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CSE-C.

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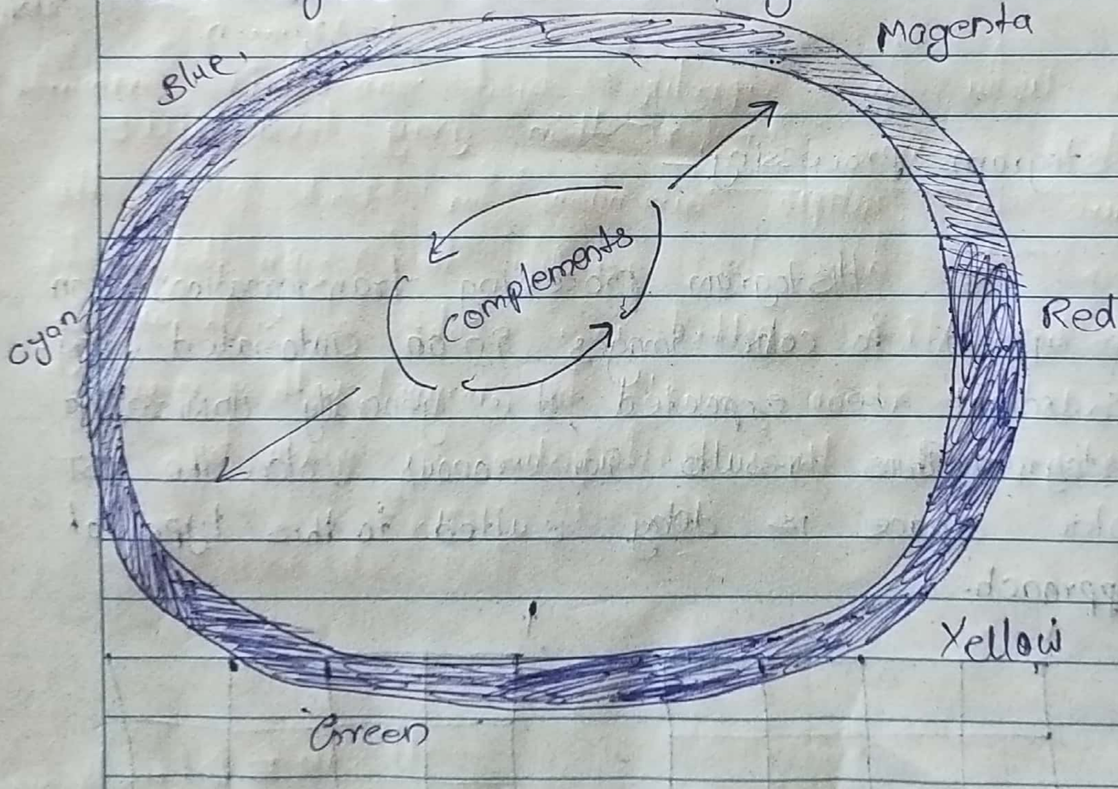
Assignment No. 5 Unit No. 5 Date :

1) Explain the following a) Colour Complements
b) Colour Slicing
c) Colour histogram processing

Colour Complements :-

Colour complements replaces each colour with its opposite colour in the circle of the Hue component. This operation is always analogous to image negative in a gray scale image. Color Complements are used to enhance the details in dark regions of a color image.



Complements of the circle

Color slicing!

Color slicing is the process of high lighting a specific range of colors in an image.

Scanned with CamScanner

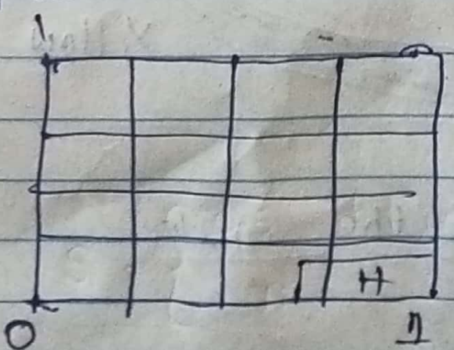
Is useful for separating object from their surroundings. It is more complex than gray level slicing due to multiple dimensions for each pixel. This can be done by selecting the region that needs to be high spotted in a cube of width 'w'. The outside region must be mapped with a neutral color. Then the transformation is given by.

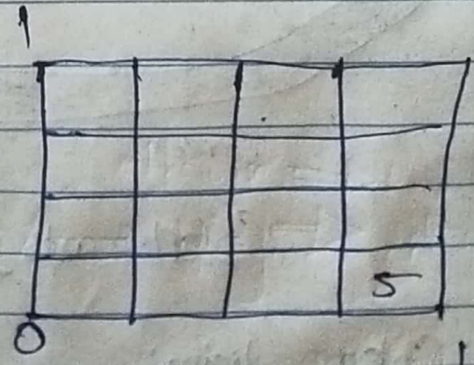
$$S_i = \begin{cases} 0.5 & \text{if } \left[|r_j - a_j| > \frac{W}{2} \right]_{\text{any } 1 \le j \le n} \Rightarrow \text{set of gray} \\ r_i & \text{otherwise} \Rightarrow \text{keep the original color.} \end{cases}$$

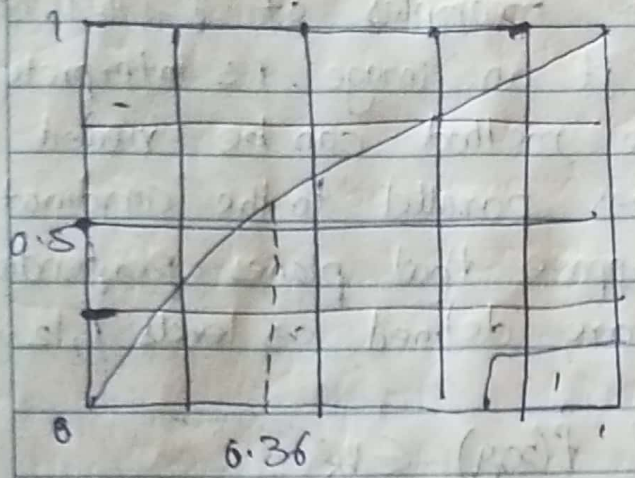
$i = 1, 2, \ldots n.$

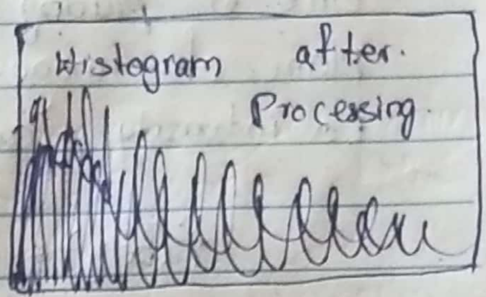
Histogram processing:-

Histogram processing transformations can be applied to color images in an automated way. As might be expected, it is generally unwise to histogram; This results in erroneous color. The HST color space is delay suited to this type of approach.









2) What is Pseudo color image processing? Explain in detail?

Pseudo color image processing :-

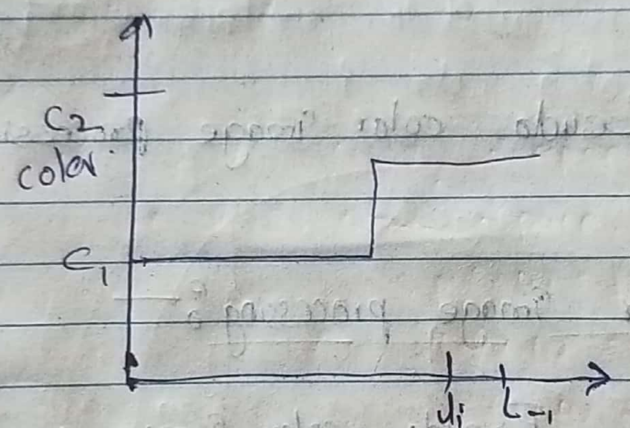
Pseudo color image processing consists of assigning colors to gray values based on a specified criterion. The term pseudo color is used to differentiate the process of assigning colors to monochrome image from the processes associated with true color images. The process of gray level to color transformation is known as Pseudo color image processing.

1. Intensity slicing
2. Gray level to color transformation.

Intensity Slicing:-

The technique of color coding is one of the simplest examples of pseudo color image processing it an image is interpreted as a 3D-function the method can be viewed as one of placing planes parallel to the coordinate plane of image. Suppose that planes perpendicular to intensity axis are defined as levels $T, l_2 \ldots l_p$.

$$f(x,y) = (k \text{ if } f(x,y) \in V_k$$



Gray level to color transformation:-

This approach is to perform three independent transformations on the gray level of any input pixel. The three results are then fed separately into the red, green and blue channels. These are transformations on the gray level values of an image and are not functions of position.

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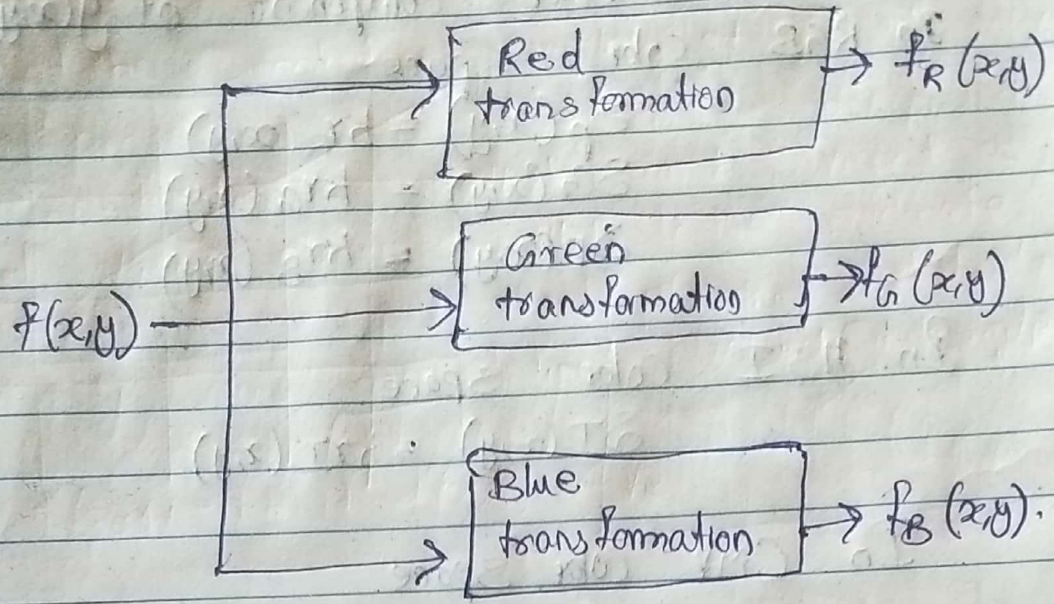

3) Explain about color model transformations?

Color transformations :-
Color transformation deal with processing the components of a color image within the context of a single color models without converting components to different colour space.

Formulation :-
We can model color transformation using the expression $g(x,y) = T(f(x,y))$
where; $f(x,y)$ is color image, $g(x,y)$ is the transformed color output image and T is the operater over a spatial neighbourhood of (x,y)
Hence, we wish to modifying intensity of an image in different color spaces using the transform we can express the transformation as

$$S_i = T_i(r_1, r_2, \ldots\ldots r_n) \quad i = 1, 2, \cdots n$$

Where r_i = color component of $g(x,y)$

In RGB color space

$$S_R(x,y) = k r_R(x,y)$$
$$S_G(x,y) = k r_G(x,y)$$
$$S_B(x,y) = k r_B(x,y)$$

In HSI color space

$$S_I(x,y) = k r_I(x,y)$$

In CMY color space

$$S_C(x,y) = k r_C(x,y) + (1-k)$$
$$S_m(x,y) = k r_m(x,y) + (1-k)$$
$$S_y(x,y) = k r_y(x,y) + (1-k)$$

4) Explain RGB, CMY and CMYK color models?

The RGB Color model:-

In the RGB model, each color appears in its primary spectral components of red, green, and blue. This model is based on the Cartesian coordinate System. The color subspace of interest is the cube shown in the following figure. In which (RGB) values are at three corners, cyna, magneta and yellow are at three other corners. In this model, the gray scale extends from black to white along the line joining these two points.

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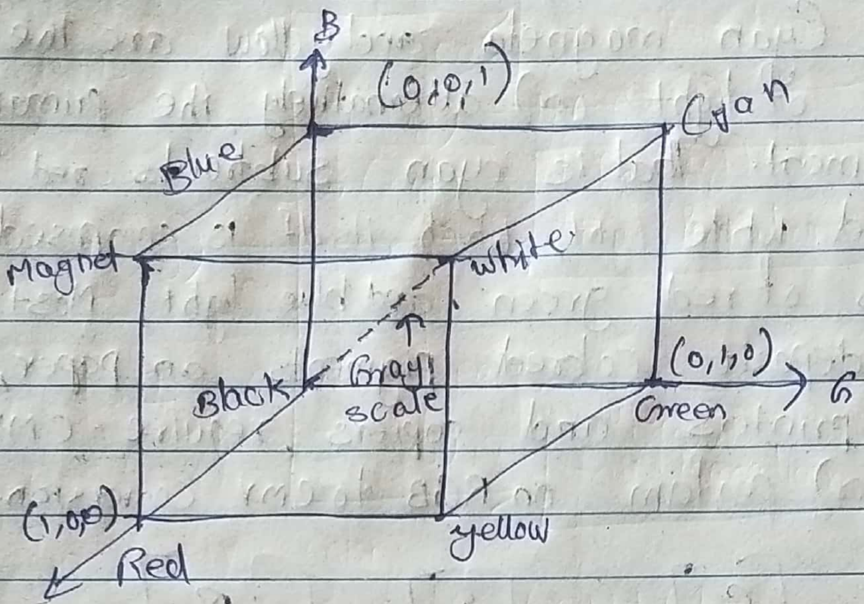
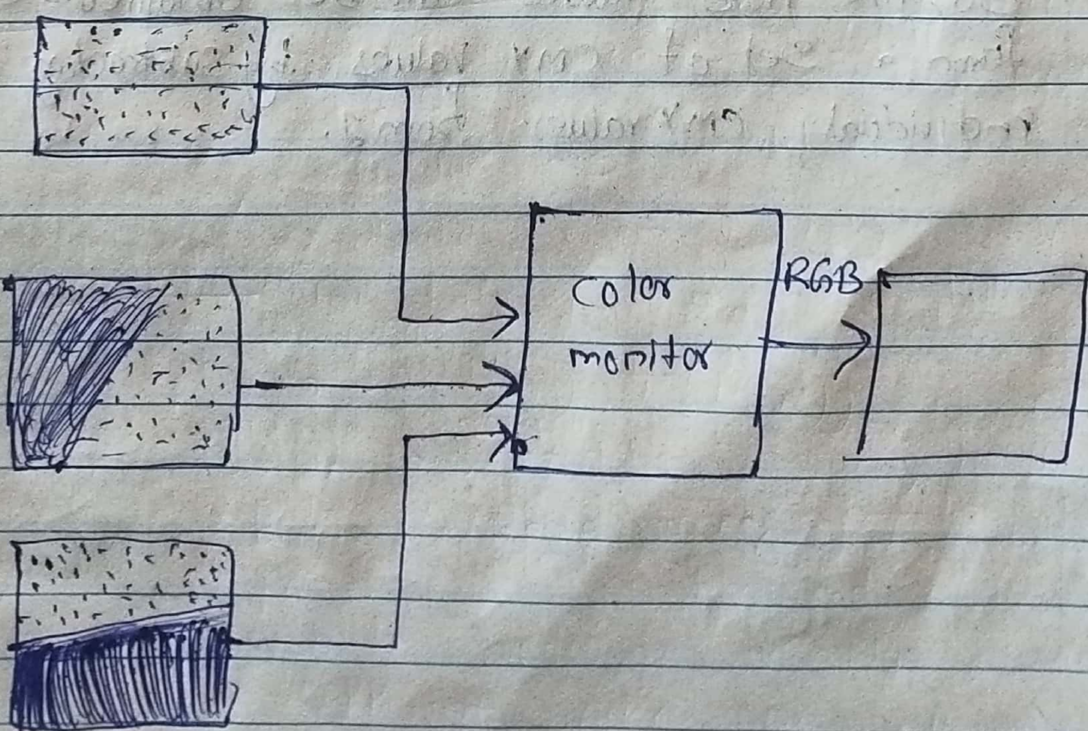


Schematic of RGB Color cube.

Image represented in RGB color model consist of three component images, one for each primary color. When fed into an RGB monitor, these three images combine on phosphor screen.



The CMY and CMYK color models:

Cyan magneta and yellow are the secondary colors of light (or) alternatively, the primary colors of pigment. That is cyan subtracts red light from reflected white light, which itself is composed of equal amounts of red, green, and blue light. Most devices that deposit colored pigments on paper, such as color printers and copiers, require CMY data input (or) perform on RGB to CMY conversion internally.

$$\begin{bmatrix} C \\ M \\ Y \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} - \begin{bmatrix} R \\ G \\ B \end{bmatrix}$$

Where again, the assumption is that all color values have been normalized to the range [0, 1]. So, the RGB values can be obtained easily from a set of CMY values by subtracting the individual CMY values from 1.