CH-1 COMPUTER GRAPHICS

- Anything which is not a text on computer is treated as computer graphics.
- It is an art of drawing pictures, lines, chart, etc. using computers with the help of programming.
- It is made up of number of pixels
- Pixel is the smallest graphical unit represented on the computer screen.

Types of Computer Graphics.

- Interactive computer graphics
  - ↳ Two way communication between computer and user
  - ↳ Observer is given some control over the image by providing him with an input device.
  - ↳ ICG user have control over the picture

- Non-Interactive / Passive Computer Graphics.
  - ↳ In this, picture is produced on the monitor and user does not have any control over the image
  - ↳ User cannot make any change in the rendered image, example, Titles shown on TV.
  - ↳ One way communication

Advantages of Interactive Computer Graphics:

i] Higher quality
ii] more precise results or products
iii] Greater productivity
iv] Lower Analysis and design cost
v] significantly enhances our ability to understand data and to perceive trends

$$\text{Aspect Ratio} = \frac{\text{Width Unit}}{\text{Height Unit}}$$

Application of Computer Graphics

4 main areas
- Display of Information
- Design
- User Interfaces
- Simulation

i] Computer Aided Designing (CAD)
- Producing zooming scales and views
- Animations are useful for testing performance

ii] Presentation Graphics
- Produce illustrations to summarize various datas.
- 2D, 3D graphics are good tools for reporting more complex data

iii] Computer Art
- Painting (with packages available)
- Pressure-sensitive stylus
- Photorealistic techniques, morphing and animations required
- For films, 24 fps
  For video monitoring, 30 fps

iv] Entertainment
- Motion pictures, music videos, TV shows, computer games.

v] Education and Training
- Ship captains, Aircraft Pilots

vi] Visualization.

- Analyzing scientific, engineering, medical, business data
- Converting data to visual form.

vii] Image Processing

- Medical Applications

viii] Graphical User Interface

- multiple windows, icons, menus allow a computer setup to be utilized more efficiently.

Elements of pictures

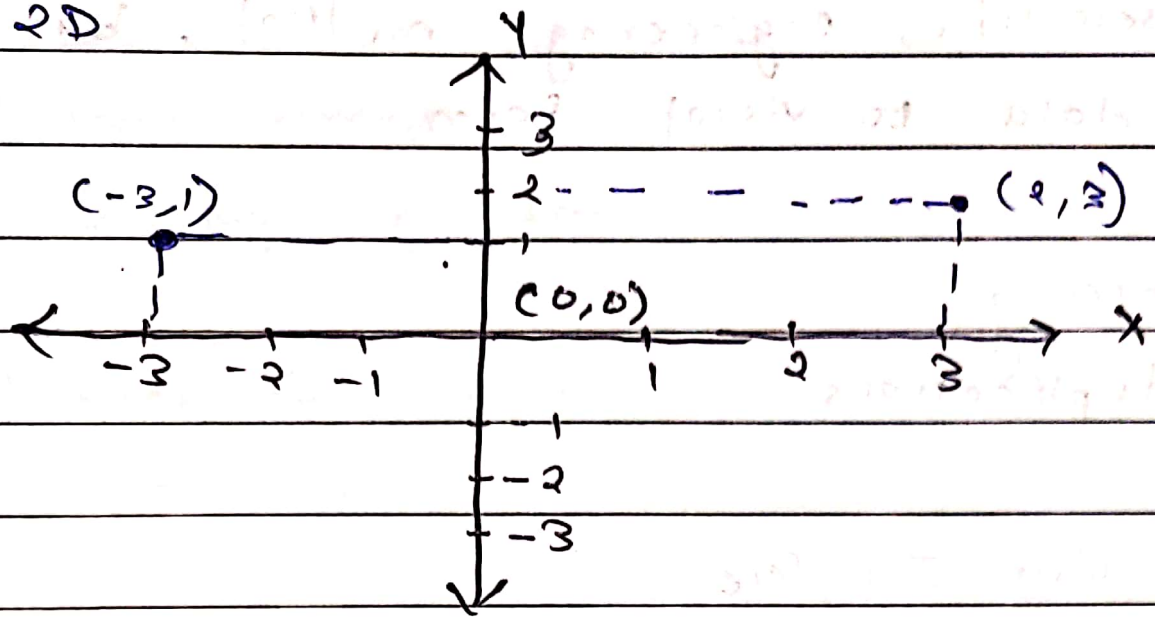
- We cannot represent an infinite number of points on a computer, just as we cannot represent an infinite quantity of numbers.
- The machine is finite and we are limited to a finite number of points making up each line.
- Greater the number of points, higher the resolution.
- Point → Pixel → Smallest addressable screen element.
  ↳ Basic element of the picture.

→ Rotating Memory Frame buffer

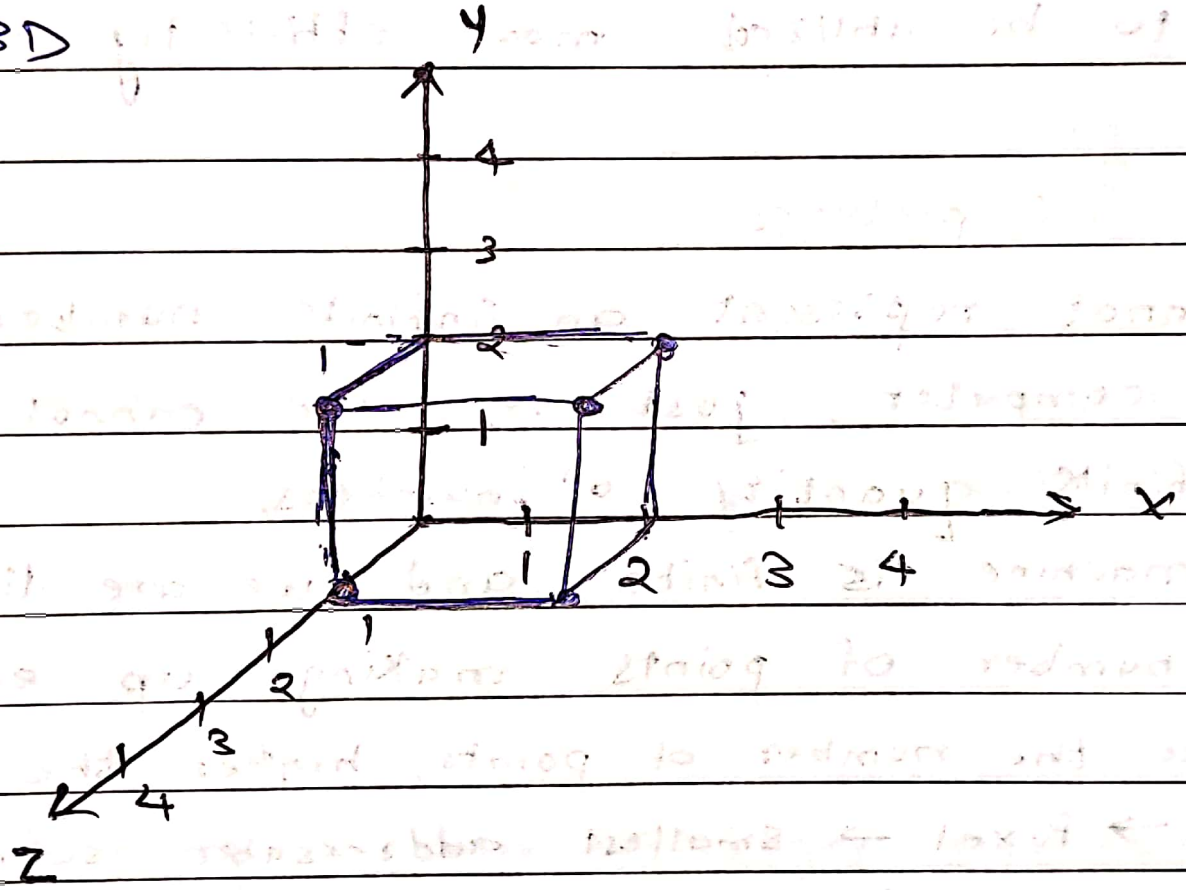
- This is the situation when we use screen resolution less than the maximum screen resolution
- In case of maximum screen resolution the frame buffer memory is fully utilized and only one page is available for display.
- It can be implemented using shift registers. Each shift register contributes one pixel in a horizontal scan line.

Coordinate system

1] 2D



ii] 3D



Video Adapters

- It is an integrated circuit card in a computer that provides digital to analog converter, video RAM, video controller

Types of Display adapters

↳ Resolution
↳ Colour Depth
↳ Refresh Rate
↳ Accelaration

i] Resolution:

- Number of dots on the screen
- 4 common resolutions
  - i] 640 x 480
  - ii] 800 x 600
  - iii] 1024 x 768
  - iv] 1280 x 1024
- Computer display generates colours by combining amounts of Red, Green and Blue. (controlled by 3 wires in the display cable.
- Each has variable amount of voltage by a number from 0 to 255.
- 16 million possible colours.

ii] Color Depth (Number of colors)

- Determined by the number of bits assigned to hold colour value.
  - → 1 bit - 2 colors (black and white)
  - → 4 bits - 16 colors
  - → 8 bits - 256 colors
  - → 16 bits - 32 thousand colors
  - → 24 bits - 16 million (high color)
  - → 32 bits - latest (true color)

- Display adapter stores a value (4 to 32 bits) for every dot on the screen
- Amount of storage determined by multiplying the number of dots.

iii] Refresh rate

- Speed at which particular dot on the screen is print
- We can set refresh rate by making use of drivers

iv] Accelarator

- Accelarator chip is an integrated chip existing on the display adapter.

Modes of Resolution

i] Text mode / Character Mode

ii] Graphics Mode

Display Modes

- The term display mode refers to the characteristics of a computer display, in particular the maximum number of colors and the maximum image resolution (in pixels horizontally by pixels vertically)

	Display Mode	Resolution (Pixels)	
1	VGA	640 x 480	Video Graphics Array
2	SVGA	800 x 600	Super VGA
3	XGA	1024 x 768	Extended GA
4	SXGA	1280 x 1024	Super Extended GA
5	UXGA	1600 x 1200	Ultra Extended GA