UNIVERSITI PUTRA MALAYSIA

APPLYING YUV COLOR MODE IN COLOR IMAGE PROCESSING BY USING JAVA SWING

SAWSAN KAMEL SHARIAH

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By

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Thesis Submitted in Fulfilment of the Requirement for the Degree of
Master of Science in the Faculty of Engineering
Universiti Putra Malaysia

September 2001

This work is dedicated to the memory of
my
Late father Dr. Kamel Shariah
God rest his sole.
Whom I miss so much
My lovely mother
for her everlasting love
and
My father in law
Dr. Ismael Abu Shariah
For his endless love
And care

Abstract of thesis presented to the Senate of University Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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Chairman: Abd. Rahman Ramli, Ph.D.

Faculty: Engineering

One of the most exciting new areas in computer technology is the development in color image processing field. Image processing is used to improve the visual quality of an image.

Jaguar Java Software is a GUI (Graphical User Interface) software, powerful yet very simple to use, provides the means to filter color images in RGB Color space and YUV Color space, to produce high quality filtered images. YUV Color space model proved to filter images in a smooth way without loosing any data, only enhancing the image structure. Different images were applied, and satisfactory results were obtained of multi-applications objectives.

Swing was used as the main programming language, which is part of the Java Foundation Classes (JFC) library. It offers much improved functionality as new components, expanded component features, better event handling.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

APLIKASI MODEL WARNA YUV DALAM IMEJ BERWARNA DENGAN MENGGUNAKAN JAVA SWING

Oleh

SAWSAN KAMEL SHARIAH

September 2001

Tuan Pengerusi : Abd. Rahman Ramli, PhD

Fakulti : Kejuruteraan.

Salah satu perkara yang paling menarik dalam teknologi komputer ialah pembangunan warna dalam bidang pamprosesan imej. Pamprosesan ini penting untuk meningkatkan lagi kualiti visual dalam imej.

Perisian Jaguar Java ialah perisian GUI (Graphical User Interface), yang sering diguna Ia depat menapis warna imej dalam RGB dan YUV, untuk mengeluarkan imej yang berkualiti tinggi. YUV model telah terbukti tanpa kehilangan data, akan tetapi dapat meningkatkan struktur imej tersebut. Imej-imej berlainan diuji, dan keputusan yang memuaskan dapat dicapai.

Perisian Swing telah digunakan sebagai perisian utama, yang mana serupakan sebahagian dari pustaka JFC (Java Foundation Class). Ia memberi banyak kelebihan sebagai komponen baru, yang dapat dipertingkatkan untuk memberi banyak kemudahan kepada penggura.

ACKNOWLEDGMENTS

I wish to express my deepest gratitude and sincere to my supervisor Dr. Abd. Rahman Ramli for supporting me in his philosophy and for his guidance and supporting with his scientific knowledge throughout the course, until this research reached the best form.

I would also like to extend a personal word of thanks and greatest appreciation to Dr. Mahmud Hassan, and Dr. Veeraraghavan Prakash, my research co-supervisors, for their discussion comments and encouragement. I am grateful to Dr. Borhanuddin Mohd Ali, Dr. Mohammed Faruqi, for their guidance and advice during my courses.

A special thanks goes to my husband Ph.D candidate Mohammed Ismael Abu Shariah, who provided me with his comment in the CDP seismic reflection subsurface sections, by using Jaguar Java Filters, and was patient enough to complete this research successfully, to him I hold a deep gratitude.

My warmest thanks are paid to my kids, Al-Yasmin, Al-Lieth, Al-Reem, and Al-Leen for being so lovely and patient during my study, until they reached the level of being only satisfied with computer applications and Java programming associated with mom.

I would like to express my deepest thanks and gratitude to my father in law Dr. Ismael I. Abu Shariah, Public service Department Malaysia (Malaysian Technical Cooperation Program, MTCP), Mr. Adnan Abdon (JPA), Mr. Zinal Abdian (JPA), Mrs. Zawiah (JPA) for providing me the financial support and their valuable help during my study.

The last but not the least, my warmest thanks are paid to my loving Mother, A warm thanks and appreciation I hold to my Father in law Dr. Ismael Abu

Shariah, and my Mother in law, for their love and patient they provided me with. I would also like to extend my thanks to my brothers, sister, brothers in law, sisters in law, and my class mates during my study, Mr. Radwan, Miss Saraswathy, Mr. Abu tasnim, Mr. Mohammed Suleiman, Mr.Adi Azmir, Engineering Faculty staff, and GSO staff, to all I hold my graduated.

I hope for all Malaysian people Happiness and health, for their endless hospitality they provided us with during our stay here in Lovely Malaysia.

CONTENTS

LIST OF FIGURES

ABBREVIATION

AWT : Abstract Windows Toolkit.

Brightness: The attribute of a visual sensation according to which an area appears to emit more or less light.

Chromaticity: Chromaticity diagrams provide a graph of all possible colours for a given system with luminance removed.

CIE : Commission Internationale de L'Éclairage. An international organisation that deals with standards and other matters related to colorimetry.

CMD: Common Mid Depth Point reflection technique.

CMY : Cayan –Magenta-Yellow

Gamut : The gamut of colors is all colors that can be reproduced using the three primaries The Lab gamut covers all colors in visible spectrum.
The RGB gamut is smaller, hence certain visible colors (e.g. pure yellow, pure cyan) cannot be seen on monitors The CMYK gamut is the smallest (but not a straight subset of the RGB gamut)

GUI: Graphical User Interface

JFC : Java Foundation Classes

JVM Java Virtual Machine

International Commission On Illumination : As its name implies, the International Commission on Illumination – abbreviated as CIE from its French title Commission Internationale de l'Eclairage - is an organization devoted to international cooperation and exchange of information among its member countries on all matters relating to the science and art of lighting.

Lab model: A refined CIE model, named CIE L*a*b in 1976 Luminance: L Chrominance: a -- ranges from green to red, b – ranges from blue to yellow .

NTCS : National Television Communication System.

PAL : Phase Alternation Line.

RGB : A colour specification system that allows a colour to be specified by providing its red, green, and blue components. This system assigns a linear relationship to all of its colours.

RGB Colour Cube: RGB Colour Cube: The three-dimensional unit cube bounded by (0,0,0) (black) and (1,1,1) (white) with all possible colours of an RGB colour system graphed in between.

SECAM : Sequential Couleur Avec Mémoire or Sequential Colour with Memory.

SPD : Spectral Power Distribution.

VOD: Video-on-demand

CHAPTER ONE

INTRODUCTION

1.1 Introduction

As our society becomes more graphically oriented, Image Processing is becoming a widely acknowledged and very extensive field. One does not have to be a scientist or an engineer to be exposed to image processing. Its applications range from space exploration and remote sensing to document processing and desktop publishing. Even eyeglasses can be considered as a form of image processing.

Image acquisition and processing were once performed exclusively by industry. Image processing has been used for the processing of pictures returned from deep space, as a tool for investigations of Earth's resources, Earth-based astronomy, weather prediction, automated inspection, and robotics-to name just a few applications. The acquisition, manipulation, analysis, and display of images have required an extensive mathematical background to understand and apply the complex algorithms to which image data was typically subjected (Huss, 1999).

For years, the color image processing science confidently predicted that ubiquitous, high performance, powerful applications for enhancing images was just around the corner. After several delays, this visual enhancing computing environment is finally a reality. It is now possible to improve the visual appearance of images to a human viewer and prepare images for measurement of the features and structures present, by just a click built in a highly powerful application.

The color processing software being built by using Java Swing deals with filtering images in two colors space to get the best possible filtered image. It may help to recall that colors image processing, like word processing, does not reduce the number of data present, but simply rearranges it. Some arrangements may be more appealing to the senses, and some may convey more meaning, but these two criteria may not be identical nor use identical methods.

1.2 Objectives

- Implementing a color image-processing program to provide the user with a basic knowledge of the fundamental techniques of color image filtering.
- Providing the user with an easy to use graphical user interface (GUI), where the user can filter images in two different color spaces, and define the better result for the application.
- Conversion of color image in two different types of formats RGB and YUV
- Generating a histogram of the image being filtered.

1.3 Software Methodology

1.3.1 Language and Platform

The programming Language chose to build with this software was Java. Java is a programming Language that is well suited for designing software that works in conjunction with the Internet. It is also an object-oriented programming language making use of a methodology that is becoming increasingly useful in the world of software design. Additionally, it is a cross-platform language, which means its programs can be designed to run the same way on Microsoft Windows, Apple Macintosh, and most versions of UNIX, including Solaris (Figure 1.1). Java extends beyond desktop to run on devices such as televisions, wristwatches, and cellular phones. JavaStation, Sun's network computer runs the JavaOS operating system and is optimized for the language, (Lemay, 1999).

1.3.2 Java's Architecture

Java's Architecture, shown in (Figure 1.2), consists of a two steps procedure, to run a program:

First, a programmer writes a Java source code and compiles it. The Java compiler (javac) creates an intermediate code, called Byte Code. The Byte Code is an intermediate code, not a specific code for a specific machine; it runs on an abstract machine called the Java Virtual Machine (Java), that is why the code can run in any Java enabled machine. It is sufficient for a

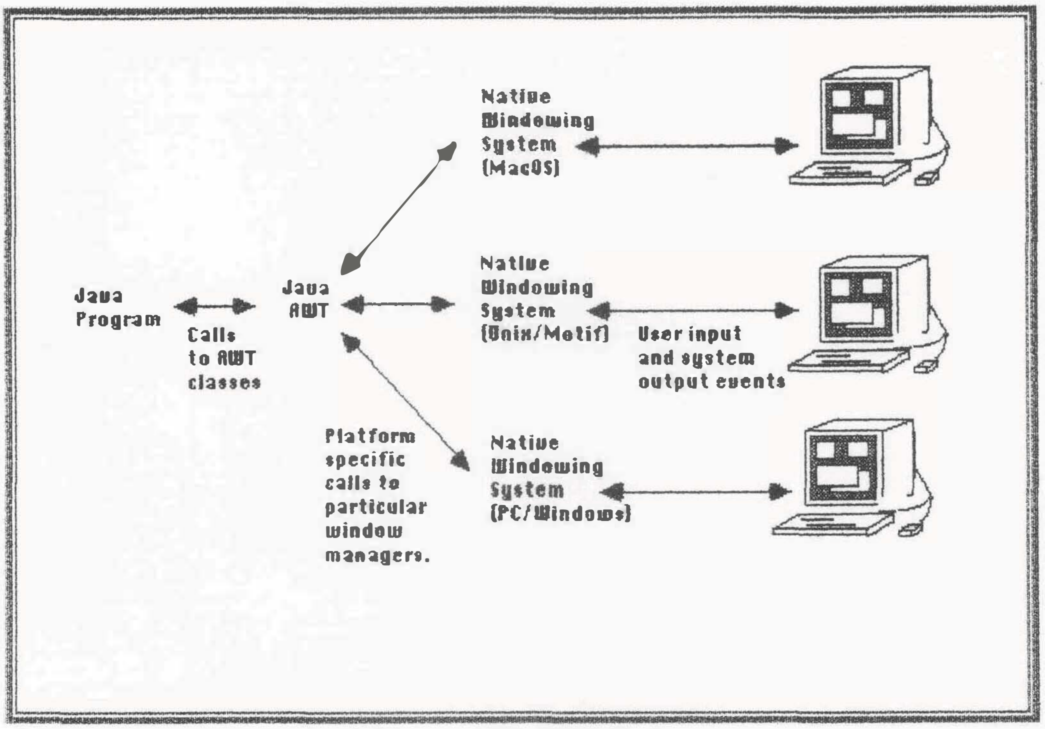
Native Windowing System (MacOS)
Java Program
Calls to AWT classes
Java AWT
Native Windowing System (Unix/Motif)
User input and system output events
Platform specific calls to particular window managers.
Native Windowing System (PC/Windows)

Figure 1.1: Java is a cross platform programming language.

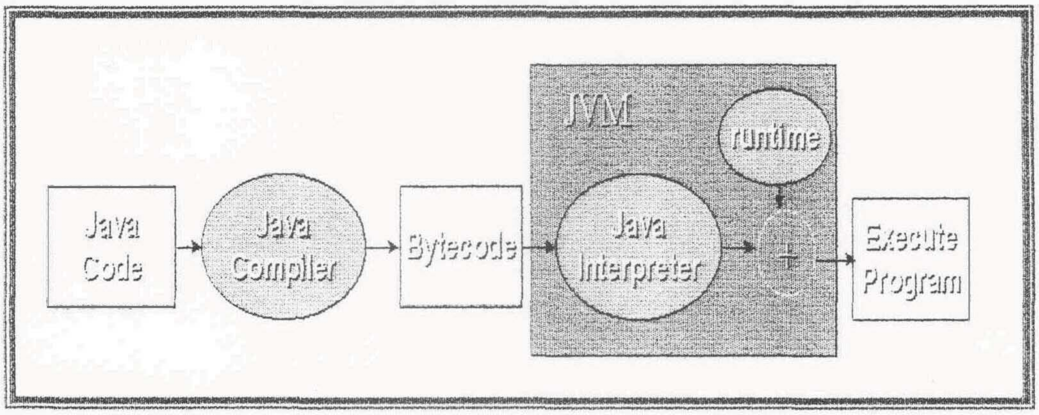

Figure 1.2: The Java Architecture