET CONTROL: ANIMAL IDENTIFIER USING IMAGE PROCESSING
APPROACH (CAT)**

NOR HAFIZI BIN KAMARUZZAMAN

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS TESIS*

JUDUL: PET CONTROL : ANIMAL IDENTIFIER USING IMAGE
PROCESSING APPROACH (CAT)

SESI PENGAJIAN: 2010/2011

Saya NOR HAFIZI BIN KAMARUZZAMAN
(HURUF BESAR)

mengaku membenarkan tesis (PSM/~~Sarjana/Doktor Falsafah~~) ini disimpan di Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dengan syarat-syarat kegunaan seperti berikut:

1. Tesis dan projek adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan Fakulti Teknologi Maklumat dan Komunikasi dibenarkan membuat salinan tesis 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)

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

 / TIDAK TERHAD


(TANDATANGAN PENULIS)

Alamat tetap: 532, Jalan Jelutong,
Felda Gunung Besout 1,
35600 Sungkai, Perak

Tarikh: 8/7/11


(TANDATANGAN PENYELIA)

Huzulha Khatwani Ibrahim
Nama Penyelia

Tarikh: 8/7/11

CATATAN: * Tesis dimaksudkan sebagai Laporan Akhir Projek Sarjana Muda (PSM).
** Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa.

PET CONTROL : ANIMAL IDENTIFIER USING IMAGE PROCESSING
APPROACH (CAT)

NOR HAFIZI BIN KAMARUZZAMAN


This report is submitted in partial fulfillment of the requirements for the
Bachelor of Computer Science (Artificial Intelligence)


FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2011

DECLARATION

I hereby declare that this project report entitled
**PET CONTROL : ANIMAL IDENTIFIER USING IMAGE PROCESSING
APPROACH (CAT)**

is written by me and is my own effort and that no part has been plagiarized
without citations.

STUDENT :  Date: 8/7/11
(NOR HAFIZI BIN KAMARUZZAMAN)

SUPERVISOR :  Date: 8/7/11
(NUZULHA KHILWANI IBRAHIM)

DEDICATION

This report is dedicated to my beloved parents; friends, supervisors and my dearest to me who have provided encouragement and guidance all the way during the completion of the report.

ACKNOWLEDGEMENTS

Foremost, I would like to express my deep and sincere gratitude to my supervisor, Miss Nuzulha Khilwani Ibrahim for his patience, motivation, enthusiasm, immense knowledge and continuous support throughout my project. Her valuable guidance and constructive evaluations have been of great value for me in all the time of research and writing of this thesis.

I would also like to thank Dr. Azah Binti Deraman@muda for offering me the brilliant suggestion and comments, helping me understanding issues related to image processing to complete this project successfully.

My sincere thanks also go to my friends for their continuing supports and encouragement all the way to accomplish my project especially my coursemate and roommate in UTeM who always give moral support when I was discouraged. I am grateful to my beloved family for their patience, benevolence and supporting me spiritually throughout my life. Last but not the least, I offer my regards and blessings to all of those who supported me in any respect during the completion of my Final Year Project.

Thank you.

ABSTRACT

The purpose of this project is to develop a windows-based expert system that incorporates Image Processing technique and works in the decision making area. The main objective of the system is to help people in controlling their pet activities in bringing foreign objects into the house. This aim is achievable by developing a system based on logical thinking method for decision making. The system is called Cat Detection System. Cat Detection System is a windows-based application which provide explanation on how the image processing technique being process and the decision making process. Within this system, the system's users can easily understand on how the system detect and differentiate the data image. Cat Detection System is tested via white-box and black-box strategy. It is successfully achieving most of its functional and non functional requirement. Cat Detection System will give full benefits to the public to support them toward better life. However, Cat Detection System is still consists a lot of limitation. It can only use to detecting cats with one colour and pattern.

ABSTRAK

Projek ini bertujuan untuk membangunkan satu sistem pakar berkualiti yang menggabungkan Teknik Pemprosesan Imej dan berfungsi di dalam bidang membuat keputusan. Objektif utama sistem ini adalah untuk membantu pemilik binatang peliharaan dalam menjaga aktiviti haiwan peliharaan mereka daripada membawa objek-objek luar masuk ke dalam rumah. Tujuan ini dapat dicapai dengan menghasilkan satu sistem tertentu yang berasaskan Teknik Pemprosesan Imej bagi membuat keputusan. Sistem ini dipanggil Sistem Pengesan Kucing. Dalam sistem ini, pengguna-pengguna sistem boleh mengetahui bagaimana sistem tersebut mengenalpasti dan membezakan imej binatang peliharaan mereka dan seterusnya ke arah membuat keputusan dengan mudah. Sistem Pengesan Kucing diuji melalui strategi kotak putih dan kotak hitam. Ia berjaya mencapai hampir semua keperluannya yang berfungsi dan tidak berfungsi. Sistem Pengesan Kucing akan memberi faedah penuh kepada orang awam untuk menyokong mereka ke arah kehidupan yang lebih berkualiti. Bagaimanapun, Sistem Pengesan Kucing tetap ada mengandungi had. Ia hanya boleh digunakan untuk memproses dan mengenalpasti imej binatang peliharaan yang mempunyai satu warna dan corak.

TABLE OF CONTENTS

CHAPTER	SUBJECT	PAGE
	DECLARATION	i
	DEDICATION	ii
	ACKNOWLEDGEMENTS	iii
	ABSTRACT	iv
	ABSTRAK	v
	TABLE OF CONTENTS	vi
	LIST OF TABLES	vii
	LIST OF FIGURES	viii
	LIST OF ATTACHMENT	xvii
CHAPTER I	INTRODUCTION	
	1.1 Project Background	1
	1.2 Problem statement(s)	1
	1.3 Objective	2
	1.4 Scope	2
	1.5 Project Significance	2
	1.6 Expected Output	2
	1.7 Conclusion	3
CHAPTER II	METHODOLOGY	
	2.1 Introduction	4
	2.2 Facts and Findings	4
	2.2.1 Domain	5
	2.2.2 Existing Systems	5
	2.2.3 Technique	6

2.3	Project Methodology	6
2.4	Project Requirements	7
2.4.1	Software Requirements	8
2.4.2	Hardware Requirements	8
2.4.3	Other Requirements	8
2.5	Project Schedule and Milestone	8
2.6	Conclusion	9
CHAPTER III ANALYSIS		
3.1	Introduction	10
3.2	Problem Analysis	11
3.3	Requirement Analysis	11
3.3.1	Data Requirements	11
3.3.2	Functional Requirements	11
3.3.3	Non-Functional Requirements	12
3.3.4	Others	12
3.4	Conclusion	13
CHAPTER VI DESIGN		
4.1	Introduction	14
4.2	High-Level Design	14
4.2.1	System Architecture for Expert System	15
4.2.2	User Interface Design for Expert System	16
4.2.2.1	Navigation Design	17
4.2.2.2	Input Design for Expert System	17
4.2.2.3	Technical Design	17
4.2.2.4	Output Design	18
4.2.2.5	Actual Output	18
4.2.2.6	Explanation	18
4.2.3	Database Design	25
4.2.3.1	Non-Database Design	25

4.3	Detailed Design	26
4.3.1	Software Design	26
4.4	Conclusion	26
CHAPTER V IMPLEMENTATION		
5.1	Introduction	27
5.2	Software Development Environment setup	27
5.3	Software Configuration Management	28
5.3.1	Configuration environment setup	28
5.3.2	Version Control	28
5.4	Implementation Status	29
5.5	Conclusion	30
CHAPTER VI TESTING		
6.1	Introduction	31
6.2	Test Plan	32
6.2.1	Test Organization	32
6.2.2	Test Environment	33
6.2.3	Test Schedule	35
6.3	Test Strategy	36
6.3.1	Classes of tests	37
6.3.1.1	Unit Testing	37
6.3.1.2	Integration Testing	38
6.3.1.3	System Testing	38
6.3.1.4	User Acceptance Testing	38
6.4	Test Implementation	39
6.4.1	Test Description	39
6.4.2	Test Data	39
6.5	Test Results and Analysis	40
6.6	Conclusion	41
CHAPTER VII PROJECT CONCLUSION		
7.1	Observation on Weakness and Strengths	42
7.1.1	Weakness	42

7.1.2 Strengths	43
7.2 Propositions for Improvement	43
7.3 Contribution	44
7.4 Conclusion	44

REFFERENCES

APPENDICES

LIST OF TABLES

TABLE	TITLE	PAGE
2.1	Project Milestones	8
4.1	Class Function Table	19
4.2	Codes	20
5.1	Procedure and Control Source Code Version	29
5.2	Implementation Status of Cat Detection System	29
6.1	Cat Detection Test Organization	32
6.2	Hardware and Firmware Configuration	33
6.3	Test Schedule of Cat Detection System	35
6.4	Types of Software Testing Under Black-box And White-box Testing Strategy	37

LIST OF FIGURES

FIGURE	TITLE	PAGE
2.1	System Methodology	6
3.1	Threshold Diagram	12
4.1	Threshold Diagram	15
4.2	User Interface (figure)	16
4.3	User Interface (GUIDE)	16
4.4	Output Area	18
4.5	Non-Database Design	25
6.1	Cat Detection Process	34
6.2	Object Detection Process	34
6.3	result Generated by Cat Detection System	35
6.4	Test Data of Cat Detection System	40

LIST OF ATTACHMENTS

ATTACHMENTS	TITLE	PAGE
APPENDICES A	Project Schedule And Milestones	45
APPENDICES B	User Interface Design	47
APPENDICES C	User Manual	50
APPENDICES D	MATLAB Codes	53
APPENDICES E	Log Book	60

CHAPTER I

INTRODUCTION

1.1 Project background

This project is to control domestic pet (cat) from bringing outside food into the house. The system will capture a set of images of the cat and process them. Using an image processing approach, the system will identify the physical appearance of the animal to determine whether it has an object in its mouth or not. If not, the system will allow the cat into the house using the passage given and if it has, then the passage is closed for the pet to enter.

This project can be beneficial to all pet owners all over the world. Only a few systems have been developed but none of them have ever included Artificial Intelligence (AI) approach in this field. The current system may or maybe not have the best approaches to recognize the images provided which has brought me the idea to develop this project.

1.2.1 Problems statement(s)

- Animal remains which the cat brought into the house left give unpleasant smell in the house
- The remains is hard to find because cats are known to hide when eating
- Cat is an active animal and hard to control its' behavior

- Human cannot restrain animal movement
- Human, especially businessman have less time to cleaning up the house
- Cat may bring poisonous animal (snake, scorpion etc) into the house

1.3 Objective

- Making an artificial intelligence system (AI) which can make a decision making process on its' own
- Using Image processing approach to identify images

1.4 Scope

- This system aimed is for domestic cats owner
- Suitable for all ages

1.5 Project significance

This project will bring benefits to all cat keepers. With this system, the owners do not have to worries if their cats will bring unnecessary things into the house. It also will improve the security of the house from poisonous or any unwanted animal into the house.

1.6 Expected output

The system should be able to processed and identify images of cat using image processing approaches. The system will do the decision making and decide either the cat have something in its mouth or not.

1.7 Conclusion

This project is beneficial for everyone who having cat(s) in their house. This project will ensure their cats will no longer bring dead animal into the house and giving problems to the owner.

The next chapter will discuss how the process of image processing will be conducted to process and determine the images of the cat, either it have dead animal in its mouth, or not.

CHAPTER II

METHODOLOGY

2.1 Introduction

Cat is the most popular animal chosen to be a pet after dog. Cat is very energetic animal and would catch any animal smaller which used to be its' food outside the house. The problems begin when the cat brings the dead animal into the house and let the leftover inside. The smell of the dead animal can be smelled all over the house but owners hard to find the source because cats is known to eat in private space which cannot be reach and hide their food. Why we choose to clean it each time while we can prevent it?

This project will try to solve those problems by prevent cats from bringing dead animals into the house. The system will differentiate either the cat does have or does not have dead animal in his mouth before entering the house.

2.2 Facts and findings

Food eating pattern –

Cats are obligate carnivores, and can survive without vegetation. Felines in the wild will usually hunt smaller mammals regularly throughout the day to keep themselves nourished. Domestic cats, however, are used to a relaxed lifestyle and, therefore, will eat even smaller amounts, but more regularly. Many cats will find and chew small

quantities of long grass but this is not for its nutritional value, it is a purely mechanical function. The eating of grass triggers a regurgitation reflex to help expel indigestible matter, like hairballs and the bones of prey.

Cat breeds –

Our entire domestic house cat is from the same species but there are many different breeds however. Each breed may have unique features which differentiate it with another breed. It is known that there are 84 breeds of cat in the world.

Head shape –

Each breeds of cat have different features. Some of it has a unique head shape and ears.

2.2.1 Domain

This project can be categorized into image processing domain. In electrical engineering and computer science, image processing is any form of signal processing for which the input is an image, such as a photograph or video frame; the output of image processing may be either an image or, a set of characteristics or parameters related to the image. Most image-processing techniques involve treating the image as a two-dimensional signal and applying standard signal-processing techniques to it. Image processing usually refers to digital image processing, but optical and analog image processing also are possible. This article is about general techniques that apply to all of them. The *acquisition* of images (producing the input image in the first place) is referred to as imaging.

2.2.2 Existing system

There are several research has been done to detect and identify a cat-like animal based on pattern, texture and shape. Meanwhile, this project is to identify either the cat has object in its mouth which to prevent it from bringing dead animal

inside the house. By using *threshold* approach in an image, the system will detect edges in the picture. An edge is loosely defined as an extended region in the image that undergoes a rapid directional change in intensity. Differential techniques are the obvious choice for measuring such changes between the image of cat and the object inside its mouth. This project also will use a set of images of a cat to maximize the accuracy.

Hardware – Laptop, Personal computer

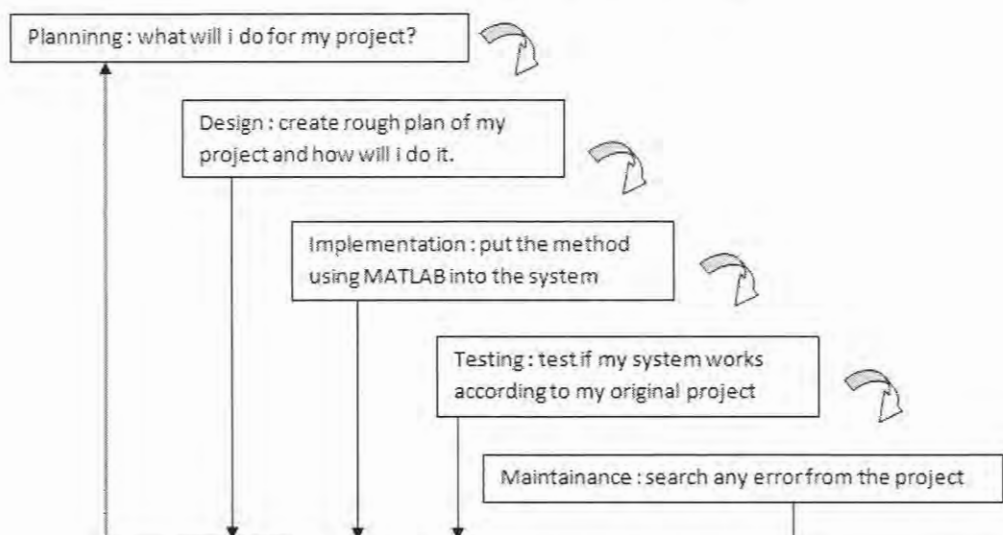
Software – MATLAB R2009a, Windows Seven Operating System

2.2.3 Technique

Color image processing is also useable to differentiate objects inside a picture. The problems with this project is domestic home cat has several of colors and some food, which it caught has the same color with its body.

2.3 Project methodology

Figure 2.1 : Cat Detection System Methodology



a) Steps

1. Capture the image.
First, an image of the face is acquired. This acquisition can be accomplished by digitally scanning an existing photograph or by using an electro-optical camera to acquire a live picture of a subject.
2. Read and display the image.
3. Find the head of the cat in the image.
4. Extract feature
 - a. Use Morphological Opening to Estimate the Background
Morphological operators enable you to detect edges, enhance contrast, remove noise, segment an image into regions, thin regions, or perform skeletonization on regions.
 - b. View the Background Approximation as a Surface - create a surface display of the background
 - c. Subtract the Background Image from the Original Image - To create a more uniform background
 - d. Increase the Image Contrast – to make it more visible
 - e. Threshold the Image - Create a binary version of the image so you can use toolbox functions.
5. Compare template/result with those in database of known cat figure.
6. Repeat step 2 until step 5 for other images.
7. Calculate accuracy.
8. Declare matches.

2.4 Project requirements

- Identify the animal in the image (it must be a cat-like animal)
- Identify the mouth area of the cats
- Detect edges of the images
- Detect if there are any object inside the mouth of the cat.

2.4.1 Software requirements

1. Windows 7 Ultimate
2. MS Word 2007 for documentation
3. MATLAB R2009a

2.4.2 Hardware requirements

1. Personal Laptop
2. Personal Computer
3. External Memory Storage

2.5 Project schedule and milestone

Table 2.1 : Project Milestones

Activity (week)	1st	2nd	3rd	4th	5th	6th	7th	8th	9th
Proposal									
Last change (proposal)									
Introduction, literature review & project methodology report									
Language Supervisor selection									
Chapter 1 & 2 to the Language Supervisor									
Chapter 3 & progress									
Chapter 4 & project evaluation									
Progress and development evaluation									
PSM 1 full report PSM 1 presentation									
Language Supervisor evaluation									

Overall marks to AJK									

2.6 Conclusion

There are many system has been develop using Image processing approach to utilize variety of images. From the past research which has been done, this project will try using set of image to utilize a target. Using the hardware and software stated, I hope this project can be done smoothly.