# FRUIT RECOGNITION SYSTEM (HARUM MANIS MANGOES)

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Tarikh: 20/7/2011

CATATAN: * Tesis dimaksudkan sebagai Laporan Akhir Projek Sarjana Muda (PSM)
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# FRUIT RECOGNITION SYSTEM (HARUM MANIS MANGOES)

CHE AMMAR FAIZAL BIN CHE HAMZAH

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

**FRUIT RECOGNITION SYSTEM (HARUM MANIS MANGOES)**

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

STUDENT : _____ Date: 28 JUNE 2011
(CHE AMMAR FAIZAL BIN CHE HAMZAH)

SUPERVISOR : _____ Date: 18/7/2011
(DR.ABD. SAMAD BIN HASAN BASARI)

**DEDICATION**

To my beloved parents, Mr. Che Hamzah bin Che Musa and Mrs. Saripah binti Saad for their expression of love and fully support…

To my supervisor, Dr. Abd. Samad bin Hasan Basari, always give me full of support and ready to lent his ears and hands to make this system complete

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## ABSTRACT

. Harum Manis mangoes are very popular in Perlis. These Harum Manis mangoes trees will produce hundred thousand tons a year. However the grading process is still doing manually. The development of Fruit Recognition system (Harum Manis mangoes) is aimed to reduce the time grading process of Harum Manis mangoes. In order to utilize the digital image during the grading process, a computer algorithm to perform image processing on digital images is applied. Besides, the Fruit Recognition System (Harum Manis mangoes) also can detect the mature mangoes to be picked. The proposed method classifies and recognizes the mature and size of Harum Manis mangoes. This method obtained by using total value of yellow color and total percentage of white area. This system also serves as a useful tool in a variety fields such as educational, image retrieval and plantation science.

# ABSTRAK

Mangga Harum Manis sangat popular di Perlis. Pokok mangga Harum Manis ini akan menghasilkan beratus ratus ribu tan mangga setahun. Walaubagaimanapun proses pengredan masih dilakukan secara manual.Pembangunan Aplikasi Sistem Pengecaman Buah (mangga Harum Manis) bertujuan untuk mengurangkan masa proses penggredan buah mangga. Selain itu, aplikasi ini juga dapat menngenalpasti mangga Harum Manis yang matang. Cara untuk mengklasifikasikan dan mengenali mangga Harum Manis matang adalah dengan menggunakan nilai jumlah warna kuning dan jumlah peratusan kawasan putih. Sistem ini juga berfungsi sebagai alat yang berguna dalam berbagai bidang seperti pendidikan, pengambilan gambar dan ilmu pertanian.

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# CHAPTER I

# INTRODUCTION

## 1.1 Project background

Computer vision system which uses image processing techniques has played a major role in the fruit packing line industry nowadays. The focus of this project is mainly on the design and development of Fruit Recognition (Harum Manis mangoes) or FR system. A new proposed system has the features analysis methods which is color-based in order to increase accuracy of recognition. The aim of this project is to design a system that can detect mature/ripe Harum Manis mangoes and grading the Harum Manis mangoes by its grade using digital image processing concept. The system is developed in order to be able to determine the diameter of Harum Manis mangoes and then sort it to two class categories: Ripe (Class A), Too Ripe (Class B). The system emphasizes on developing a user friendly graphical user interface for sorting the Harum Manis mangoes. The system firstly acquires image of Harum Manis mangoes from the web camera. Then, the acquired image will be processed to determine the mature of Harum Manis mangoes.

## 1.2 Problems statements

The problem statement is nowadays the grading process of Harum Manis mangoes are doing by manually. As a result, this system Fruit Recognition Harum Manis mangoes is build up to reduce the time of Harum Manis mangoes farmers and Harum Manis mangoes plantation agencies. Besides, they will get more profit and the mangoes can be in the good condition. Harum Manis mangoes trees can produces many tons of mangoes and it brings a problems to the plantation agencies to grade them. Plantation agencies still use manually process to grade the Harum Manis mangoes by their size. Therefore, the Fruit Recognition Harum Manis mangoes system is build to do the detection of yellow color and grading process at the same time. The system will make the grading process more effective and faster by grading the Harum Manis mangoes based on the level of yellow color.

## 1.3 Objective

Different fruit images may have similar or identical color and shape values. Hence, using size based and shape features analysis methods are still not robust and effective enough to identify and distinguish fruits images. So **the objective** of this project are.

1. To use a color-based features analysis methods in order to increase accuracy of Harum Manis mangoes recognition for grading scheme.

2. To develop a system which can offer a faster and accurate result during grading process.

3. To reduce the human error in grading process and promote ICT in agriculture industries.

## 1.4 Scope

Fruit Recognition system (Harum Manis mangoes) is developed in order to manage the grading process that is doing manually by mangoes plantation agencies such as FAMA based on its size. This system can do the grading process more effectively and faster using yellow color level detection. The Harum Manis plantation agencies can reduces their time and gain more profit. At the same time, the quality of Harum Manis will be in good condition. Besides, this system is also can promote the Harum Manis mangoes as icon of Perlis and promote the ICT for agriculture industries. Many parties will get the benefits from this system.This system also serves as a useful tool in a variety fields such as educational, image retrieval and plantation science.

## 1.5 Project significance

This project will bring benefits to Harum Manis mangoes plantation agencies and planters. With this system, only the mature mangoes will be picking up and planters will reduce their loss. After that, the mangoes will automatically grade to their class.

## 1.6 Expected output

The system should be able to processed and identify images of Harum Manis mangoes using image processing techniques. The system will perform the decision making and decide both the grading and color of Harum Manis mangoes are mature or not.

## 1.7 Conclusion

The aim of this project is to design a system that could sort the Harum Manis mangoes into sizes using digital image processing concept and detect the ripe/mature Harum Manis mangoes. This project will bring benefits to Harum Manis mangoes plantation agencies and planters.

# CHAPTER II

# LITERATURE REVIEW AND PROJECT METHODOLOGY

## 2.1 Introduction

Harum Manis mangoes are very popular in Perlis. Many planters and farm agencies planting this fruit. As a result, sometimes they produce so many tons of mangoes. There are because the buyers randomly pick up the fruits even though it is not mature/rape. By referring to this problem, an automated and intelligent system that can detect and grade the mature mangoes by using Image Processing technique via their color will be proposed. Then, the mangoes will directly grade and it will save times because before that the grading process was doing manually.

## 2.2 Facts and findings

Harum Manis mangoes trees can grow in various soil types, although it is more fertile in the fertile soil with pH 5.5-7.5. Harum Manis mango trees are very suitable in areas with a dry period (2-4 months) significantly in a year and temperature 24-30 C. Dry weather during the flowering period is the best time for fruit production. Harum Manis mangoes are produced fruit once in a year.

**i. Growth and expansion**

Harum Manis mango trees are usually planted from bud grafting, grafting a wedge or a combination of approaches to ensure that goods produced will be exactly according to its nature and bear fruit earlier. Grafting trees began to bear fruit within 3-5 years, grown from seed bear fruit at the age of 6-10 years.

**ii. Fruits**

Harum Manis mango fruit depends on a long stalk out of the tree canopy. The fruit is of great DRUP types, range in size from 5-22 cm long. Fruit is kidney-shaped, round oval or (rarely). The skin is yellow or green.

### 2.2.1 Domain

This project can be catagorized 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

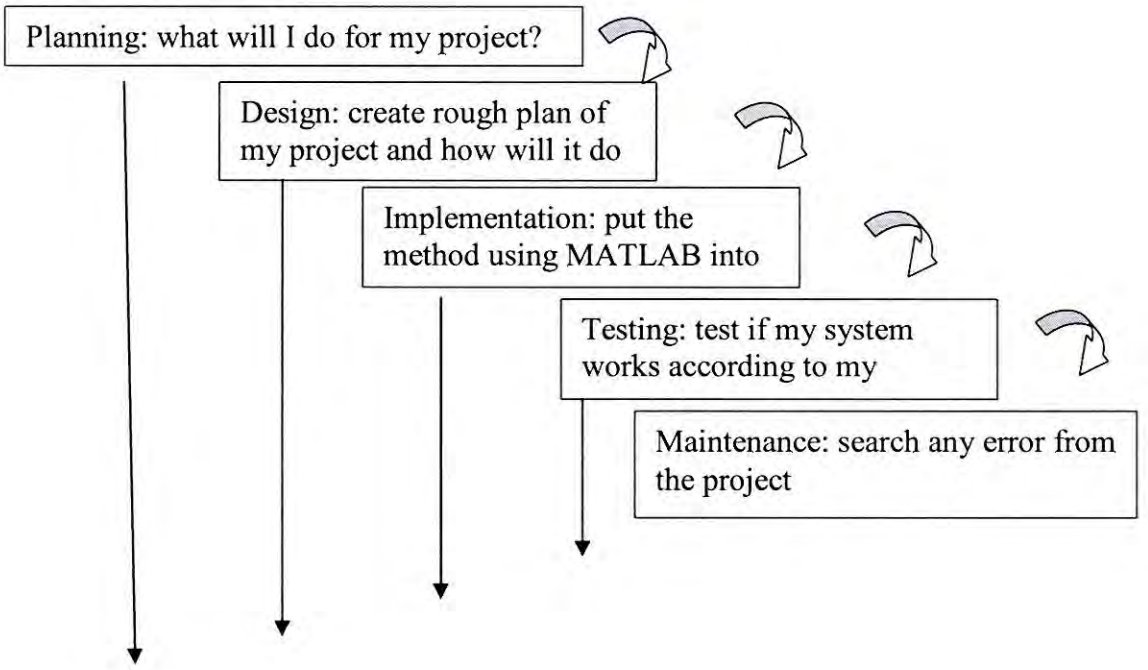
There are several research has been done to detect and identify size of fruit based on color, texture and shape. Meanwhile, this project is to identify the yellow color of the ripe/mature Harum Manis mangoes and ready to be picking up. After

that, grading process will be start. In this grading process, it will base on the size of the mangoes to class them into three class such as A and B. Class A is for ripe mangoes, Class B is for too ripe. By using C*olor Detection* approach in an image, the system will detect yellow color in the picture.

### 2.2.3 Technique

Color image processing also useable to differentiate objects inside a picture. The problem with this project is Harum Manis mangoes have the same color with thing around it such as its leaves. In grading process, binary image of Harum Manis mangoes will give the percentage of white area. Before that, bounding box will be use to determine which area that will be calculate. As a result if the percentage is above fifty percents means too ripe mangoes.

## 2.3 Project methodology



### 2.3.1 Approach

Hence, Object-Oriented Analysis and Design had been chose as project methodology, a method to design and build large programs with a long lifetime. Object Oriented Analysis and Design is often part of the development of large scale systems. This methodology is a closer to the way problems appear in life. In terms of object or concept and relations between concepts, it is easy to modeling simplified with object-oriented because this system have objects and relation. Object-oriented analysis and design is an approach that models a system as a group of interacting object.

### 2.3.2 Model

The Fruit Recognition System (Harum Manis mangoes) project life cycle will be using Prototyping is a series of process that develop an information system which gathers information and gives the related output? This prototyping was choose because this technique is quite simple or easy to implement and even though there are any changes and correction during developing a system.

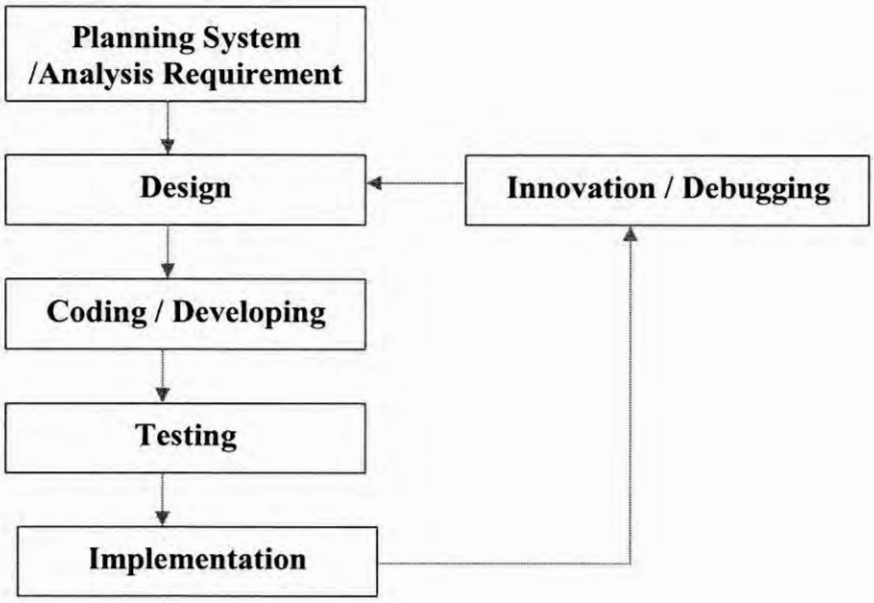



**Figure 2.1: Instructional design**

The first phase of the project is planning and analysis. In this phase, I try to study and solve of the problem statement. As a result, this phase is to achieve objective of system development. Besides, I collect all the data and information that needed in this project. Before the work plan is drafted, project's feasibility is analyzed which will used as a guidance in making decisions and identifying risks associated with the project objectives. Analyzed is developed to get enough information from FAMA and lecturer regarding to the manual system of grading Harum Manis mangoes so I try to understand on current systems.

**i. Design phase**

In design phase, it started where development of Fruit Recognition System (Harum Manis mangoes) project is begin and many activities planned are carried out. All design activities is done in this phase including of milestone project, software requirement, hardware requirement, infrastructure, interface design, program function and any task that will achieve the project objective. I design the interface using MATLAB 2009a

**ii. Coding / Developing phase**

During coding phase, the code is developing for this system. It is develop using the programming language that had been planned. I choose MATLAB coding to develop the system. The coding is coded based on the technique that planned (Image Processing tools) as the main function.

**iii. Testing phase**

Testing phase is proceeding after coding phase. It will test into the user and all the task will review to process a system also detect any weakness coming from project. There are a few techniques use to test the system such as Unit Testing, Data Testing, System Testing, Black Box Testing, White