COLOR IMAGE PROCESSING

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SUBMITTED TO

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Color image PROCESSING

- Introduction
- Color Fundamental
- Color Models
- Pseudo color processing
- Basic of full color image processing
- Color Transformation
- Conclusion

Introduction

- The characteristics of color image are distinguished by its properties brightness, hue and saturation.
- simplifies object extraction and identification.
  - ✓ Motivation to use color
  - ✓ Brightness
  - ✓ Hue

Motivation to use color:

- Powerful descriptor that often simplifies object identification and extraction from a scene
- Humans can discern thousands of colour shades and intensities, compared to about only two dozen shades of gray

Hue:

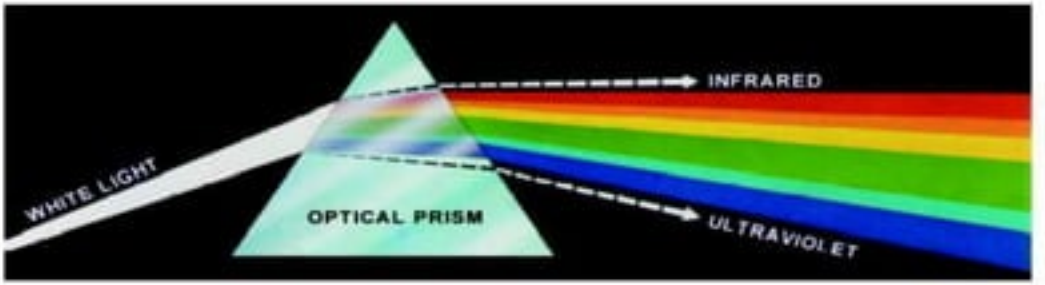
- Attribute associated with the dominant wavelength in a mixture of light waves
- Hue is somewhat synonymous to what we usually refer to as "colors". Red, green, blue, yellow, and orange are a few examples of different hues.
- Mean wavelength of the spectrum

Brighuess:

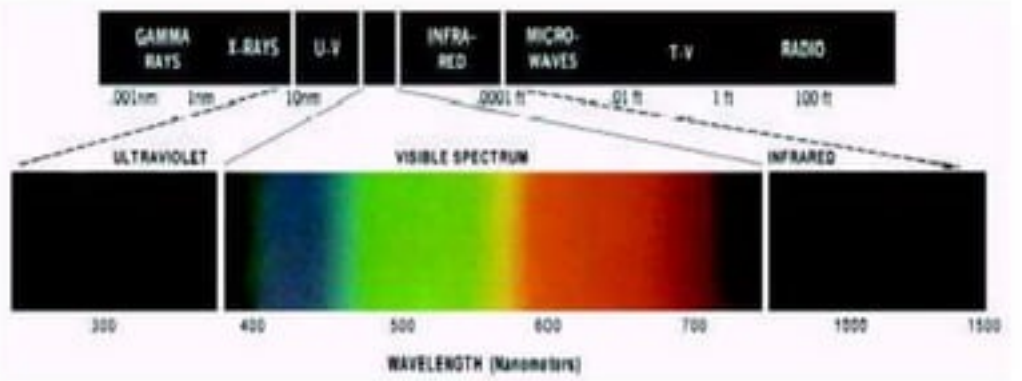
- Intensity
- Perceived luminance
- Depends on surrounding luminance

Color Fundamental:

- In 1666 Sir Isaac Newton discovered that when a beam of sunlight passes through a glass prism, the emerging beam is split into a spectrum of colors



- A chromatic light source, there are 3 attributes to describe the quality:



- Primary colors can be added to produce the *secondary colors of light:*
  - ✓ Cyan (green plus blue)
  - ✓ Yellow (red plus green)
  - ✓ Magenta (red plus blue)

- The three basic quantitles useds to describe the quantity of a chromatic light source are:
  - ✓ Radiance
  - ✓ Luminance
  - ✓ Brightness

Radiance:

- The total amount of energy that flows from the light source (measured in watts)

Luminance:

- The amount of energy an observer *perceives* from the light source (measured in lumens)
- we can have high radiance, but low luminance

Brightness:

- A subjective (practically unmeasurable) notion that embodies the intensity of light

Color Models:

- Color, by defining a 3D coordinate system, and a subspace that contains all constructible colors within a particular model.

- A color model is an abstract mathematical model describing the way colors can be represented as tuples of numbers, typically as three or four values or color components.

- Each color model is oriented towards either specific hardware (RGB,CMY,YIQ), or image processing applications (HSI).

- Any color that can be specified using a model will correspond to a single point within the subspace it defines

TYPES OF COLOR MODELS:

- ✓ RGB Model
- ✓ CMY Model
- ✓ HSI Model
- ✓ YIQ Model

RGB Model:

- Color monitor, color video cameras
- In the RGB model, an image consists of three independent image planes, one in each of the primary colors: red, green and blue.
- Specifying a particular colour is by specifying the amount of each of the primary components present.
- The geometry of the RGB colour model for specifying colors using a Cartesian coordinate system. The greyscale spectrum,

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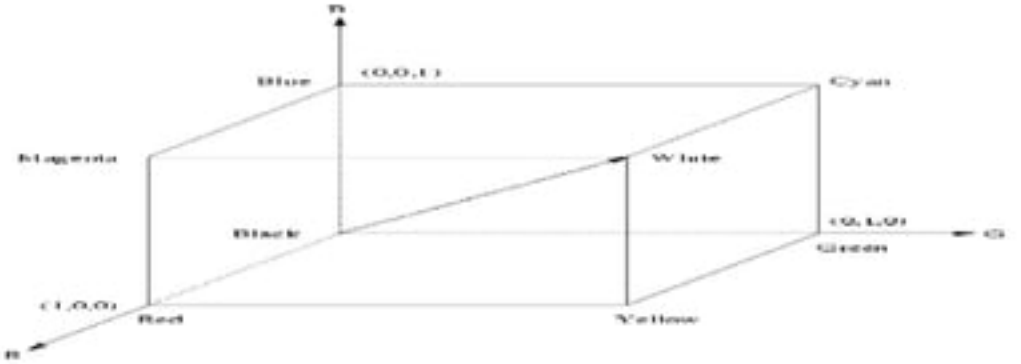
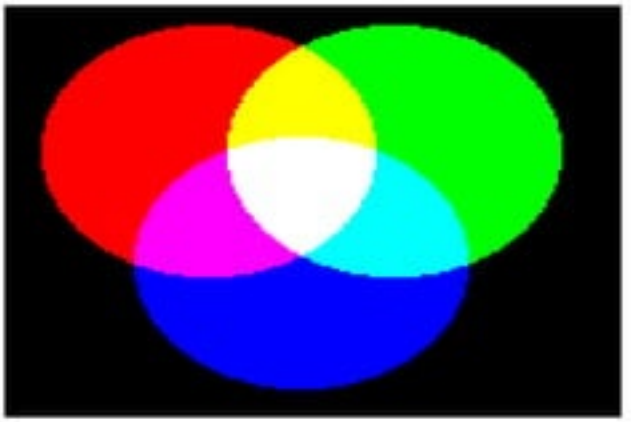
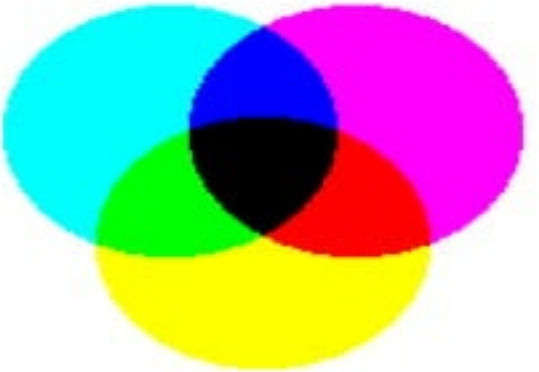


- The RGB color cube. The grayscale spectrum lies on the line joining the black and white vertices.

CMY Model:

- The CMY (cyan-magenta-yellow) model is a *subtractive* model appropriate to absorption of colors, for example due to pigments in paints
- Whereas the RGB model asks what is added to black to get a particular color, the CMY model asks what is subtracted from white.
- In this case, the primaries are cyan, magenta and yellow, with red, green and blue as secondary colors

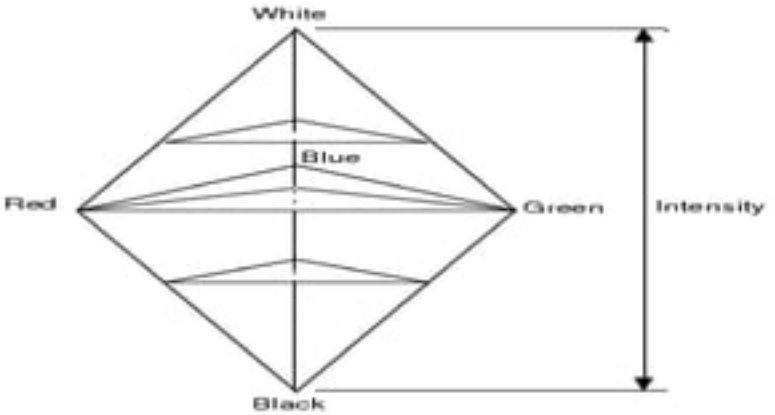


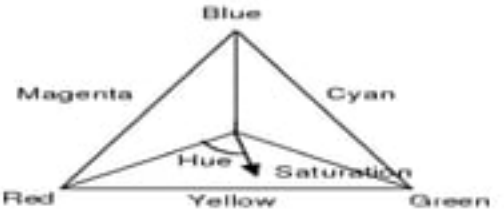


- The relationship between the RGB and CMY

HSI Model:

- As mentioned above, colour may be specified by the three quantities hue, saturation and intensity.
- This is the HSI model, and the entire space of colors that may be specified in this way is shown





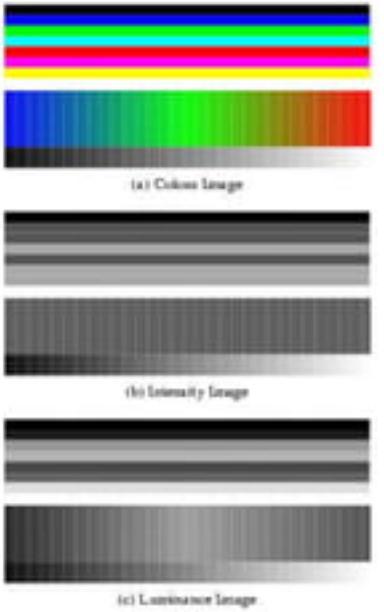
- Conversion between the RGB model and the HSI model is quite complicated. The intensity is given by

$$I = R + G + B$$

- where the quantities R, G and B are the amounts of the red, green and blue components, normalised to the range [0,1]. The intensity is therefore just the average of the red, green and blue components.
- The saturation is given by: $S = 1 - \min$

YIQ Model:

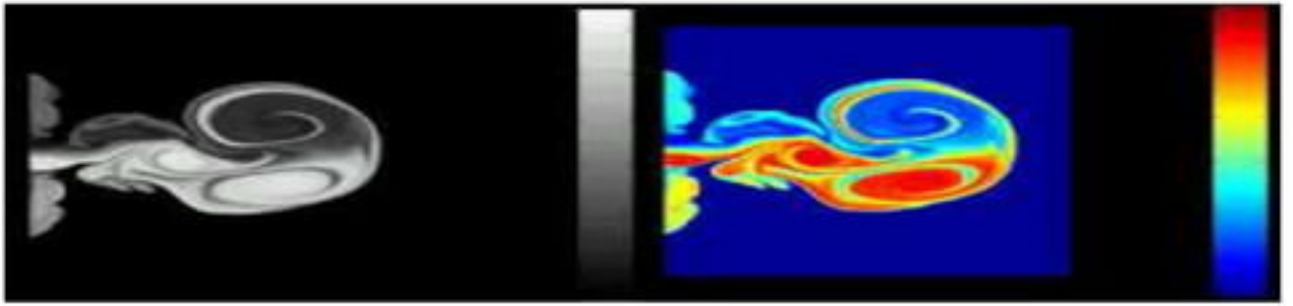
- The YIQ (luminance-inphase-quadrature)model is a recoding of RGB for colour television, and is a very important model for colour image processing. The importance of luminance was discussed in
- The conversion from RGB to YIQ is given by:
- The luminance (Y) component contains all the information required for black and white television, and captures our perception of the relative brightness particular colors.



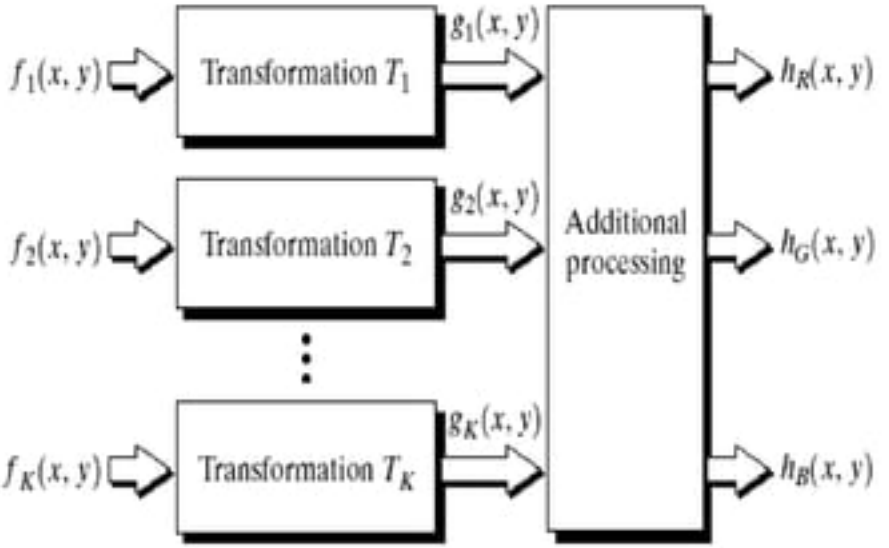
Pseudo color processing:

- Pseudo color image processing consists of assigning colors to grey values based on a specific criterion
- The principle use of pseudo color image processing is for human visualization

- Intensity slicing and color coding is one of the simplest kinds of pseudo color image processing
- Grey level color assignments can then be made according to the relation
- where ck is the color associated with the kth intensity level Vk defined by the partitioning planes at $l = k - 1$ and $l = k$



- Used in the case where there are many monochrome images such as multispectral satellite images



Basics of Full-Color Image Processing:

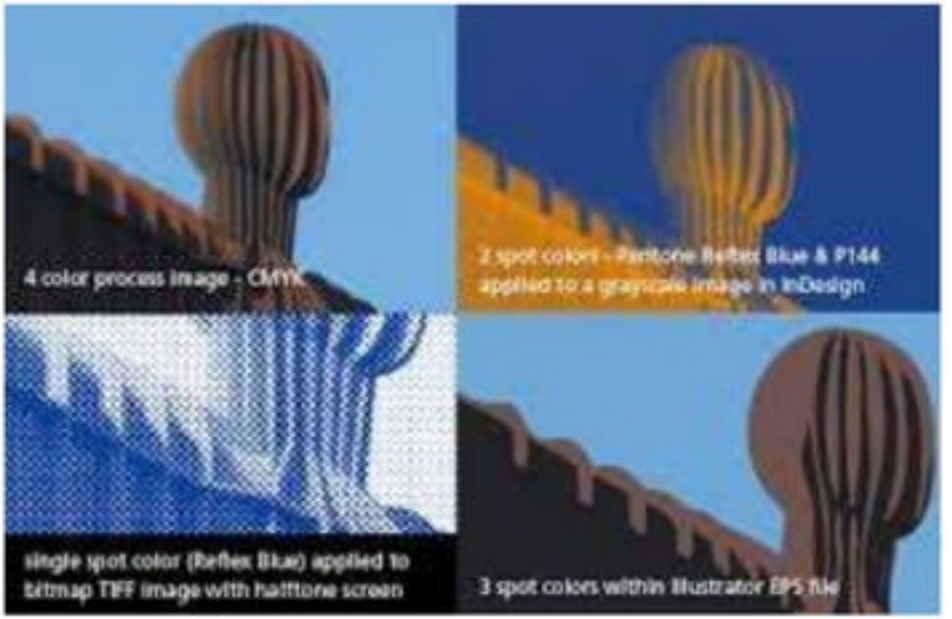
- Full-color image processing approaches fall into two major categories
- In the first category, we process each component image individually and then form a composite processed color image from the individually processed components
- In the second category, we work with color pixels directly

Color transformations:

- Color transformations can be of the form □
- where ri and si are the color components of the input and output images, n is the dimension of the color space. Ti are referred to as full-color transformation or mapping functions

Implementation Tips :

- Linear interpolation by using control points is implemented in "interp1q"
- Cubic spline interpolation by using control points is Color implemented in "spline"



Conclusion:

- Digital color processing includes processing of colored images and different color spaces that are used. For example RGB color model, YCbCr,
- HSV. It also involves studying transmission , storage , and encoding of these color images.
- The RGB primary commonly used for color display mixes the luminance and chrominance attributes of a light.

THANKS TO

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THANKYOU