VISION INSPECTION SYSTEM FOR HALAL CHICKEN AUTHENTICATION

MOHAMMAD FITRI ALIF BIN MOHAMMAD KASAI

A project report submitted in partial fulfilment of the
requirements for the award of the degree of
Master of Engineering (Electrical - Mechatronics & Automatic Control)

Faculty of Electrical Engineering
Universiti Teknologi Malaysia

JUNE 2013

To my beloved mother and father

ACKNOWLEDGEMENT

First of all, thanks to mighty Allah S.W.T for the blessing and opportunity for me to complete my Master degree project. I would like to take this opportunity to express my deepest gratitude to my supervisor, Assoc. Prof. Dr. Hazlina Binti Selamat for her invaluable guidance, assistance and support throughout the project. Under her supervision, many aspects regarding on this project has been explored. With the knowledge, idea and support that has been received from her, not only able to complete this project and thesis in the time given.

Besides, I would like to thanks to my beloved mother and father for their support during Master degree study and friends especially Osama Kanjou and Aliyu Mohd Abdu for their assistance during the period of this project. They have been very supportive throughout the study and provided me with moral support in times of hardship that drive me to complete this study. Unfortunately, it is impossible to list all of them in this page. However, your contribution will always be remembered.

My utmost thanks also go to Kementerian Pelajaran Tinggi (KPT) Malaysia for funding my Master study at Universiti Teknologi Malaysia (UTM). In Shaa Allah, with this knowledge, it will be shared with others.

ABSTRACT

Vision inspection system is a rapid, economic, consistent and objective inspection technique. This project focuses on the process to authenticate whether the slaughtered chickens images are halal and slaughtered correctly according to syariah law or not based on the slaughtered chicken images by using image processing methods and neural network. The captured images first undergo pre processing such as cropping, background subtraction process and erosion method. The pre processed images are then segmented using method such as component connected labeling method to detect the circularity of esophagus and trachea. Feature extraction is used to extract important information from the processed images and the features used in this project are circularity and the average value of red, green and blue (RGB) colours. Probabilistic neural network is used to classify the features of the image and compared with the trained feature to authenticate the halal status of the image. Time taken for authenticate slaughtered chicken image is fast and its accuracy is also reasonable.

ABSTRAK

Sistem pemeriksaan penglihatan ialah satu teknik pemeriksaan yang pantas, ekonomi, konsisten dan objektif. Projek ini menumpukan pada proses pengesahkan imej ayam yang telah di sembelih adalah halal atau tidak dan menurut undang-undang syariah dengan menggunakan kaedah-kaedah pemprosesan imej dan jaringan saraf. Imej-imej yang ditangkap mula menjalani pra-pemprosesan seperti memotong, proses penolakan latar belakang dan kaedah hakisan. Imej pra-proses kemudiannya di segmenkan menggunakan teknik seperti melabelkan komponen berhubung untuk mengesan kebulatan saluran pernafasan dan makanan. Pengekstrakan ciri adalah digunakan untuk mengambil maklumat penting dari imej-imej yang diproses dan ciri-ciri yang digunakan didalam projek ini ialah kebulatan dan nilai purata warna merah, hijau dan biru (RGB). Jaringan saraf kebarangkalian adalah digunakan untuk mengelaskan ciri imej dan dibandingkan dengan ciri terlatih mengesahkan status halal imej. Masa diambil untuk mengesahkan imej ayam sembelihan adalah laju dan ketepatan juga munasabah.

TABLE OF CONTENTS

LIST OF TABLE

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Introduction

This section discuss about the introduction of the study which are overview of Halal, slaughtering process and computer vision, problem statement, objectives, and scope of study.

1.2 Overview of Halal

In Islam, there are mainly two terms that mean Islamic prohibition or restriction on food: Halal and Haram. "Halal" is an Arabic word meaning "lawful" or “permissible", and the term not only covers food and drink, but also to all matters of daily life. When it comes to halal food, most people think of meat foods. “Haram” is an Arabic word meaning “unpermissible” as example in food, Muslim are Haram to eat swine flesh.

It was explain in Quran surah An-Nahl verse 114:

“He has only forbidden you dead meat, and blood, and the flesh of swine, and any (food) over which the name of other than Allah has been invoked.”

1.3 Overview of Slaughtering Process

The slaughtering process is done accordance to the Shariah law and Malaysia Standard MS1500:2009 by following these requirements to be complied with [5]:

i) Slaughtering shall be performed only by a practicing muslim who is mentally sound, baligh, fully understands the fundamental rules and conditions related to the slaughter of animal in Islam.

ii) The act of slaughtering shall be done with niyyah (intention) in the name of Allah and not for other purposes.

iii) The animal to be slaughtered has to be an animal that is Halal.

iv) The animal to be slaughtered shall be alive of deemed to be alive at the time of slaughter.

v) The slaughter act shall sever the trachea (halqum), oesophagus (mari') and both the carotid arteries and jugular veins (wadajain) to hasten the bleeding and death of animal.

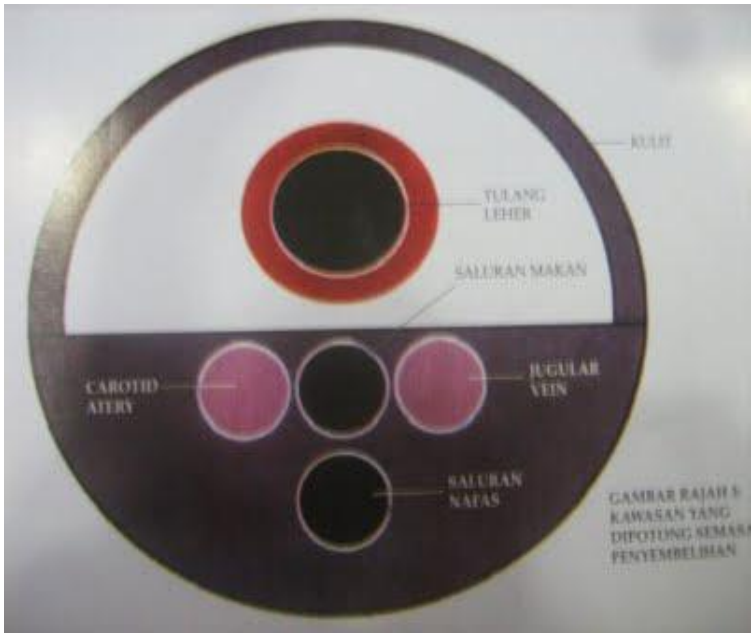

Figure 1.1 Slaughtering part of chicken [5]

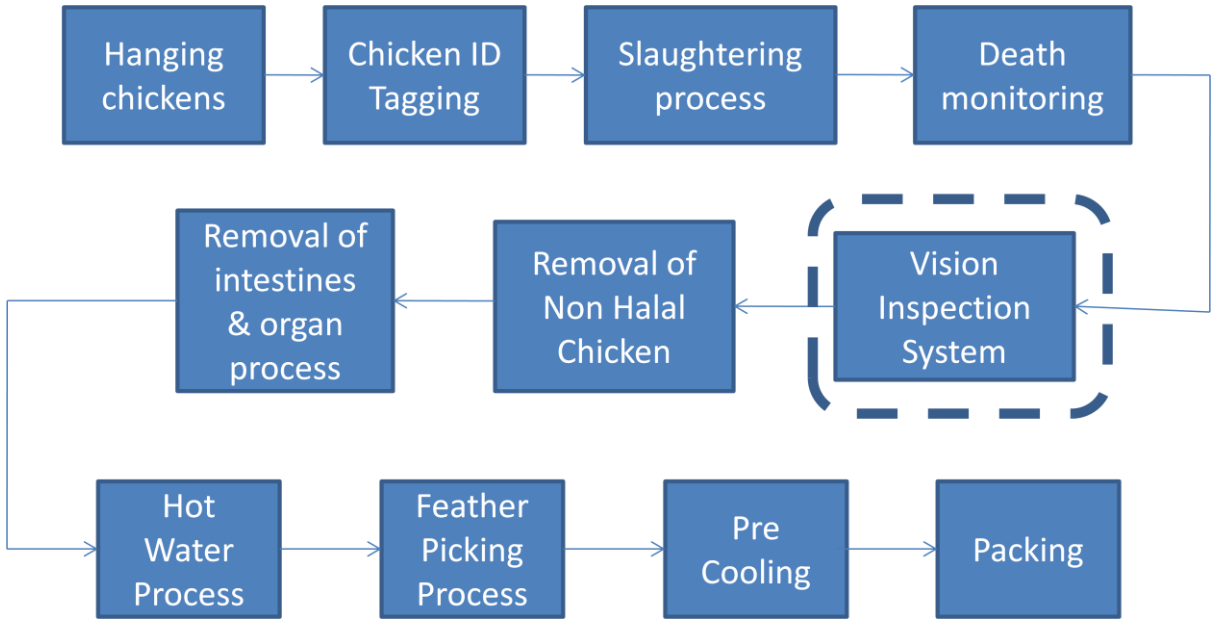

Figure 1.2 Syariah-compliant automated chicken processing system

1.4 Overview of Computer Vision

Computer vision is a field that includes methods for acquiring, processing, analyzing, and understanding images and, in general, high-dimensional data from the real world in order to produce numerical or symbolic information, *e.g.*, in the forms of decisions. A theme in the development of this field has been to duplicate the abilities of human vision by electronically perceiving and understanding an image [3].

This image understanding can be seen as the disentangling of symbolic information from image data using models constructed with the aid of geometry, physics, statistics, and learning theory. Computer vision has also been described as the enterprise of automating and integrating a wide range of processes and representations for vision perception [4].

1.5 Problems Statements

There are three main problem statements in this project:

i) Authentication of halal by human is not trustable and not accurate because of the amount of chickens being slaughter and the slaughter process is nonstop.
ii) 1000 slaughtered chickens per hour to be check by halal inspector.
iii) Hiring the halal inspector cost lot of money.

1.6 Objectives

There are three main objectives to be achieved:

i) To authenticate the halal slaughter chicken using image processing method.
ii) To classify halal and non halal slaughtered chicken using artificial intelligence method.

1.7 Scope of Study

There are three scopes listed to ensure that the study is conducted within the boundary:

i) Use image processing toolbox in Matlab as image processing tool.
ii) Detecting regular and irregular shape of esophagus and trachea channel by using image processing methods.
iii) Classify halal of chicken slaughtering images by using artificial intelligence method.

REFERENCES

[1] Relf Christopher (2004), *Image acquisition and processing with LabVIEW*, Taylor & Francis

[2] Timmermans AJM (1998), *Computer vision system for online sorting of potplant using artificial neural network,* Acta Horticulturae

[3] Linda G. Shapiro and George C. Stockman (2001), *Computer Vision,* Prentice Hall

[4] David A. Forsyth and Jean Ponce (2003), *Computer Vision, A Modern Approach*, Prentice Hall

[5] *MS1500:2009 Halal Food – Production, Preparation, Handling and Storage – General Guidelines (2nd rev.),* SIRIM

[6] Navid Razmjooy, B. Somayeh Mousavi and F.Soleymani (2011), *A real-time mathematical computer method for potato inspection using machine vision*.

[7] Yousef Al Ohali (2011), *Computer vision based date fruit grading system: design and implementation*.

[8] M.Z. Abdullah, J.Mohamad-Saleh, A.S. Fathinul-Syahir, B.N.M. Mohd-Azemi (2011), *Discrimination and classification of fresh-cut starfruits (Averrhoa carambola L.) using automated machine vision system.*

[9] O. Alhusain, Z. Toth, A. Rakusz and B.Farkas , *Vision-based system for quality control of some food products*.

[10] Chetna V.Maheshwari, Kavindra R.Jain and Dr.Chintan K.Modi (2012), *Novel approach for quality evaluation of Qryza Savita L (rice) based on machine vision technology.*

[11] M A Gonzalez, V L Ballarin, A R Celin, M Rapacioli, JJ Lopez-Costa and Y V Flores (2011), *Development of software for digital image processing for analysis of neuroangiogenesis*.

[12] Hardik Pandit and Dr. D M Shah (2011), *Application of digital image processing and analysis in healthcare based on medical palmistry*.

[13] T. Lindeberg and M.-X. Li, *Segmentation and classification of edges using minimum description length approximation and complementary junction cues*.

[14] J.M. Aguilera, A.Cipriano, M.Erana, I.Lillo, D.Mery and A.Soto, *Computer vision for quality control in latin American food industry, a case study*.

[15] Kivanc Kilic, Ismail Hakki Boyaci, Hamit Koksel and Ismail Kusmenoglu (2007), *A classification system for beans using computer vision system and artificial networks*

[16] Doru Cioata and Cristian Iacob, *Digital image processing in medicine*

[17] Gonzales, Wood and Eddins (2008), *Digital image processing using Matlab*, Pearson

[18] Tadhg Brosnan and Da-Wen Sun (2002), *Inspection and grading of agricultural and food products by computer vision system-a review.*

[19] O.Alhusain, Z.Toth, A.Rakusz, L.Almasi and B.Farkas, *Vision based system for quality control of some food products.*

[20] Mahendran R., Jayashree GC and Alagusundaram K (2011), *Application of computer vision technique on sorting and grading of fruits and vegetables.*

[21] Chris Solomon and Toby Breckon (2011), *Fundamental of digital image processing,* Wiley-Blackwell