Overview of Graphics System

Q. क्या है Computer Graphics?

प्रतिरूपण

→ Creation, manipulation & storage of geometric objects (modelling) and their images (rendering) display those images on screen or hardcopy devices.

interpret करना

Application of C.G.:

1. CAD
2. Presentation Graphics
3. Computer Art
4. Graphical User Interface
5. Entertainment
6. Education & Training
7. Visualization
8. Image Processing

Some Basic Terminology:

1. **Pixel:** → Basic unit of image.
   → Smallest area which can be addressed on a screen.
   → Pixel is specified by its row & column number.

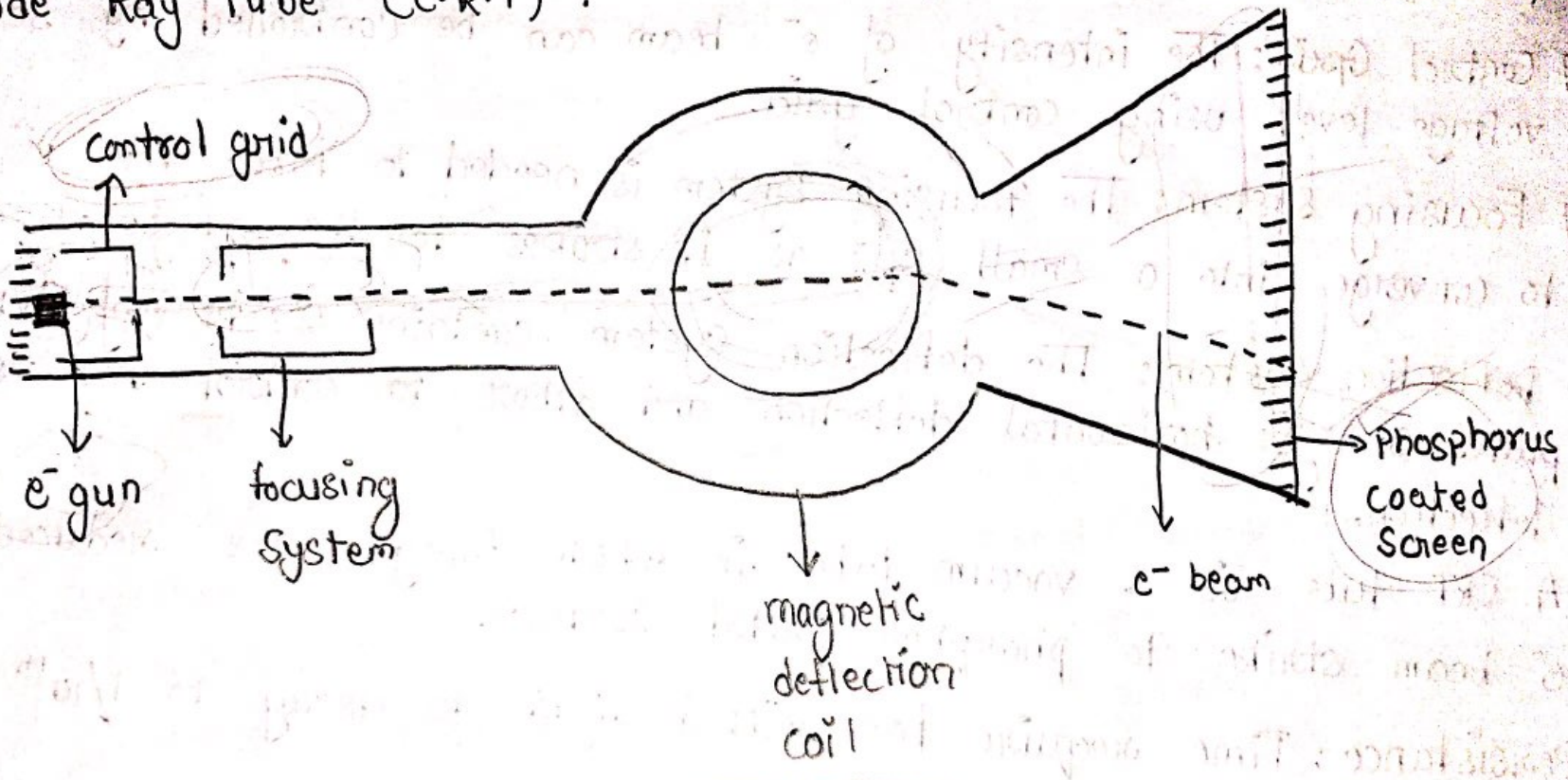
2. **Resolution:** → No. of pixels per unit area/length.
   → जितना jyada resolution utna jyada pixels.
   → Measured as dot per inch/dpi
   → For a better image, pixels should not overlap.

3. **Aspect Ratio:** → No. of horizontal & verticle pixels per screen.
   → Width to height ratio of an image.
   → LCD has 16:9 aspect ratio.
   → Mobile phone screen has 5:4 ratio.

4. **Persistence:** → Persistence is defined as the time require for emitted light to decay to $1/10^{th}$ of original intensity.

Display Devices :

(1.) Cathode Ray Tube (C.R.T) :



Cathode Ray Tube

✡ Electron Gun: Emits e^- beams when voltage is applied. These e^- are then accelerated towards phosphor coated screen.

✡ Control Grid: The intensity of e^- beam can be controlled by setting voltage level using control grid.

✡ Focusing System: The focusing system is needed to force the e^- beam to converge into a small spot as it strikes to the phosphor coated screen.

✡ Deflection System: The deflection system contains 2 sets of deflecting plates. One for horizontal deflection and other to control the verticle deflection.

A CRT tube is a vaccum tube in which images are reduced where e^- beam strike to phosphor coated surface.

- Persistance: Time require for emitted light to decay to $1/10^{th}$ of its original intensity.

- Refreshed Rate: To refresh an image per second for keeping the cathode ray generator image intensity constant. It simply means no. of times the refreshing process is repeated in unit time to retain the image on the screen.

* Refreshing of CRT: In order to keep phosphorus glowing we need to redraw the picture repeatedly by directing the e^- beam back over the same point again and again. This is called refreshing of CRT.

Major parts of CRT:

(a) Electron gun (b) Electron beam (c) Focusing coils (d) Deflection coils
(e) Anode formation (f) Shadow Mask (g) Phosphor Layer.

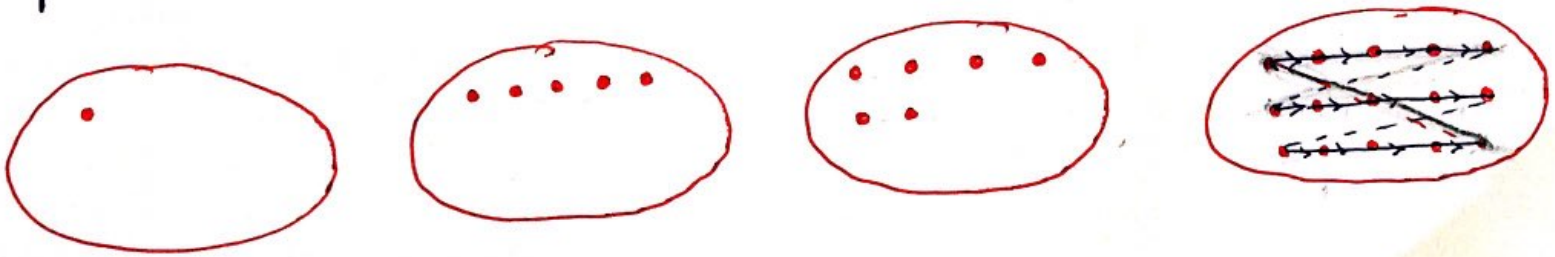
Working: A CRT is a vacuum tube, in which images are produced when electron beam strikes the fluorscent screen.
Heat is supplied to the cathode by the filament. The free electrons are accelerated towards the phosphor coating by a high positive voltage intensity of electron beam is controlled by setting the voltage level on the control grid.
The focusing system is needed to force the electron beam to converge into a small spot as it strikes the phosphor. The deflection system contains two sets of deflecting plates for horizontal & vertical deflection.

Raster Scan System or Raster Scan Display :

→ In this system e^- beam is swept ~~across~~ across one row at a time from top to bottom as e^- beam move across each row the beam intensity is turned on/off to create a pattern of illuminated spots.

→ Picture definition is stored in memory area called frame buffer / refresh ~~rate~~ buffer.

Refresh buffer / frame buffer : This memory area holds the set of intensity value for all the screen points.
Stored intensity values are then retrieved from refresh buffer and "pointed" on screen one row at a time.



* Horizontal Retrace: The return to the left of the screen of e^- beam after scanning the whole scan line onto the beginning of next scan line.

* Vertical Retrace: The return to the first left of screen after refreshing the last scan line.

Advantages:

→ Lines produced are zig-zag as the plotted values are discreate.

→ High degree realism is achieved in picture with aid of advanced shading and surface technique.

→ Less memory cost.

Disadvantage:

→ Have less resolution.

→ Require screen size memory array (frame buffer).

→ Occupies a large volume.

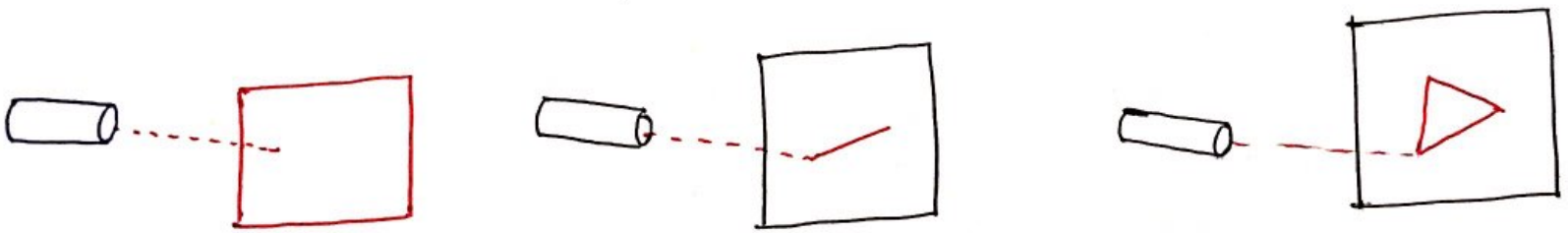
Random Scan System / Random Scan Display :

→ In random scan display, the random scan monitor draw a picture one line at a time. Therefore, it is also known as calligraphic display.

→ The refresh rate depends upon the number of lines to be deisplayed.

→ Picture definition is stored as line drawing commands in an area of memory refered as refresh display file.

→ Random scan displays are designed for line drawing applications and cannot draw realistic or shaded scenes.



Advantages :

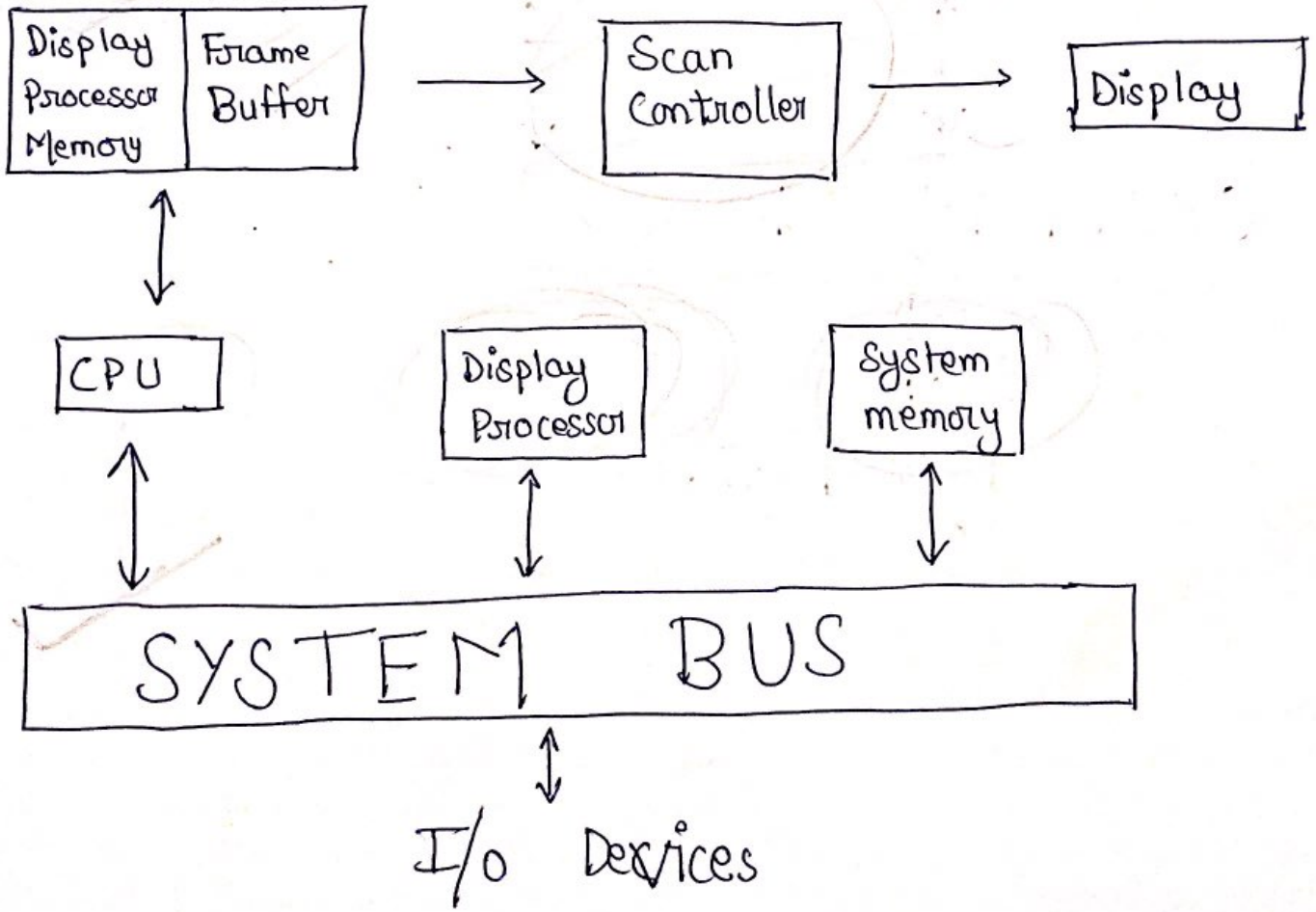
→ Very high resolution
→ Easy animation
→ Require Less memory

Disadvantages :

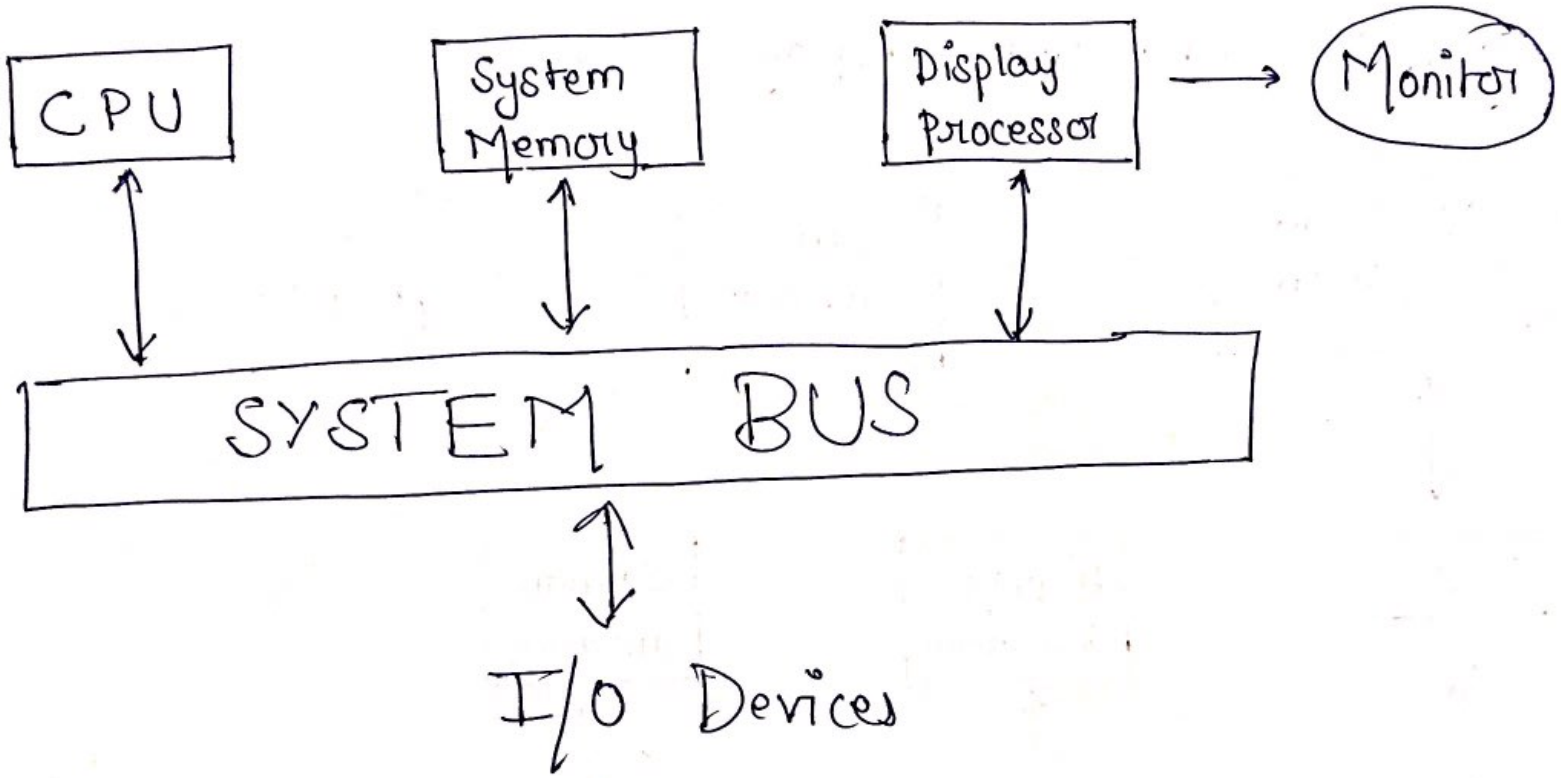
→ Requires intelligent e^- beam, processor controlled.
→ Limited colour capability.

Display Processor Architecture :

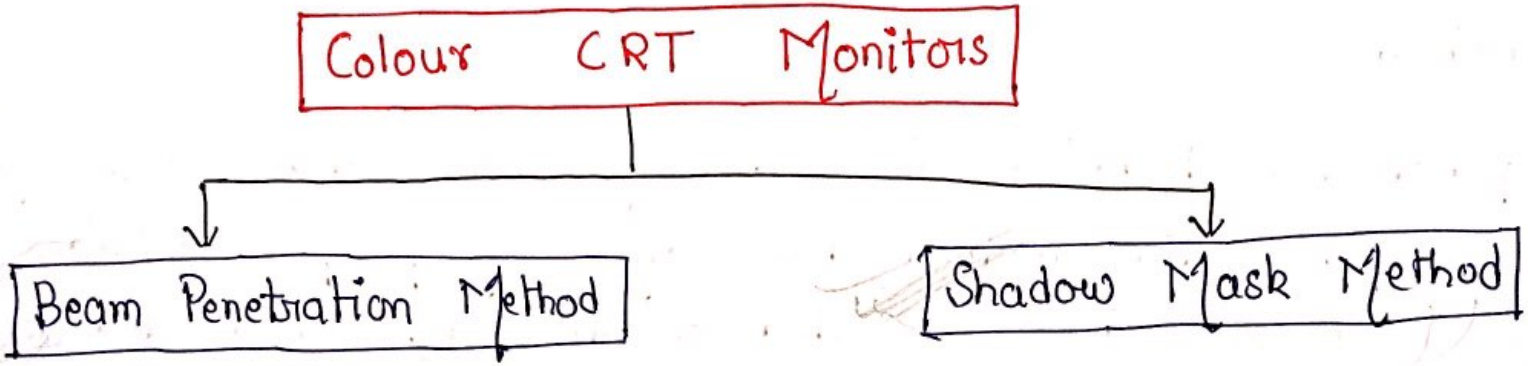
1. Raster graphics system with display processor.



2. Random Scan System:



Colour CRT Monitors



→ The color CRT's mix RED, GREEN, BLUE colour to get coloured pixel. Pixel is divided into phosphor dots for RED, GREEN & BLUE colour.

→ For Each colour there is a separate electron gun intensity of the single color is determined by voltage for the beam.

(1) Beam Penetration:

→ Beam penetration technique is used only with random scan system.

→ In beam penetration method two layers of phosphor ~~usually~~ usually green or red are coated on the CRT screen and the displayed color depends on how far the electron beam penetrates into the phosphor layer.

→ The slow moving electron beam will excite the ~~outer green~~ inner red layer, while the fast moving beam will excite the outer green layer..

→ Intermediate speed will produce the combination of red and green to show two additional color orange and yellow.

Limitations :→ It is an inexpensive method but only 4 colours are possible.

→ Quality of the product is not good.

Shadow Mask Method :

→ This method produce much wide range of colours, than beam penetration method, there are 3 phosphor dots : at each pixel position and each dot emits red, blue, green colors.

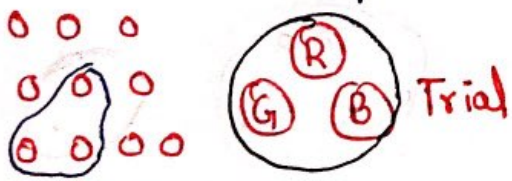
→ The CRT has three electron guns one for each colour dot.

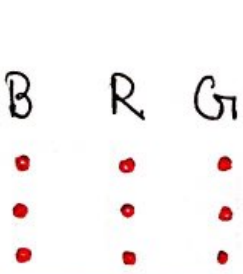
→ It has a shadow mask grid just behind the phosphor coated screen.

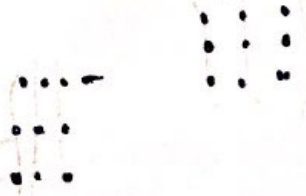
→ Color variations are obtained by varying the intensity levels of 3 electron beams.

→ Shadow mask method is used with Raster scan system.
eg: HOME TELEVISION.

→ The dots are arranged in Delta-Delta position/pattern or inline pattern.







→ High Quality Raster Graphic System have 24 bit/pixel allowing 256 voltage setting for each e^- gun, ie 8 bit storage for 1 colour.

→ 17 million colors are possible with 24 bits of storage per pixel & known as true colour system.