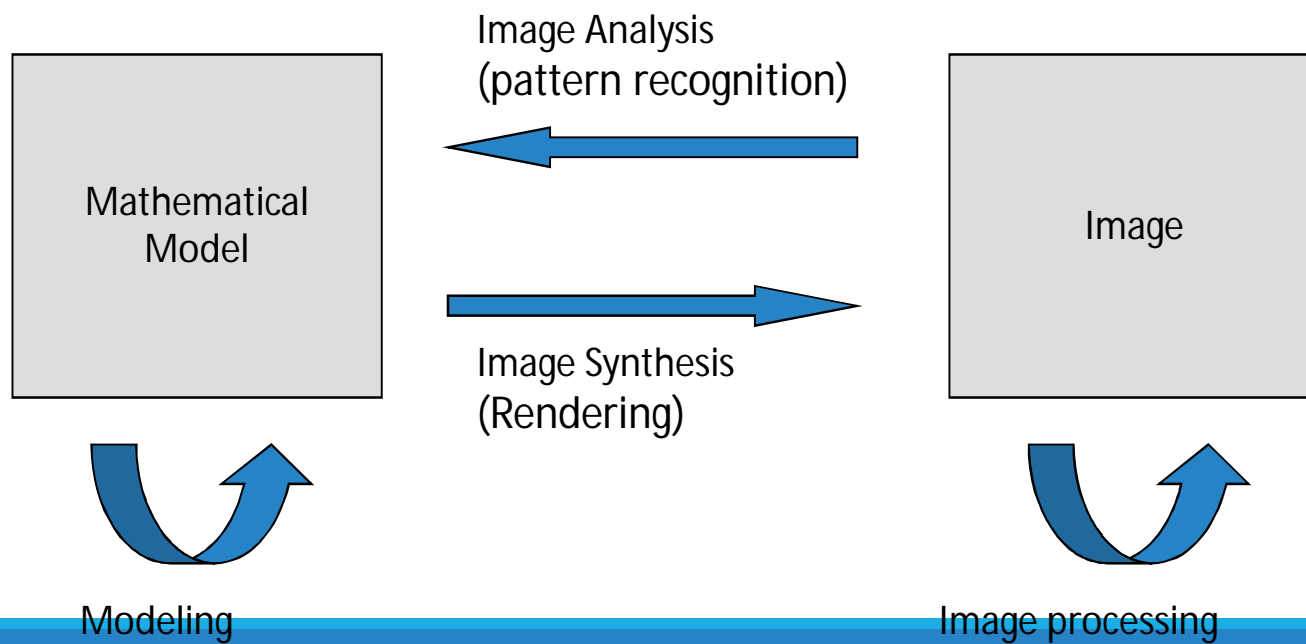


Computer Graphics



Representations in graphics

Vector Graphics

Image is represented by continuous geometric objects: lines, curves, etc.

Raster Graphics

Image is represented as an rectangular grid of coloured squares

Vector graphics

Graphics objects: geometry + colour

Complexity $\sim O(\text{number of objects})$

Geometric transformation possible without loss of information (zoom, rotate, ...)

Diagrams, schemes, ...

Examples: PowerPoint, CorelDraw, ...

Raster graphics

Generic

Image processing techniques

Geometric Transformation: loss of information

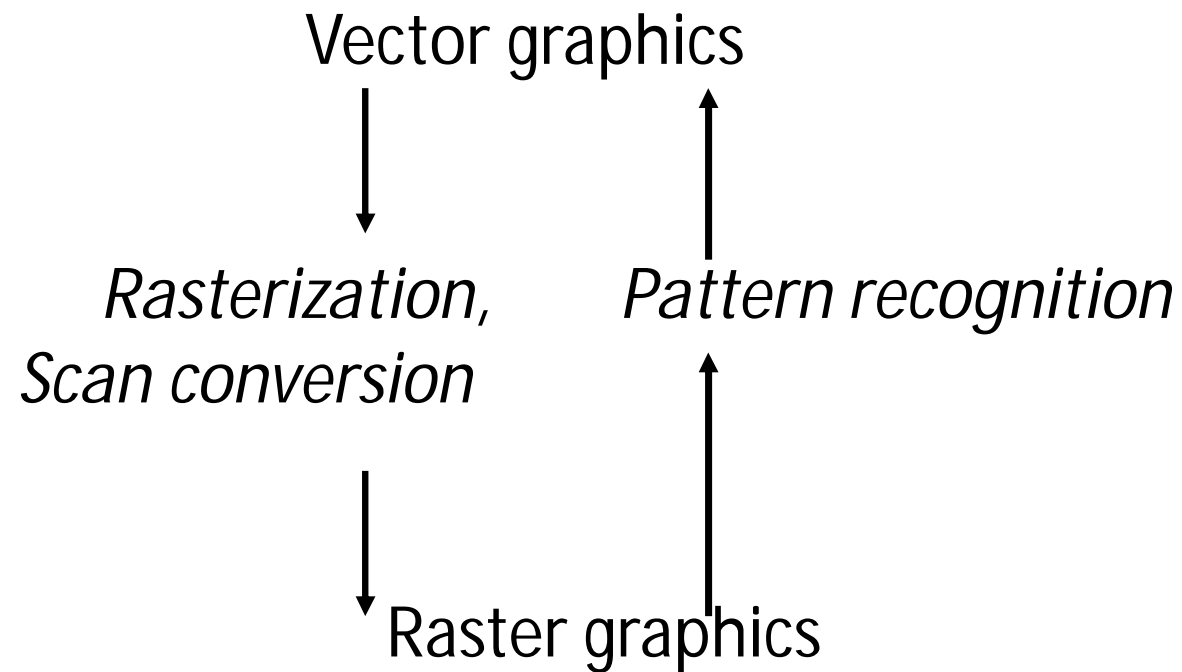
Complexity $\sim O(\text{number of pixels})$

Jagged edges, anti-aliasing

Realistic images, textures, ...

Examples: Paint, PhotoShop, ...

Conversion

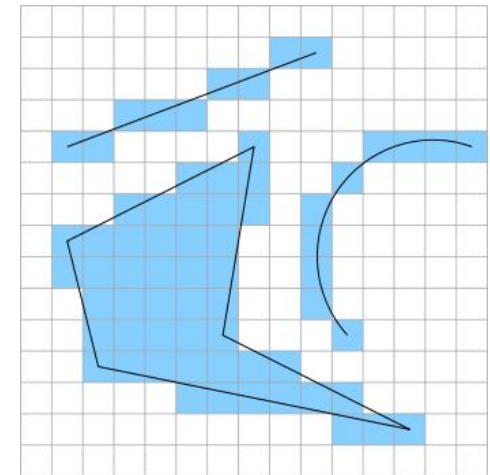


Rasterization

Converts the vertex information output by the geometry pipeline into pixel information needed by the video display

Aliasing: distortion artifacts produced when representing a high-resolution signal at a lower resolution.

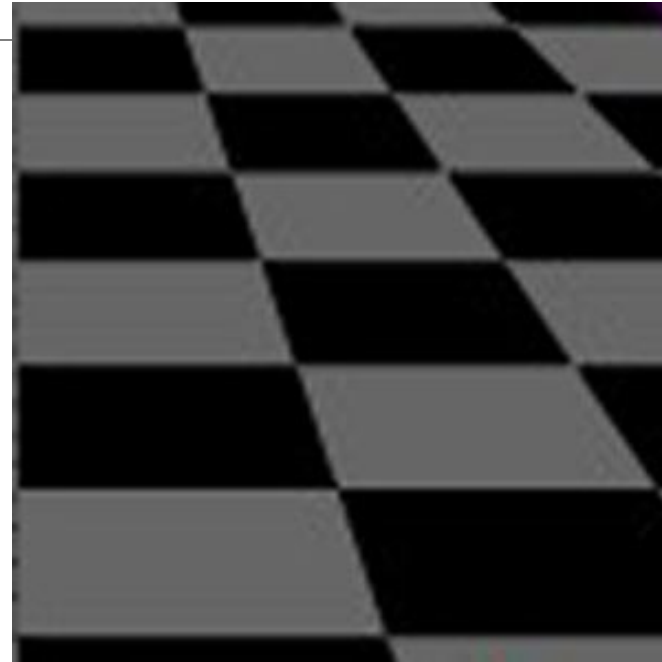
Anti-aliasing : technique to remove aliasing



Anti-aliasing



**Aliased polygons
(jagged edges)**



Anti-aliased polygons

Hardware

Vector graphics

Raster graphics

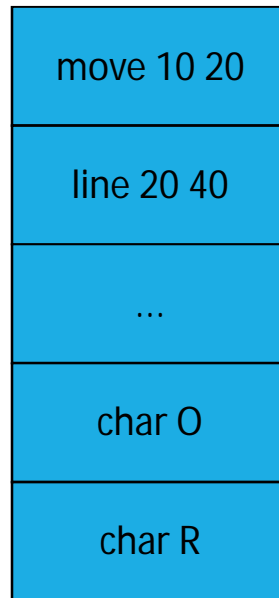
Colour lookup table

3D rendering hardware

Vector Graphics Hardware

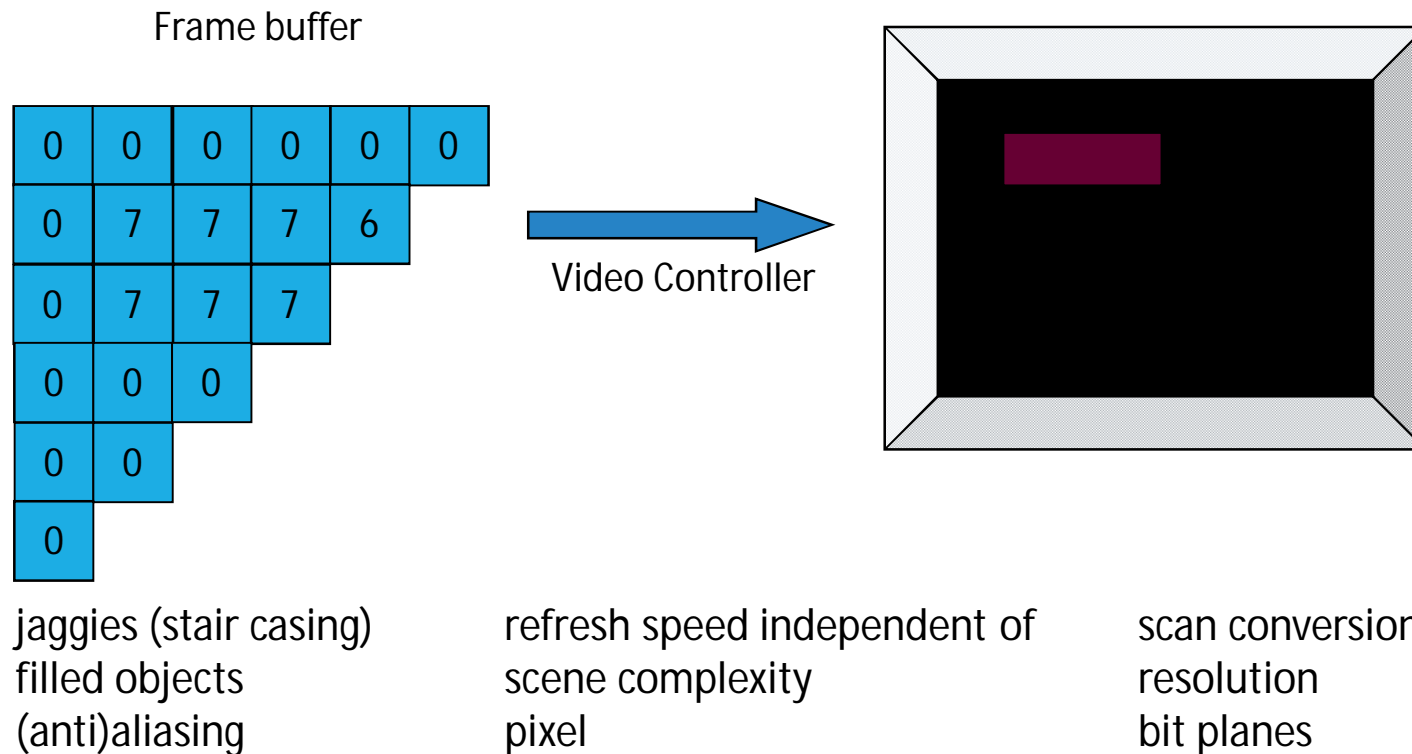
Display list

continuous & smooth
lines
no filled objects
random scan
refresh speed
depends on
complexity of the
scene

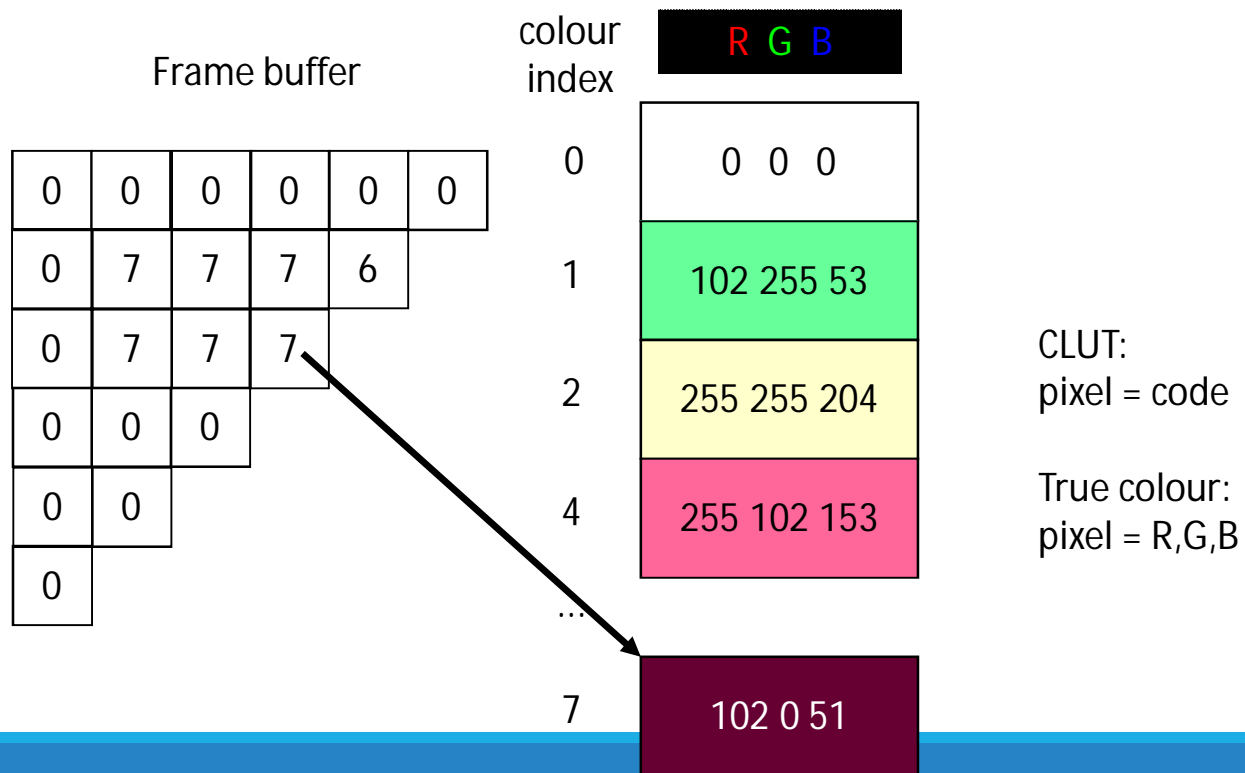


Display Controller

Raster Graphics Hardware



Colour Lookup Table



Display Hardware

- How are images displayed?

Display Hardware

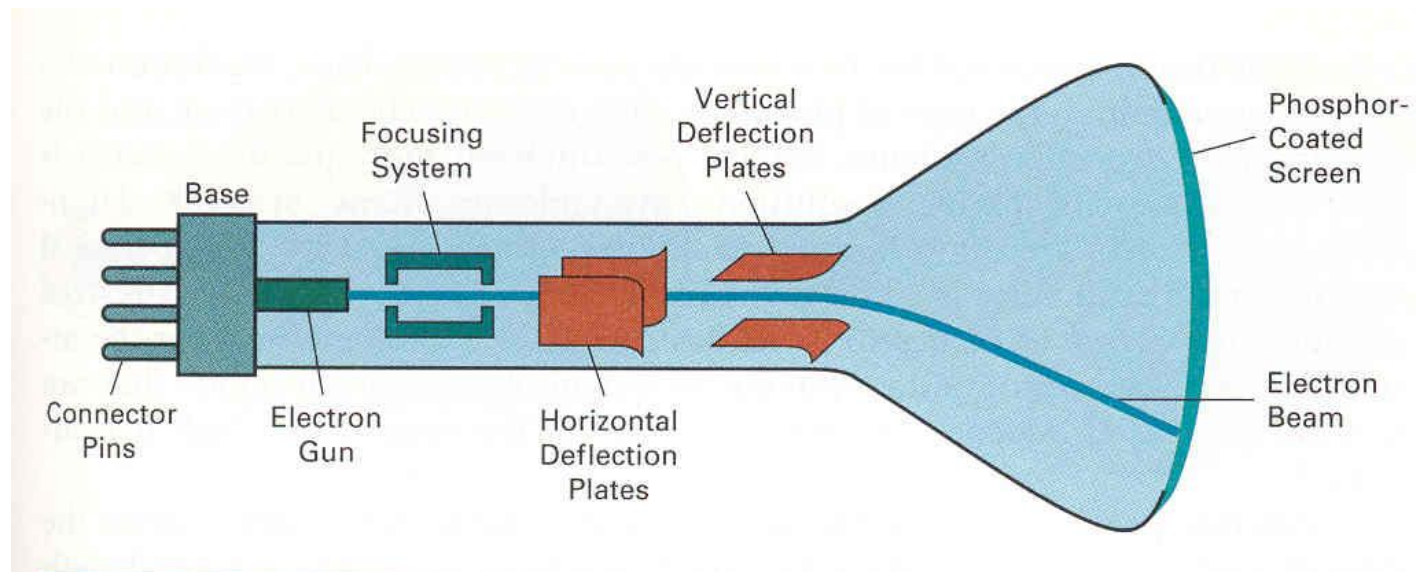
Video Display Devices

- Cathode Ray Tube (CRT)
- Liquid Crystal Display (LCD)
- Plasma panels
- Thin-film electroluminescent display
- Light-emitting diodes (LED)

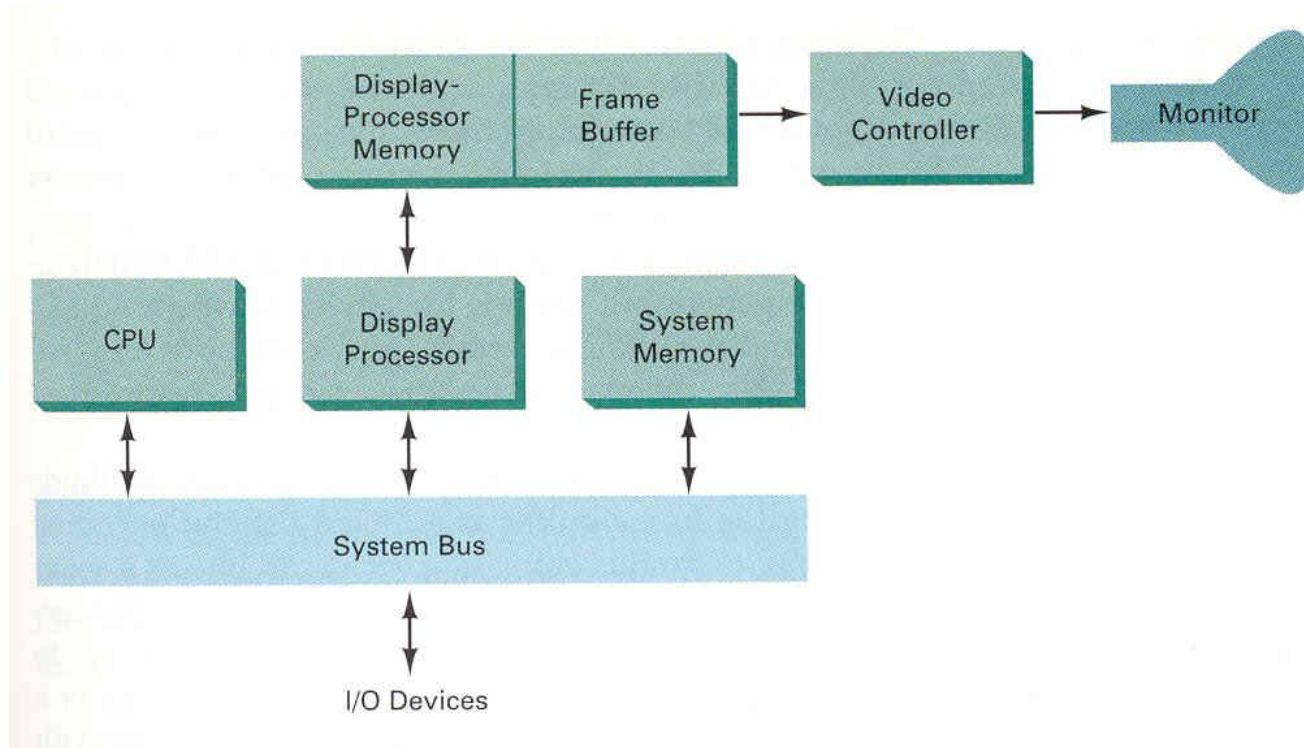
Hard-Copy Devices

- Ink-jet printer
- Laser printer
- Film recorder
- Electrostatic printer
- Pen plotter

Cathode Ray Tube (CRT)



Raster Graphics

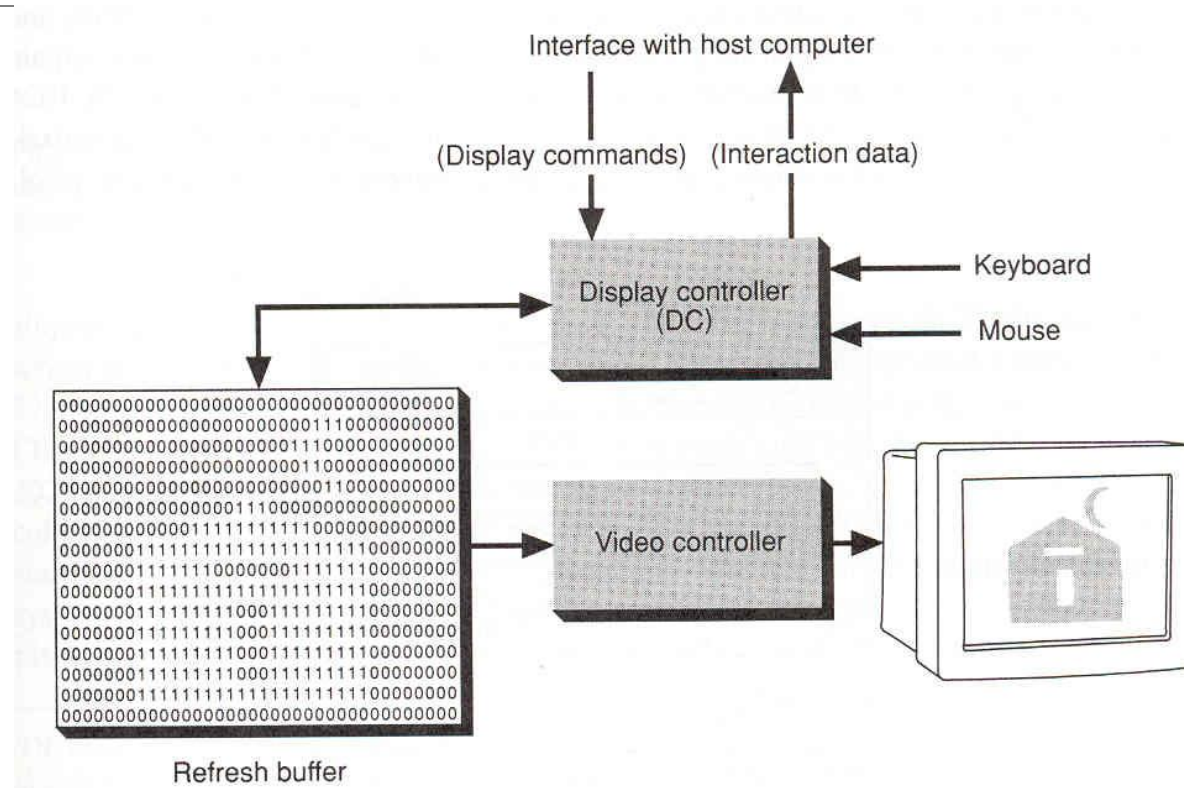


Graphics Definitions

Rendering : process of generating an image from the model

Framebuffer : a video output device that drives a video display from a memory containing the color for every pixel

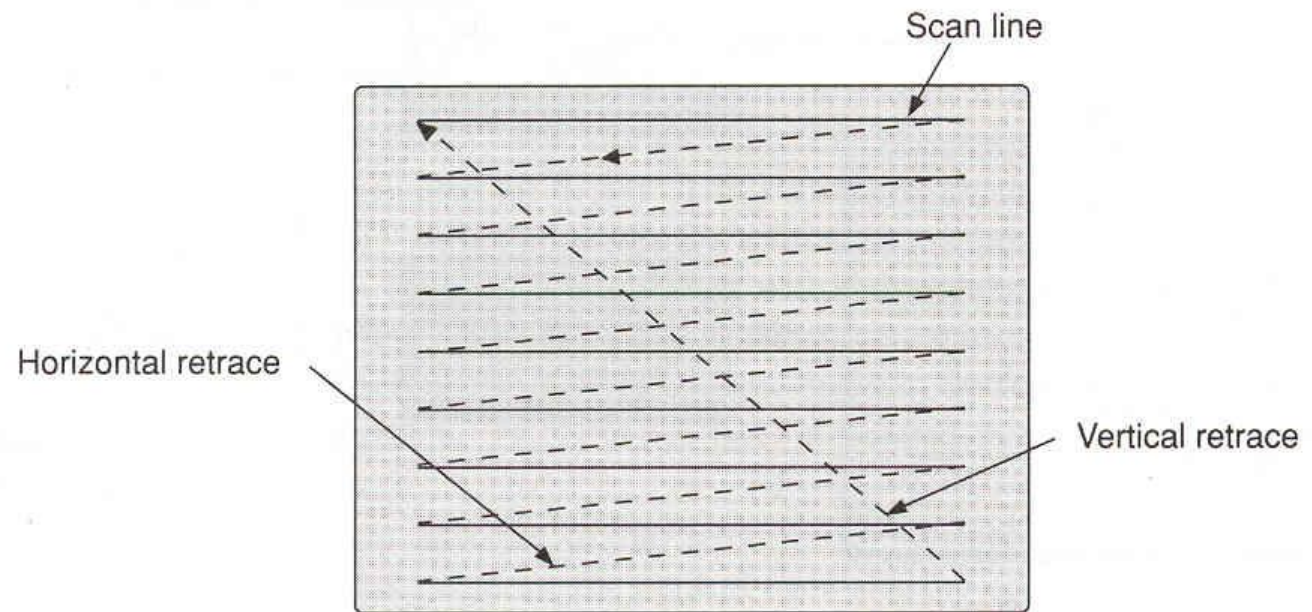
Frame Buffer



Frame Buffer Refresh

Refresh Rate

- Usually 30~75 Hz



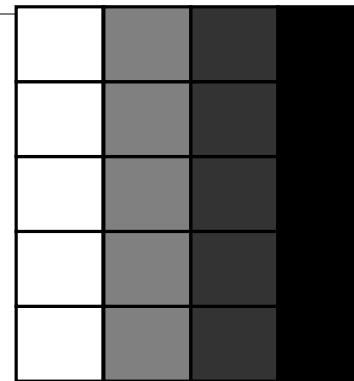
Color Frame Buffer

				255	150	75	0	
			255	150	75	0		0
255	150	75	0			0		0
255	150	75	0			0		0
255	150	75	0			0		0
255	150	75	0			0		
255	150	75	0					

Blue channel

Green channel

Red channel



Color CRT

