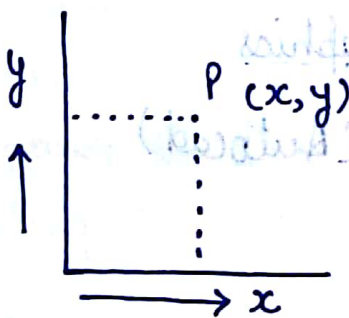


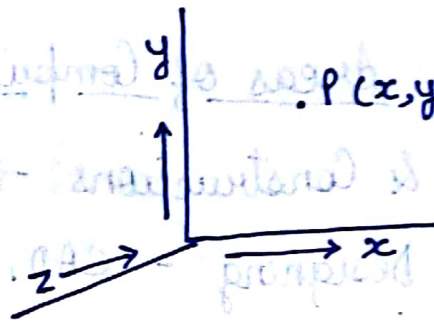
19.08.2018

## Computer Graphics

- \* Computer Graphics is the branch of computer science which represents the ideas in picture format.
- \* Computer Graphics is an art of drawing pictures, lines, charts etc using the computer with the help of programming.
- \* An object in the computer graphics always represented in either 2D or 3D format.



2-D representation



3-D representation

- \* Computer Graphics can be divided in two categories:
  1. Interactive Computer Graphics
  2. Non-Interactive Computer Graphics

### Interactive Computer Graphics

It involves a two way communication between user and computer. In this system the observer is given some control over image by providing him an input device.

For Example -

A computer game, user control the game graphics by using input device and object respond on that command.



# Non Interactive Computer Graphics

8/10/2018

- \* It is also called passive Computer Graphics.
  - \* It is the Computer Graphics in which user does not have any kind of control over the images.
  - \* The image is totally under the control of some instruction or program not under the user.
- Ex - Screen Saver.

## Application Areas of Computer Graphics

1. Building & Constructions - Maps (Autocad)
2. Machine Designing - CAD, CAM
3. Circuit Designing
4. Art - Corel Draw, Photoshop
5. Medical Science
6. GUI
7. PPT
8. Cartography - Art of Designing Maps
9. Satellite image
10. Entertainment
11. Simulation & Modelling (Virtual Device)

New Field → Medical Image Processing

20-08-2018

## Graphical User Interface (GUI):

Graphic User Interface provide a platform to the user, that works on the application, just click on the menu item or icon. Icon is the graphical symbol that is designed to look like processing option that is related to process.

## Components of GUI

1. Desktop
2. Windows
3. Menus
4. Graphic pointers → Mouse Pointers
5. Pointing Devices → Track-ball, Touch Pad

## Graphical Devices

1. Input Devices:
  - i. Mouse
  - ii. Keyboard
  - iii. Light Pen
  - iv. Touch Screen
  - v. Scanner
  - vi. Joy Stick
  - vii. Graphic Pad
  - viii. MICR
  - ix. OCR
  - x. OMR
  - xi. Web Cam
  - xii. Bar Code (BCR)

2. Output Devices:
  - i. Monitors
  - ii. Printers
  - iii. Plotters

## i. Printers :

- a) Impact Printers -
- a) Chain Printers
  - b) Drum Printers
  - c) Daisy wheel (Letter Quality) Printer
- b) Non-Impact Printers -
- a) Inkjet Printer
  - b) Laser Printer

- ## ii) Plotter :
- a) Flatbed Plotter
  - b) Drum Plotter



21-08-2018

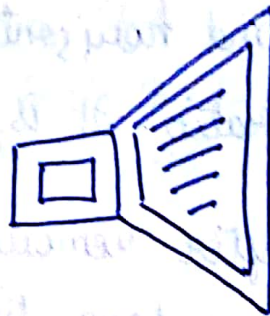
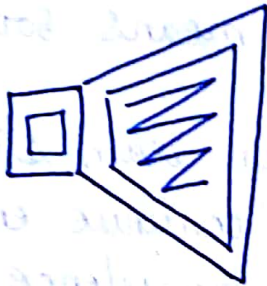
## Raster & Random Display

### 1. Raster Scan Display :

In RSD the electronic beam swept across the screen, one row at a time from top to bottom. As electron move across each row the beam intensity turned on & off to create a pattern on the screen.

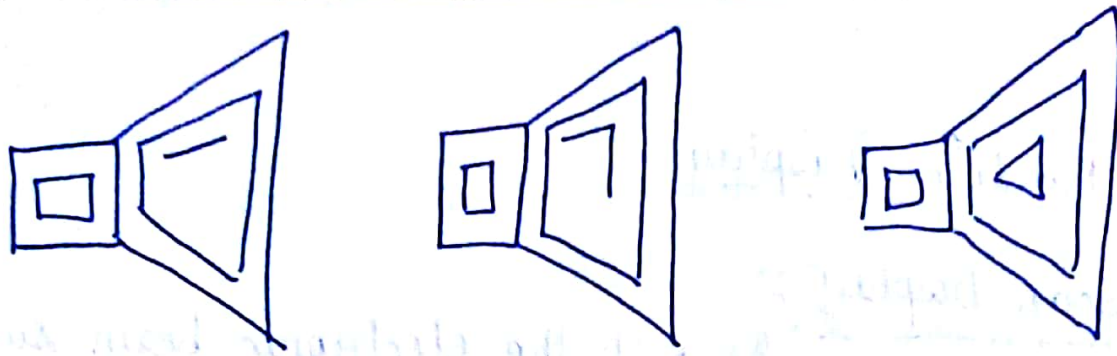
Picture definition is stored in the memory that is called refresh buffer or frame buffer. This memory area holds the set of intensity value for all screen points. Stored intensity values are then received from the refresh buffer and pointed on the screen on row at a time

Normally refresh rate is 60 to 80 frame/second that is calculated in Hz.



### 2. Random Scan Display or Calligraphic Display or Vector D :

- i. Random display draw a picture one line at a time, so it is also called vector Display.
- ii. Refresh rate on a random scan system depends on the no. of lines to be displayed.
- iii. Picture definition now stored as a set of line drawing commands in the area of memory under the display file.
- iv. This method draw 30 to 60 components line per second.



## Definitions :

1. Pixel : The smallest unit or component of elements of an image is called the pixel.
2. Resolution : The maximum number of pixel displayed without overlapping on CRT screen is called the resolution.
3. Aspect ratio : The ratio of maximum no. of vertical pixel and horizontal pixel is called the aspect ratio. It is generally  $3/4$  means  $800/600$
4. Persistence : After removing the electron beam strike how long time phosphor continue emitte the light that is called persistence.



25-07-2018

WEDNESDAY

Refresh Rate :- This represent the number of times the image is refreshed at each scan. It is expressed in terms of the Hertz.

Bit Depth :- It is also called color depth, this is known as the Bit per pixel. ■

## Display Technique to display a colour picture

### 1. Beam Penetration Method:

In this method, CRT screen is coated by two layers of phosphorous with Red and Green colour. A high energy electron beam applied on the phosphorous screen. The phosphorous screen absorb the energy from the electron beam and emit some light, that is called pixel. The display colour depends on how far the electron beam penetrate the phosphorous coated screen. If the electron beam penetrate outer layer, then red colour displays, if electron beam penetrate inner layer of phosphorous then green colour display. By changing the intensity of electron gun various colour combinations pixel can be created.

### 2. Shadow Masked Method:

In this method, three electron guns are used to emit the electron beam. These three guns emit the Red, Green and Blue electron beam, One shadow mask having the holes is placed between the electron gun and phosphorous coated screen. Electron beam pass through



the hole of shadow mask and create a spot on the phosphorous screen. This spot having the colour combination of Red, Green and Blue, when the intensity of all three guns are maximum, then we get the white spot on the screen. When intensity of all three guns are minimum, we get the black spot on the screen.

## Monitors

### CRT (Cathode Ray Tube) Monitors :

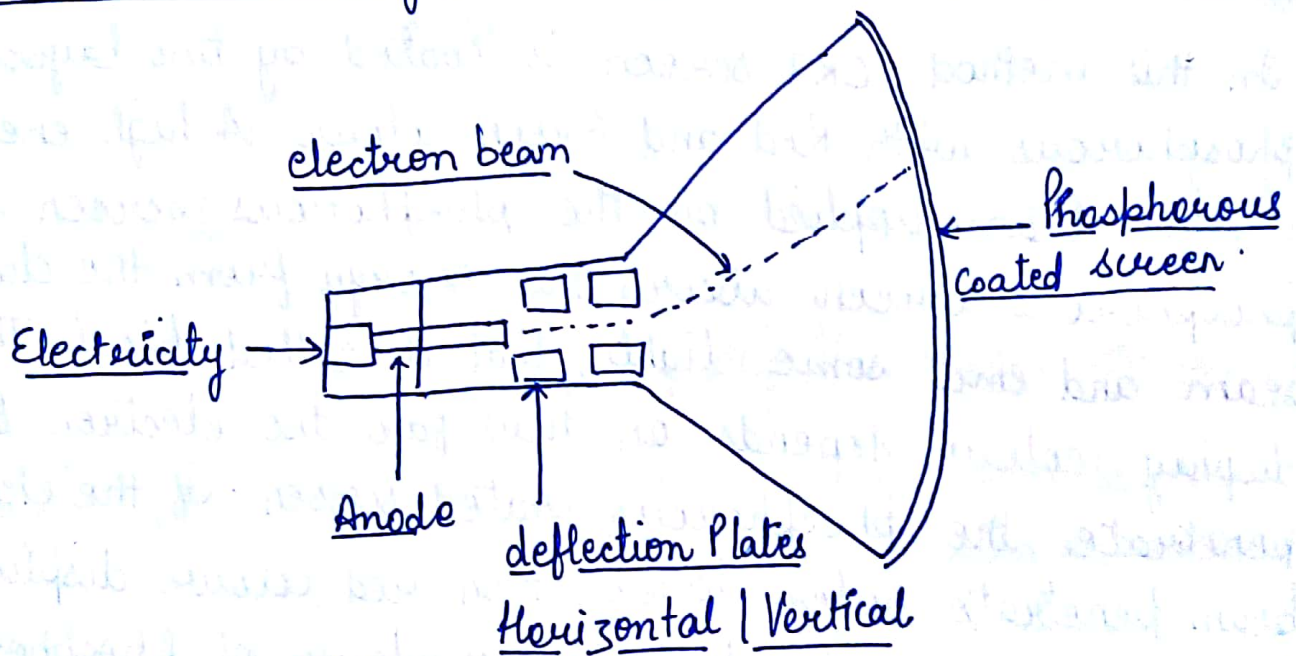


fig: Structure of CRT Monitors.

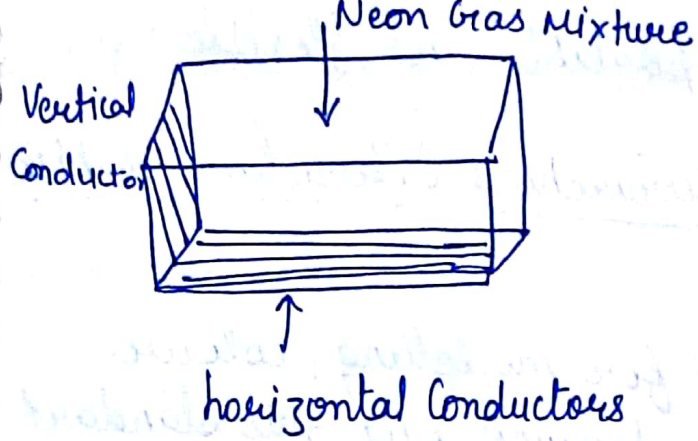
Flat Panel Monitors : → Plasma Display

→ Thin Film Electroluminescent Display

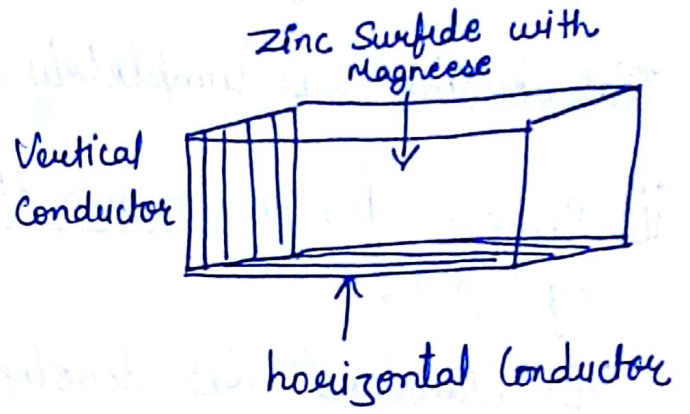
→ LCD (Liquid Crystal Display)

→ LED (Light Emitting Diode)



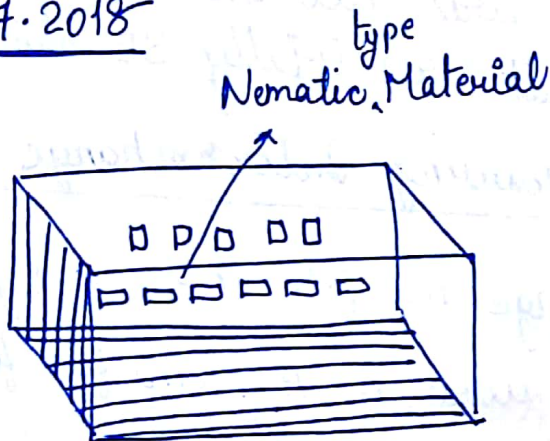


a) Plasma Display



b) Electroluminescent Display

26.07.2018



c) LCD

## Graphic Software Standards

There should be some standards to develop a graphic software that can give flexibility and portability. Without standards a graphic file cannot be transfer to another system. Some international and national standard Organisation develop common standards for Computer Graphics -:

### 1. Graphic Kernel System (GKS) -

This was first graphic standard and it was designed for 2-D graphics only. Later on 3D version also develop



This version was completely portable and flexible.

ii) PHIGS (Programmer's Hierarchical Interactive Graphics System):

This standard was developed for modelling, colour specification, picture maintenance, but this standard was able to handle to 2D graphics only. The new version of this standard was also developed the name given 'PHIGS+', it was totally 3D standard.

iii) DXF File Format - Drawing InterExchange Format

It was developed to change the file format by using the ASCII code. It is widely used in AUTOCAD file format.

Color Models -

- i) RGB - Red, Green, Blue
- ii) CMYK
- (iii) HSV

A color Model is a technique for explaining the properties of behaviour of color. No single color model represent all aspect of the color, so that different color models are created.

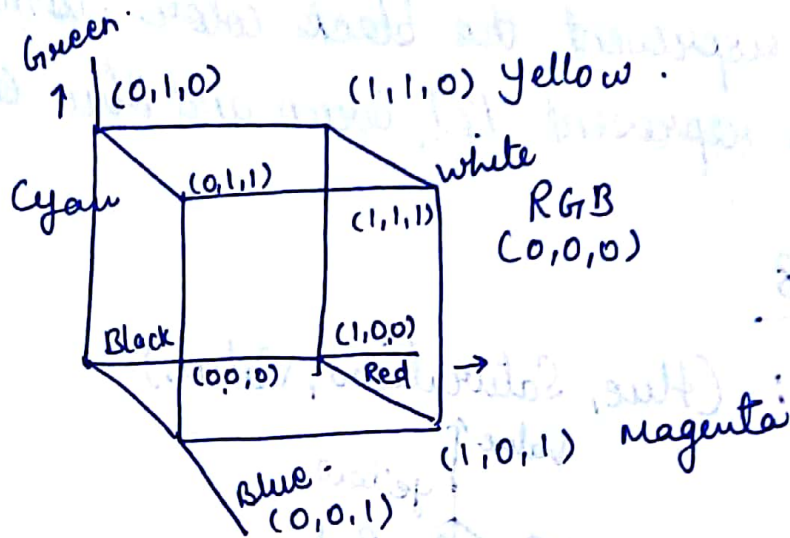
What is Color?

When the particular color frequency rays are reflected by an object, this color frequency rays called the object color. In black color object absorb all of colour frequency rays and in white color,



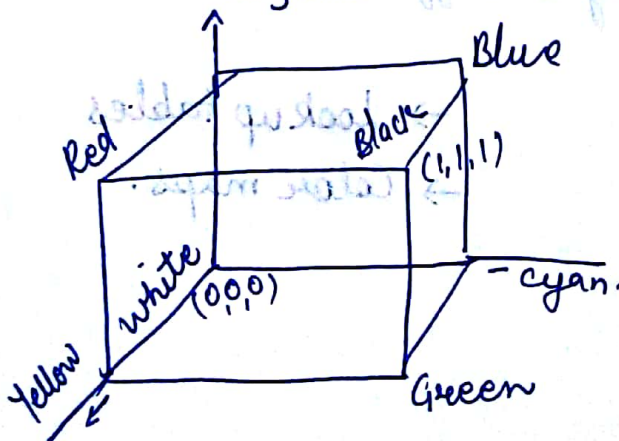
all color frequency rays are reflected by an object

i. R.G.B



R.G.B colour model is represented by a cube. All vertices of cube represent different colour. X, Y & Z axis represent Red, Green and Blue colour respectively. The origin of cube having the coordinate  $(0,0,0)$  represent the black colour. Opposite vertex having the maximum intensity with the coordinate  $(1,1,1)$  represent white colour. Remaining vertices of the cube represent Yellow, Cyan and Magenta colours.

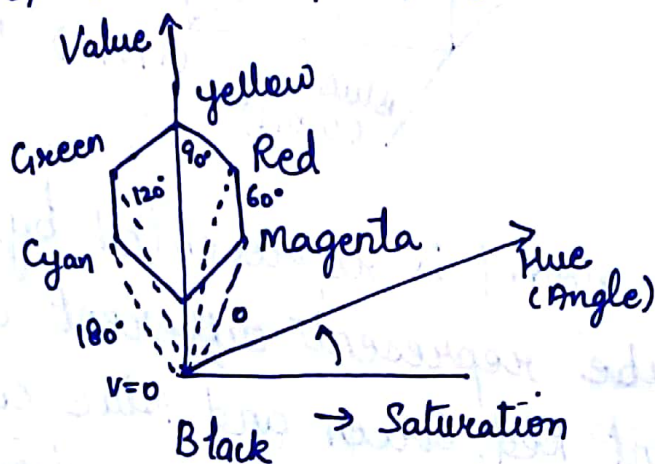
ii.) CMYK — Cyan, Magenta, Yellow, Black



This model is also represented by a cube. X, Y and Z axis represent Cyan, Magenta and Yellow color respectively. The origin represent the white color and opposite vertex represent the black color. Other remaining vertices represent Red, Green and Blue colors.

27.07.2018

iii) HSV: (Hue, Saturation, Value)



HSV model is represented by a hexagon. Each vertex of the hexagon represent different colour. X axis represent the saturation and Y axis represent value. When the is zero the colour model represent the black colour, when value is '1' represent a white colour. Hue is the angle of rotation of a hexagon. While changing the hue angle different colour combination can be generated.

- Look up tables
- Color maps.