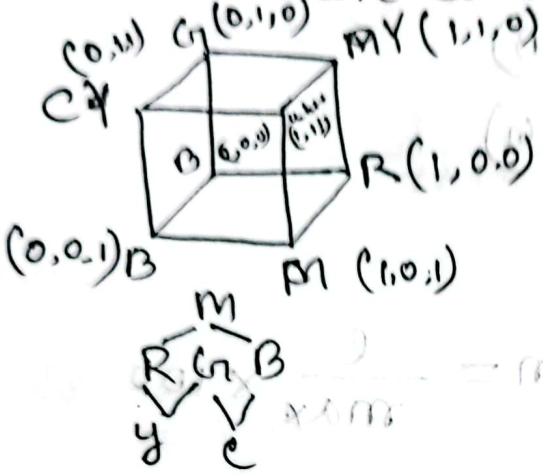
Practice Sheet Problem

color model

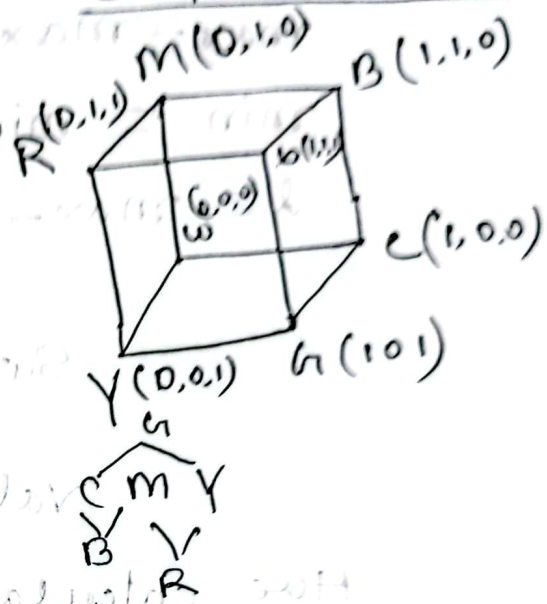
(24) Comparison between additive and subtractive color models:

(25)

RGB color cube:



CMY color cube



(26) Distinction between CMY and CMYK:

CMY: Stands for cyan, magenta, and Yellow, the primary colors in subtractive color used in printing. Mixing these colors ideally result in black. However, this combination often leads to muddy black instead of a true black.

CMYK: Adds K, which stands for black, to the CMY model. Since mixing CMY doesn't always produce a pure black, an additional black K is used in printing to achive richer, more consistant blacks.

(29) RGB to HSV color values Algorithm:

Step 1:

Find out maximum, and minimum value from RGB values.

max = max(R, G, B)

min = min(R, G, G)

l = max − min

$$\text{Saturation} = \frac{l}{max} \times 100$$

$$\text{Value} = max \times 100$$

Hue calculation:

if R == max,

$$Hue = \left(\frac{G-B}{l}\right) \times 60°$$

[if H > 0° H = H + 360°]

if G == max

$$Hue = \left(\frac{B-R}{l}\right) \times 60° + 120°$$

if B == max.

$$Hue = \left(\frac{R-G}{l}\right) \times 60° + 240°$$

(30) Convert the RGB colors into HSV color values.

(i) RGB(0.25, 0.3, 1.0)

max = 1.0

min = 0.25

$l = 1 - 0.25 = 0.75$

Saturation = $\frac{l}{max} \times 100 = \frac{0.75}{1.0} \times 100 = 75$

value = max = $1.0 \times 100 = 100$

Here B is maxima

$H = \left(\frac{R-G}{l}\right) \times 60° + 240°$

$= \left(\frac{0.25 - 0.3}{0.75}\right) \times 60° + 240°$

$= 236°$

HSV values (236°, 75, 100)

(ii) RGB(0.01, 1.0, 0.99)

max = 1.0

min = 0.01

$l = 0.99$

Saturation = $\frac{l}{max} \times 100 = \frac{0.99}{1.0} \times 100$

$= 99$

value = max $\times 100$

$= 1.0 \times 100$

$= 100$

Here, G is max

$H = \left(\frac{B-R}{l}\right) \times 60° + 120° = \left(\frac{0.99 - 0.01}{0.99}\right) \times 60° + 120°$

$= 124.85°$

HSV = (124.85°, 99, 100)

(iii) RGB(0.8, 0.8, 0.35)

max = 0.8

min = 0.35

$l = (0.8 - 0.35) = 0.45$

$\text{Saturation} = \frac{l}{max} \times 100$

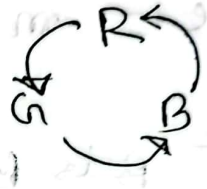
$= \frac{0.45}{0.8} \times 100$

$= 56.25$

$\text{Value} = max \times 100$

$= 0.8 \times 100$

$= 80$



Here,

Since r=g (this happens when the colo is neutral between red and green),

We use the formula for H:

$H = \left(\frac{G - B}{l}\right) \times 60°$

$= \left(\frac{0.8 - 0.35}{0.45}\right) \times 60°$

$= 60°$

HSV (60°, 56.25, 80)

(iv) RGB(0.0, 0.4, 0.4)

max = 0.4

min = 0.0

l = 0.4

Saturation = $\frac{l}{max} \times 100 = \frac{0.4}{0.4} \times 100$

Value = $0.4 \times 100 = 40$

Here, G = B, we ~~can~~ use the formul for G:

$H = \left(\frac{B-R}{l}\right) \times 60° + 120°$

$= \left(\frac{0.4-0.0}{0.4}\right) \times 60° + 120°$

$= 180°$

HSV (180°, 100, 40)

(v) RGB(1.0, 1.0, 0.5)

max = 1.0

min = 0.5

l = 0.5

Saturation = $\frac{l}{max} \times 100°$

$= \frac{0.5}{1.0} \times 100$

$= 50$

Here, R = G, So for R,

$H = \left(\frac{G-B}{l}\right) \times 60°$

$= \left(\frac{1-0.5}{0.5}\right) \times 60°$

$= 60°$

Value = max $\times 100$

$= 1 \times 100 = 100$

HSV (60°, 50, 100)

(VI) RGB(0.7, 0.71, 0.7)

max = 0.71

min = 0.7

l = 0.01

saturation = $\frac{l}{max} \times 100$

$= \frac{0.01}{0.71} \times 100$

$= 1.408$

value = max × 100

$= 0.71 \times 100$

$= 71$

Here, G is max

$H = \left(\frac{B-R}{l}\right) \times 60° + 120°$

$= \left(\frac{0.7-0.7}{0.01}\right) \times 60° + 120°$

$= 120°$

HSV(120°, 1.408, 71)

(VII) RGB(0.5, 0.5, 0.5)

max = 0.5

min = 0.5

l = 0

saturation = $\frac{l}{max} \times 100$

$= \frac{0}{0.5} \times 100$

$= 0$

Here, R = G = B

value = max × 100

$= 0.5 \times 100 = 50$

for R,

$H = \left(\frac{G-B}{l}\right) \times 60°$

$= \left(\frac{0.5-0.5}{0}\right) \times 60°$

$\Longrightarrow$ undefined

(VIII) Same.

(21)

ID: 21301586

A = 21
B = 30
C = 15
D = 86

CMY (0.A, 0.C, 0.D) → (0.21, 0.15, 0.86)

CMY to RGB

$$\begin{pmatrix} R \\ G \\ B \end{pmatrix} = \begin{pmatrix} 1.0 \\ 1.0 \\ 1.0 \end{pmatrix} - \begin{pmatrix} 0.21 \\ 0.15 \\ 0.86 \end{pmatrix}$$

RGB (0.79, 0.85, 0.14)

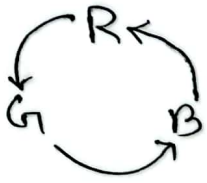
max = 0.85, min = 0.14

$l = 0.71$

$$\text{Saturation} = \frac{l}{\text{max}} \times 100 = \frac{0.71}{0.85} \times 100$$

$$= 83.529$$

Value = max × 100
= 0.85 × 100
= 85



Here, G max

$$H = \left(\frac{B-R}{l}\right) \times 60° + 120°$$

$$= \left(\frac{0.14 - 0.79}{0.71}\right) \times 60° + 120$$

$$= 65.07°$$

HSV (65.07°, 83.529, 85)