illomination model:

* Shading model or lighting model is used to calculate the intensity of light is reflected at a given point on a surface.

* There are 4 factors on which lighting effect depends on

1. Light source
2. distributed source
3. surface
4. observer.

1. Light source:

* light source is the light Emmiting source. there are 2 types of light source)
  1. point source
  2. parallel source.

Point source eg:

* The Source that Emmit rays in all direction (A bulb in room)

Parllel Source eg:-

* can be consider as a Point source which is far from the Surface (sun).

distributed Source:-

* Rays on orginated from a finite area (A tube light)
* theior position Electromagnetic Spectrum & shape. determine the lighting Effect.

Surface:-

* when light falls on a Surface Part of it is reflected and part of it is obsorbed. Now the Surface structure decides the amount of reflection of obsorption of light.
* The position of the Surface of position all the near by surfaces also determine the lighting Effect.

Observer:-

The observer position of Sensor Spectrum also affect the lighting effect.

types of illumination:

1. Ambient illumination
2. diffuse Reflection
3. Specculor Reflection.

1. Ambient illumination:

* Assume you are standing on a road, facing a building with glass exterior of sun rays are falling on that building reflecting back from it and the falling on the object under observations. this would be a Ambient illumination

* In simple words, Ambient illuminations ~~is that are~~ is the one where source of light is indirect

* The reflected intensity I_{amb} of any point on the surface is,

$$\boxed{I_{amb} = K_a I_a}$$

K_a: Surface ambient reflectively value from 0 to 1

I_a: Ambient light intensity

2. Diffuse Reflection:

-> In this reflection the brightness of a point depends upon the angle made by the light source & the surface

-> The reflected intensity I_{diff} of point on the surface is:

$$\boxed{I_{diff} = k_d \cdot I_p \cos(\theta) = k_d \cdot I_p (N \cdot L)}$$

I_p : the point light intensity

k_d : Surface diffuse reflectively value 0 to 1

N: Surface Normal

L: light direction.

3. Specular Reflection :

* when light falls on any shiny or glossy surface most of it is reflected back, such reflection is known as Specular reflection.

phong model :

* is an Emperical model for specular Reflection which Provides us with the formula for caluclation on the reflected intensity I spec :

$$\boxed{I_{spec} = w(\theta) I \cdot \cos^{n}(\phi)}$$

$w(\theta)$: k_p

θ : Angle b/w L & R

ϕ : Angle b/w R & V

L : direction of light source

N : Normal to the surface

R : Direction of the reflected ray

V : direction of observer

Color model :

* A color model is an orderly System for creating a whole range of colors from a small set of primary colors

[redacted]

Color model :-

* A color model is an orderly System for Creating a whole range of colors from a Small set of primary colors

* 2 types of color model

1. Additive
2. Subtractive

1. Additive :

* color model use light to display color.

* colors perceived in additive models are the result of transmitted light.

2. Subtractive:

- use Printing inks
* colour preceived in subtractive models are the result of reflected light.

Types of colour model

1. RGB ~~is an additive~~ colour model
eg : monitor,

2. cmyk color model
eg : printers

3. HSV color model
IO color model

4. IQ colour model.

1) RGB color model :

* RGB is an additive colour model.
* for Example displays uses lights to display color, color light from transmitted light

$\boxed{\text{Red + Green + Blue} \Rightarrow \text{white}}$

Green (255) + Red (255) = yellow

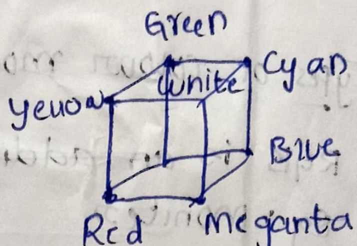
Green (255) + Blue (255) = cyan

Red (255) + Blue (255) = Meganta

Red (255) + green (255) + Blue (255) = white

→ The Red-green-blue model is formed by a colour cube

$$\{ (R, G, B) : 0 \leq R, G, B \leq 1 \}$$



conversion from (R, G, B) to (x, y, z) is given via the chromatices,

(x_r, y_r, z_r) (x_g, y_g, z_g) (x_b, y_b, z_b)

matrix multiplication

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} x_r & y_r & z_r \\ x_g & y_g & z_g \\ x_b & y_b & z_b \end{pmatrix} \begin{pmatrix} R \\ G \\ B \end{pmatrix}$$

2) YIQ color model :-

* in the YIQ color model, Luminance (brightness) information is contained in the Y parameter while chromaticity information (hue and purity / saturation) is incoporated into the I & Q parameters

* A combination of red, green & blue intensites are chosen for the Y parameter

* black & white tellvsion moniters use only the y signal
* parameter I contains orange - cyan
* Q carries green - magenta.
* An RGB signal can converted into telivision signal using an NTSC Encoder, which converts RGB values to YIQ values
* The conversion from RGB values to YIQ value is accompolished with the transformation from YIQ to RGB

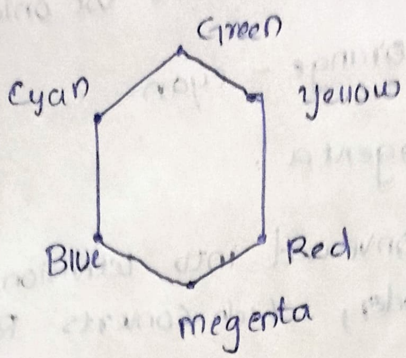
$$\begin{pmatrix} R \\ G \\ B \end{pmatrix} = \begin{bmatrix} 1 & 0.956 & 0.619 \\ 1 & -0.272 & -0.647 \\ 1 & -1.106 & 1.703 \end{bmatrix} \begin{pmatrix} Y \\ I \\ Q \end{pmatrix}$$

from RGB to YIQ

$$\begin{pmatrix} Y \\ I \\ Q \end{pmatrix} = \begin{bmatrix} 0.299 & 0.589 & 0.144 \\ 0.596 & -0.275 & -0.321 \\ 0.212 & 0.528 & 0.311 \end{bmatrix} \begin{pmatrix} R \\ G \\ B \end{pmatrix}$$

HSV color model:

* color parameter in this ~~media~~ model are, Hue (h), Saturation (s), value (s)
* The 3D representation of HSV model is derived from RGB cube.
* Viewing the cube along the diagonal from the white vertex to the origin (black)



color hexagon

* The boundary of the hexagon represents the various hues, and it is used as the top of the HSV hexagon. Saturation is measured along a horizantal axis of value is along a vertical axis through the center of the hexagon.

* Hue (H) angle ranging from 0°-real through 360°

* vertices of the hexagon are Seperated by 60° intervals

* complimentary colors are 180° apart

* Saturation (S): Varies from 0 to 1

* S can be defines as the ratio of the purity of a Selected hue to its maximum purity at, $S=1$

* At $S=0$, we have gray color.

cmyk color model:-

* Cyan, magenta & yellow ink provided the largest possible set of unique colors in printed media

* Black ink (K stand for key) was added to the mix. because it would not be accurately reproduced Using the other three inks.

* c, m, y, b in various degree which creates a variety of different colors.

* Basically it is used for business carols, stationary sticker, Posters, etc.

* cmyk has lesser than range of color than RGB

* used for print works.

- Halftone -