Analysis of Various Color Image Models with Thermogram Image Techniques for Medical Images

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***Abstract* -** In the present day almost every Image is coloured. It adds life to painting, photography or a film. The motivation for use of color is it is powerful descriptor that often simplifies objects identification and extraction from scène and human can separate thousands of color shades and intensities ,compared to about only two dozen shades of gray. Hence it becomes important to study various color image models and compare with Thermogram image color. Subsequently the medical field required to use color image technique for various reasons like it is possible to improve contrast of color image for better interpretation, sharping details of an image to progress the visual representation, sharpen the edges to increase the contrast between doubtful regions and the background so that the doctors can diagnose and treat human diseases. In this paper a survey of various color image techniques is studied to focus on the development of color image processing in medicine and health care. it is the aim for examining all the methods in color image in digital image processing.

***Keywords* -** Color Image, Digital image processing (DIP), Thermogram image, Color Models.

I. INTRODUCTION

Color Image processing is a subject involves procedures which simplifies objects extraction and identification in the given image and human can perceptual sense of light in the visible range incident to retina. Color image is understood by the following properties

- Physical properties of light which gives rise to color.
- The nature of human eye and the way in which it detects color.
- The nature of human vision perceived by brain.

Color image processing is very important for two reasons.

1. Humans can distinguish between thousands of shades of color as compared to 20-30 shades of grey.
2. Color is very important feature for objects identification and extraction from the scene

Color can only exist when three component are present a viewer, an object and light. Light enters the eye is absorbed by cones. These signals are transmitted to brain which interprets and perceives color as shown in the fig1. Mechanicas of color processing by human brain is not completely understood but physical nature of color can be formally expressed and modelled.

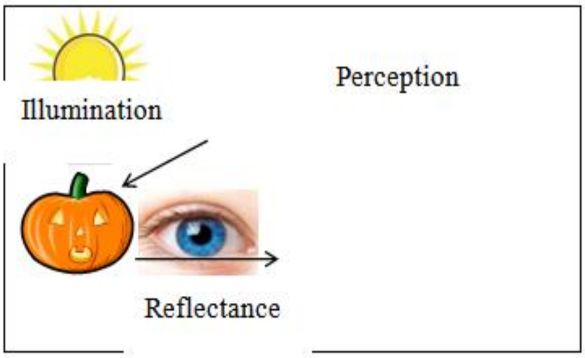


Figure 1: Image information Model

II. COLOR FUNDAMENTAL

In 1666 Sir Isaac newton discovered that when a beam of sunlight passes through a glass prism, the emerging beam of light is split into a spectrum of colors. Pure white light perceived as colorless, it actually contains all colors in the visible spectrum as below

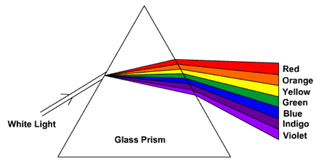


Figure 2: Color Spectrum visible by passing white light through prism

In Electromagnetic radiation different color correspond to radiation of different wave length (λ).Intensity of each wavelength is specified by its amplitude. Electromagnetic spectrum ranging from approximately 400 to 700 nano meters in wave length as below figure

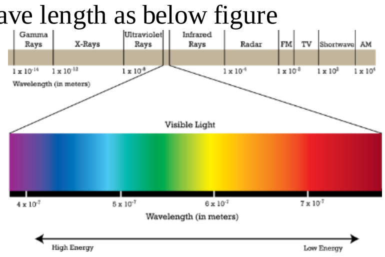


Figure 3: Visible range of electromagnetic spectrum

1. For an achromatic (monochrome) light source there is only one attribute to describe the quality intensity

2. For the chromatic light source ,there are three attributes to describe the quality:

Radiance: Total amount of energy flow from a light source (watts)

Luminance: Amount of energy received by an observer (lumens)

Brightness: Intensity

Human's eyes have retina which is made up of specialized cells which will convert received light into neural impulses. The important cells are cones and rods.

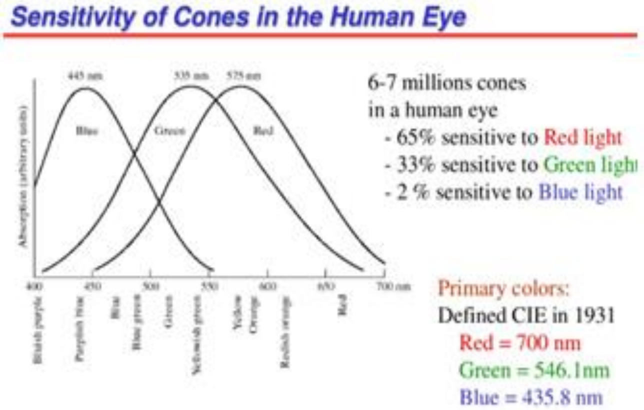


Figure 4

Rods are responsible for monochrome night vision, scotopic vision, peripheral vision and vision in low light levels are responsible for gray scale vision. Cones are responsible for color (red , blue, green).International Commission of Illumination (CIE) standard definitions Blue is 435.8nm,Green is 546.1nm and Red is 700nm defined in 1931 doesn't match human perception

III. PRIMARY AND SECONDARY COLORS

Primary colors are Magenta, Cyan and yellow. Secondary colors are Red, Green and blue

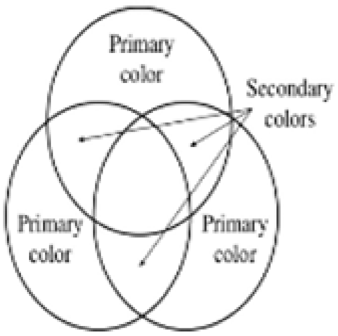


Figure 5

IV. COLOR MODEL

Color by definition a 3D coordinate system and a subspace that contains all constructible color with in a particular model. A color model is an abstract mathematical model describing the way color can be represented as tuples of number, typically as three or four values or color components. Each color model is oriented towards either specific hardware or image processing application. Any color that can be specified using a model will correspond to a single point within the subspace it defines

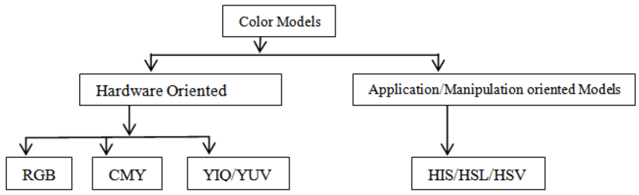


Figure 6:Color Model

V. HARDWARE ORIENTED MODELS

These color models are used in applications related to hardware such as in monitors, printers, color TV etc.

1. RGB color model - This model is used in image acquisition and display devices such as monitors, video cameras, scanners etc.

2. CMY - color model is used in coloring printing

3. YIQ/YUV - This color model is used in color TV broadcast where Y is the luminance components and I,Q are chromatic component

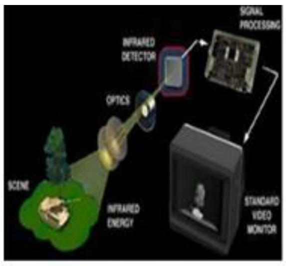
VI. MANIPULATION/APPLICATION ORIENTED MODELS

This model describes colour in terms of how it is perceived by human eye and thus more intuitive in manipulating colors. This model is used for in image manipulation algorithms.

VII. THERMOGRAM IMAGES

Images taken by Thermography camera are called Thermogram Images. Thermographic camera detect radiation in long infrared range of the electromagnetic spectrum around the range from 9,000 to 14000 nanometres and produce image of the radiation .Image of Thermogram are as follows

Thermogram Image



Thermal Imaging System

VIII. APPLICATIONS

Colour models are used for Improving and identifying the objects of images. The applications of colour model are Aerial imaging, Satellite imaging, Medical imaging, Digital camera application, Remote sensing. Colour models are used in many areas such as forensics, Astrophotography, Fingerprint matching, etc. Colour models are applied to images and videos help the visually impaired in reading small print, using computers and television, and face recognition. Color contrast enhancement, sharpening and brightening are just some of the techniques used to make the images vivid. In the field of e-learning, colour models is used to clarify the contents of chalkboard as viewed on streamed video; it improves the content readability. Medical imaging uses this for reducing noise and sharpening details to improve the visual representation of the image. This makes colour model a necessary aiding tool for reviewing anatomic areas in MRI, ultrasound and x-rays to name a few. In forensics colour is used for identification, evidence gathering and surveillance. Images obtained from fingerprint detection, security videos analysis and crime scene investigations are enhanced to help in identification of the culprits and protection of victims.

IX. EXPERIMENTAL RESULT

All the Algorithms are implemented in MATLAB R2017b tool which are at the END. The Algorithms which are implemented are

Colour models	RGB Model	HIS model
YIQ model	Pseudo colour image processing	Contrast enhancement of colour image
Smoothing and Sharpening of colour images	Noise of colour image	Noise of colour image

X. CONCLUSION

Colour image enhancement algorithms offer a wide variety of approaches for modifying images to achieve visually acceptable images. The choice of such techniques is a function of the specific task, image content, observer characteristics, and viewing conditions. Most of the techniques are useful for altering the RGB values of individual pixels and hence the overall contrast of the entire colour image. But they usually enhance the whole image in a uniform manner which in many cases produces undesirable results. There are various techniques available which produce highly balanced and visually appealing results in a diversity of images with different qualities of contrast and edge information and it will produce satisfactory results.

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XII. REFERENCES

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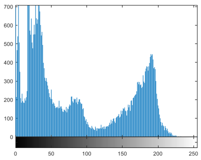
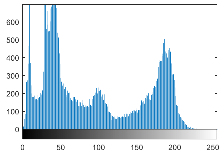
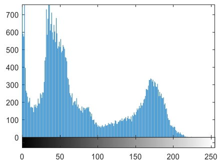
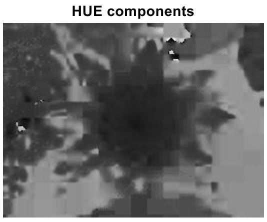
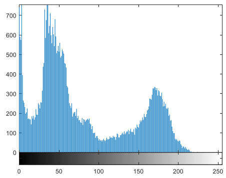
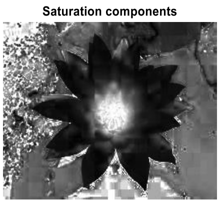
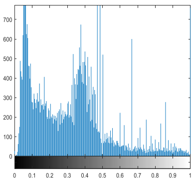
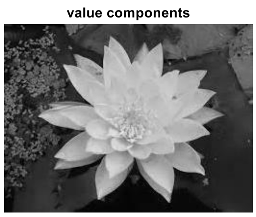
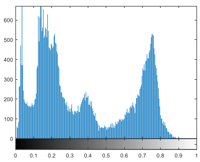
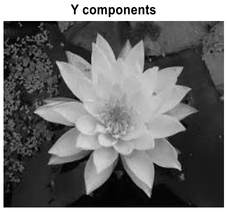
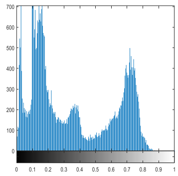
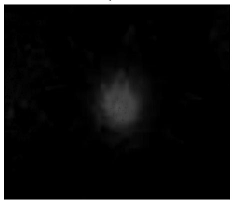
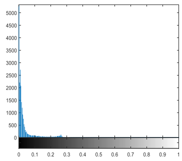
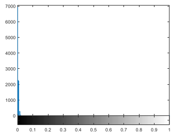
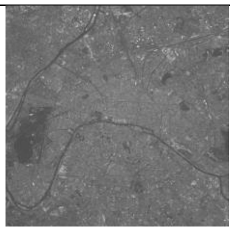
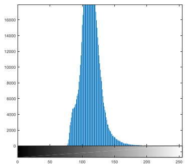
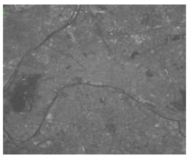
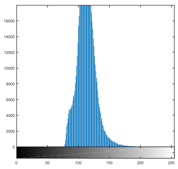
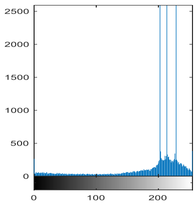
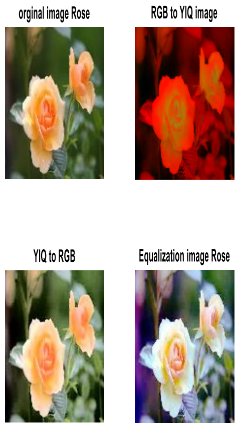
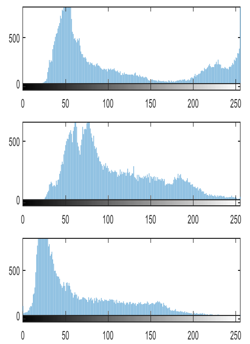
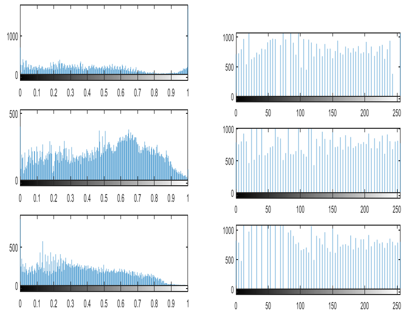
Algorithm	**Original Image**	**Color model**	**Histogram**
Red component separation	 Lilly flower color image		 Histogram of Red component of the processed image after execution
Green component separation	 Lilly flower color image		 Histogram of Green component of the processed image after execution
Blue component separation	 Lilly flower color image		 Histogram of Blue component of the processed image after execution
Hue component Separation	 Lilly flower color image		 Histogram of Hue component of the processed image after execution
Saturation component Separation	 Lilly flower color image		 Histogram of Saturation component of the processed image after execution
Value component Separation	 Lilly flower color image		 Histogram of Saturation component of the processed image after execution

Y component Separation	 Lilly flower color image		 Histogram of Y component of the processed image after execution
I component Separation	 Lilly flower color image		 Histogram of I component of the processed image after execution
Q component Separation	 Lilly flower color image		 Histogram of Q component of the processed image after execution
Pseudo colour image processing Setting (R G B)=(255,255,0)			 Histogram of Pseudo image processing of the processed image after execution
Pseudo colour image processing Setting (R G B)=(255,0,255)			 Histogram of Pseudo image processing of the processed image after execution
Colour components		Colour components 	 Histogram of colour component of the processed image after execution

Contrast enhancement Colour image		 Histogram of original enhancement image	 Histogram of YIQ to RGB & Equalization of the processed image after execution