CLARIFICATION OF MUSK LIME BASE ON COLOR

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ABSTRACT

Clarification of musk lime base on color can directly gain to marketing company because grading process must when it comes to exporting such materials. In the Malaysia, this type method of grading for musk lime is not used which cause imbalance in marketing as the price of the musk lime varies with the grade. Therefore, this system carried out to develop a prototype judging the musk lime maturity and to estimate the expiry date of musk lime by their color. Software development life cycle methodology was implemented in this system design by using several image processing techniques including image acquisition, image enhancement and feature extraction. Seventy four sample data of musk limes were collected during image acquisition phase in the format of RGB color image. The grading systems use a computer and capture the image of musk lime using wed cam. Then, it the background of the image removed by using averaging filtering techniques. Next, RGB color information is changed to HSV color information. The values are then being used as information for determining the maturity and estimate expiry date of musk lime.

ABSTRAK

Pengagihan limau kasturi mengikut warna boleh mendapat manfaat secara langsung kepada syarikat pemasaran kerana proses pengedaran ketika mengeksport limau kasturi. Di Malaysia, kaedah jenis ini tidak digunakan untuk penjualan limau kasturi yang menyebabkan ketidakseimbangan dalam pemasaran sebagai harga limau kasturi berbeza dengan gred. Oleh itu, sistem ini dijalankan untuk membangunkan prototaip menilai kematangan limau kasturi dan untuk menganggarkan tarikh luput limau kasturi dengan warna. Kaedah kitar hayat pembangunan perisian telah dilaksanakan dalam reka bentuk system ini dengan menggunakan teknik pemposesan imej beberapa termasuk pemerolehan imej, peningkatan imej dan penyarian sifat. Tujuh puluh empat data sampel limau kasturi dikumpul semasa fasa pengambilhan imej dalam format imej warna RGB. Sistem penggredan menggunakan computer dan menangkap imej limau kasturi menggunakan camera. Kemudian, latar belakang imej yang dikeluarkan dengan menggunakan purata menapis teknik. Seterusnya, maklumat warna RGB ditukar kepada maklumat warna HSV. Nilai-nilai ini kemudiannya digunakan sebagai maklumat untuk menentukan tarikh matang dan anggaran lupusan limau kasturi.

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CHAPTER I

INTRODUCTION

This chapter briefly describes the clarification of musk lime base on color that will be developed later. This chapter comprises six sections: The first section describes the background of the project. Second section describes defines the word commonly use in this project. The third section describes the problem statement and motivation of the project. The fourth section describes the objectives for the project. The fifth section describes the scopes for the project. The sixth section explained the outcome of the project. Finally the thesis organization is described in section six.

1.1 Background

Malaysia is one of the leading economies of the ten ASEAN Countries, and is achieving steady growth. The main contributions are from Agriculture sector. Agriculture in this country has been strongly supporting the economy by specifically on plantation crops, to which Malaysia has put the heaviest weight compared to its Asian neighbors. From the observation, application of information and technology in agriculture has help to improve this sector. More specifically, e-Agriculture involves the conceptualization, design, development, evaluation and application of innovative ways to use information and communication technologies (ICT) in the rural domain, with a primary focus on agriculture. ICT help this sector by providing system must be in user-friendly form, easy to access, cost-effective and well protected from unauthorized accesses. This research focus on musk lime in agriculture sector.

In Malaysia musk lime which is known as 'limau kasturi' is used mostly as refreshments and beverage because of its distinctive flavor. It is classified in the Rutacea family which includes several other important fruits such as oranges, mandarins, limes, Clementine, lemons and grapes. Musk lime plants are characterized by a spiny or thorny stem, green and leathery leave, and clusters of small and aromatic white flowers. The fruit, which is similar to the lemon, is juicy, acidic, and typically green or yellowish green even when mature (but will turn yellow like the lemon if exposed to a cool winter environmental conditions). The lime fruit tends to be smaller and rounder (globular) than the lemon, and with a sweeter and more acidic pulp and a thinner rind. It also has discovered that this beneficial effect derived from the quantities of vitamin C the fruit contains. The products of musk lime in industries are perfumes, iced tea or a soft drink, cleaning products, and aromatherapy.

In current industry, musk lime is not classified into grad it delivers to market and factory to process. Indirectly, it causes loss to the musk lime industry and farmers. Other than that, the absence of classifying system causes the limes not to be exported to foreign country. Musk lime can be classify using manual method by human power but will leads to error. By using, ICT application (Image processing method) can develop a user friendly system to categorize the musk lime. The classified musk lime can sell with different prices in market and may export to the foreign country.

In 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. There are several steps involves to develop system by using this method: - Image acquisition, Image enhancement and Feature extraction. This system can help to gain marketing company and exported to foreign countries.

1.2 Definition of terms

I. ICT - Information and communication technologies
II. Agriculture - the cultivation of animals, plants, fungi and other life forms for food, fiber, and other products used to sustain life.
III. Musk lime – type of lime
IV. UMP – University Malaysia Pahang
V. Judgment – decision making
VI. RGB – Red Green Blue
VII. HSI – Hue, Saturation, intensity

1.3 Problem Statement

In the industrial scale, this type method of grading is not used either manually or using sophisticated system. Directly or indirectly it will cause imbalance in marketing, as the price of the musk lime varies with the grade. Furthermore, the absence of classifying system causes the limes not to be exported to foreign country. Grading is a must when it comes to exporting such materials. As the result, it will cause gain to marketing company.

Comparing the manual and automatic process of categorizing the limes, manual process requires a lot of human power. The problem faced if the manual process carries out to categorized musk lime is a lot human power needed to identity each of the fruit. Since, the musk lime small in size it will take time and fruits will delay to market. Other than that, judgment of musk lime color grading by human eye can leads to error. Sometime, the tiredness, stress of the worker can cause this problem. Furthermore, the classification of musk lime by human eye also not standard accusation. Human vision has limited ability in differentiating similar colors like dark green, light green, yellowish and yellow.

1.4 Objectives

There are several objectives to be achieved in this project:

I. To develop a prototype for judging the musk lime maturity base on their color.

II. To estimate the expired date of musk lime by their color.

1.5 Scopes

There are some restrictions in this project. First of all, the maturity musk lime is judged by color. The size of musk lime should be small within (3-6 centimeters in diameter). During image capturing process there should be a fixed length between the camera and the musk lime (~50mm).This process includes seventy four samples of musk lime. This project will be completed by using Matlab R2010a as the development platform. The healthy musk limes without injured will the outcome of this project.

1.6 Significance of the study

Basically, this project helps agriculture industry to increase product where musk lime companies earn more by classification the fruit into grad. The classified musk lime can sell with different prices in market and may export to the foreign country. Directly or indirectly, the present of this system in agriculture industry farmer get more benefit. This is because farmer can reduce human power in the musk lime farm for the clarification process.

1.7 Thesis Organization

Chapter 1 included background of the study, definition of term, problem statement, and objective, scope of study and significance of the study. The background of the study explains general information on musk lime. The subchapter 'definition of terms' defines the term commonly used in this documentation. While the problem statement discusses the possible problems that need to be overcome throughout this project, the problem faced by musk lime industry explains in problem statement subtitle. The main purpose and aim of this project is elaborated under objective. Scope of the study explains the characteristic of musk lime that will be required for this project. At lastly, significance of the study explained outcome and benefit of the project.

CHAPTER II

LITERATURE REVIEW

This chapter briefly describes the review on existing techniques related with clarification of musk lime base on color. This chapter comprises five sections: The first section explained more briefly about musk lime. In the second section, describes details on color separation. The third section describes the comprehensive review on existing related systems. The fourth section explained current flow system in industry. Next, fifth section describes new system that will proposed to the industry. Finally, conclusion gives a summary on this chapter.

2.1 Introduction

In the Malaysia, there are certain limes that can found in Malaysia: - lime (Citrus Aurantifolia), musk lime (Citrus Microcarpa), kaffir lime (Citrus Hystrix)

and pomelo (Citrus Gradis) [3]. Calamondin or culomansi (scientific name : citrus microcarpa) is a fruit tree in the family Rutaceae that was developed in and is very popular throughout Southeast Asia, especially the Philippines, where it is most commonly used for cooking [1]. Musk lime consists of vitamin C which good for health. The usages of musk lime in daily life are [4]:-

a) To avoid dandruff
b) To wash silver things
c) Beauty of skin and body
d) To clean leg from bad smell
e) To wash rust on the cloths

Basically, computer vision system can recognize the fruits base on four features textures, color, intensity and size. Normally, by increasing the features used, the performance of the methods proposed can be increased. Moreover, both surface information (color and texture) and geometry information (size and shape) of food products in images play a significant part in defect detection and class discrimination [14]. Color features have been extensively applied for apple quality evaluation mostly for defect detection. For instance, color features of each pixel in images obtained in three components of RGB spaces could be successfully used to segment defects on ‘Jonagold’ apples [6][7].

Nowadays the market need high quality products within a short time, automated grading of agricultural products is getting special priority among many farmer associations. In order, to solve this problem the system (detector of musk lime) plays an important role of quality control for agricultural products. Regarding there is some journal has been taken from seniors and internet. There are development of a lemon sorting system based on color and size, color grading in tomato maturity estimator using image processing technique, Automated oil palm fruit grading system using artificial intelligence, Fruit recognition using color and texture features and Eggshell crack detection system. In this chapter, there are two related systems selected to do some research:-

a) Color grading in tomato maturity estimator using image processing technique [8].

b) Automated oil palm fruit grading system using artificial intelligence [9].

c) Objective color measurement of tomatoes and limes [10].

2.2 Overview

Color provides valuable information in estimating the maturity and examining the freshness of fruits & vegetables. Color is one of the most significant criteria related to fruit quality. It indicates the parameters like ripeness. The adaptation of human eye to small changes in color and the effect of the background on the perceived color, type of illumination, viewing angle are some of the main sources of error. Hence it is hard to provide precise guideline for visual inspection of fruits based on color. The system can offer the solution for these problems [15 – 18].

Limes turn yellow when ripe. While limes grow as a green skinned fruit, they will actually turn yellow when fully ripe. Their sugars increase and they are quite delicious [2].

Limes start out are green. They turn yellow when first ripe (Extremely ripe Meyer limes actually take on an arrange hue. Once mature, most varieties will hang on the tree of several months slowly growing larger on developing thicker skins [2].

Table 2.1 Musk lime color descriptions

Category	Description
Dark green	Unripe musk lime, 90% green, 10% black
Green	Start ripe , musk lime ready to plug, 100% green
Yellowish	50% Green, 50% yellow
Yellow	Ripe musk lime, 100 % yellow

The musk lime that export to market and factory must have some specification:-

I. Size
II. Skin color
III. Clean
IV. Free from injury or disease
V. Texture of musk lime free damages

2.3 Exiting case study

2.3.1 Color grading in tomato maturity estimator using image processing technique [8]

This study conducted by W. Md. Syahrir, A. Suryanti, C. Connsynn on 2008. They are form Faculty of Computer Science and Software Engineering, University Malaysia Pahang. This study is carried out to helping the growth of Malaysia's tomato industry by enhancing the process of manpower color grading into the era of machine vision color grading in order to compete with the same industry globally. This related study will describe the techniques that have been used.

2.3.1.1 Method

This system develops using image processing techniques which is image acquisition, image enhancement and feature extraction. The flow chart of the process is shown in figure 2.1.

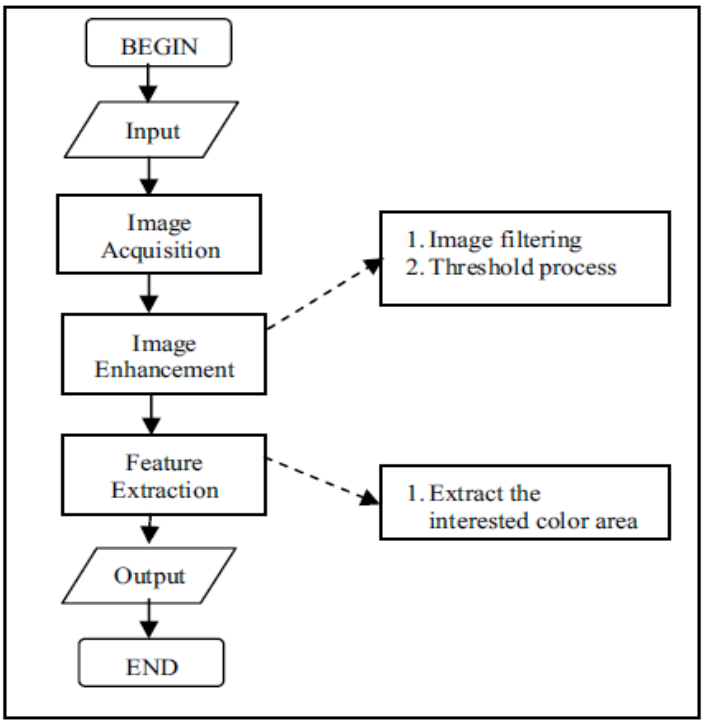

Figure 2.1 Overall processes in tomato maturity estimator

In the first phase, 50 tomatoes were used as sample data in the testing phase of this project development. All tomato samples had gone through the phases of the prototype of that system that has produced output, mainly image acquisition, convert an image into grayscale image, filtering, threshold and features extraction.

Image acquisition is the first process in the system development. The images were captured by placing a PC camera at approximately 100mm on the top of the tomato, by using same background and same visible light condition. Next step is Image Enhancement. The purpose of image enhancement is to highlight certain features of interest in an image. The background of the image considered as noise in this system, thus removing the influences of background is necessary. Two types of image enhancement technique in Spatial Domain methods had been implemented which are image filtering and threshold process in order to remove the influence of image background.

Features extraction is to extract the information of the interested area in the image for further usage in processing the image. a* values of the tomato color is the interested area in this process. After the influence of the image background has been removed, the total of a* values are collected and sum up. The sum of total a* values will then be used to get the mean of a* values. In details, several processes under feature extraction are to be undergo by the image which including boundaries tracing, removing background and obtaining a* values. The expired date of tomato is determined base on the storage life shown in figure 2.2.

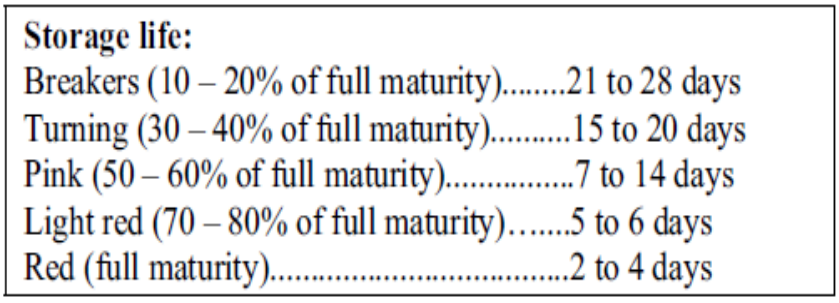

Figure 2.2 show the tomato storage life time.

2.3.1.2 Advantages and disadvantages of the system

By using this system, the prototype was able to estimate the expiry date of the tomatoes which is not even available yet in the Export Market Process, where this can increase the product of tomato in market with different size. Furthermore, the prototype provide a better alternative compared to using manpower in determining tomato maturity, the machine will not prone error due to tiredness or bias.

The disadvantage of the system is the prototype can only process one tomato for each process. The worker has to scan the tomato one by one where it will take time. The packaging process will be late and local market will late receive the product. Next, the prototype was not able to differentiate tomato with other fruits or vegetable.

2.3.2 Automated oil palm fruit grading system using artificial intelligence [9]

This study conducted by Z. May, M. H. Amaranon 2011. They are from Electrical and Electronic Engineering Department, University Teknologi Petronas.This related study will describe the techniques that have been used.