COMPUTER GRAPHICS

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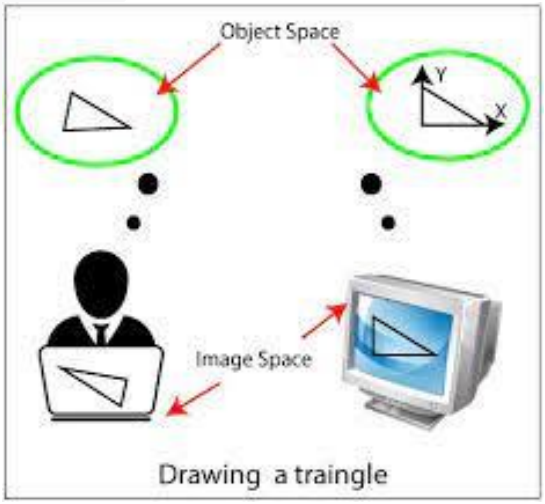
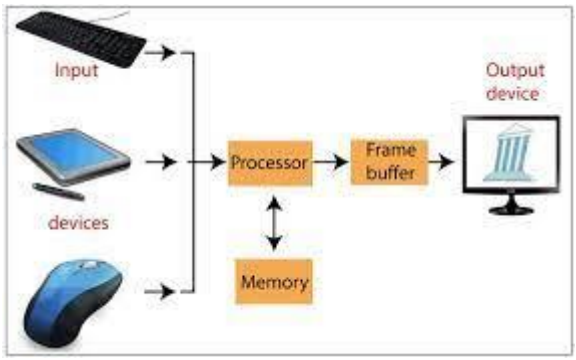
Computer graphics is commonly seen as a computer science branch that deals with the computerized image fusion theory and technology. As simple as a triangle outline, a computer-generated image may represent a scene. The computer has become a powerful tool for producing images quickly and economically. When a computer is used to create images, the same process is followed as creating images manually. The process's primary computational steps give a boost to several important computer graphics areas. Also on computers, the term computer graphics covers almost everything. Here in the computer graphics program's classroom, we think of computer graphics as drawing images on machines, often known as rendering. The images can be photos, sketches, animations, or pictures of items imagined. Or they may be pictures, we cannot see directly, like internal body parts. We have put a great deal of our time to develop how computer images can replicate real-world scenes. We want objects on computers not only to look more real, but also their colors to be more realistic and how different materials appear.



DEFINITION OF COMPUTER GRAPHICS:

-Computer graphics can be a series of images which is most often called a video or single image. Computer graphics is the technology that concerns with designs and pictures on computers. That's why, computer graphics are visual representations of data shown on a monitor made on a computer. "Computer graphics is the use of a computer to define,

store, manipulate, interrogate, and represent the pictorial output.” An image in computer graphics is made up of a number of pixels.



TYPES OF COMPUTER GRAPHICS

There are two kinds of computer graphics are–

1 Interactive Computer Graphics-In interactive computer graphics, users have some controls over the image, i.e., the user can make any changes to the image produced. Interactive Computer Graphics involves computer-user two-way communication. For Example: Ping-pong game. Drawing on touch screens. Display weather forecast or other moving charts/graphs on the screen. Animating pictures or graphics in movies. Graphics animation in video games.

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WORKING: The modern display of graphics is very simple to build. It is composed of three components:

Display controller or video controller

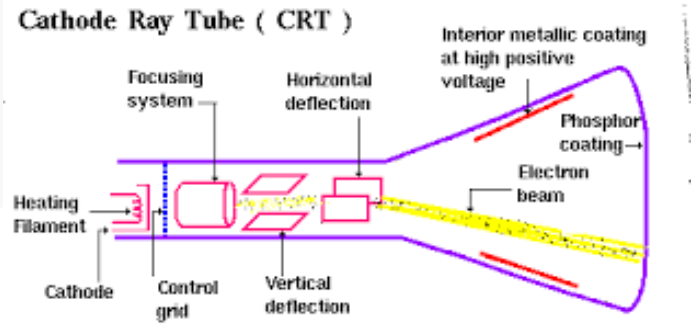
Digital memory or frame buffer

Television monitor

1. Display controller or video controller- It's a Memory Buffer and TV Monitor interface. Its task is to pass Frame Buffer's contents to the monitor. The display controller reads each continuous byte of Memory frame buffer data and converts 0's and 1's into appropriate video signals. In today's term, the display controller is recognized as a display card, and one of our choices can be a VGA(Video Graphics Array) card with a resolution of 640×480. Display Controller is also capable of displaying the image in colors.

2. Digital memory or frame buffer-This is a place where images and pictures are stored as an array (matrix of 0 & 1, 0 represents darkness, and 1 represents image or picture). It is also called a frame buffer. In today's term frame buffer is called V-RAM (video RAM), and it helps to store the image in bit form. It helps to increase the speed of graphics.

3. Television monitor- Monitor helps us to view the display, and they make use of CRT(Cathode ray tube) technology



Advantages 1. Superior Quality. 2. More accurate outcomes or products. 3. Increased Productivity. 4. Lower cost of development. 5. Increases the ability to understand information and interpret patterns significantly

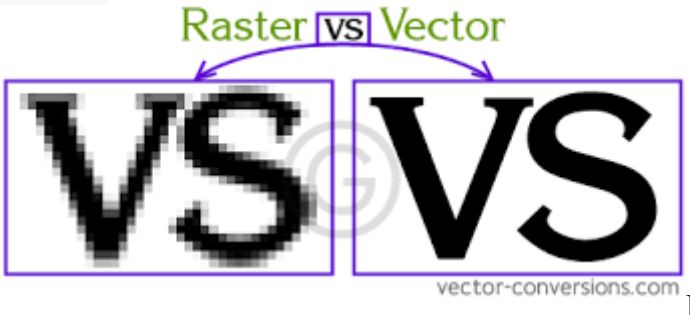
NON INTERACTIVE GRAPHICS

Non-interactive computer graphics are also known as passive computer graphics. It is a type of computer graphics in which the user has no control over the image. The photo is completely controlled by the instructions of the program, not by the user.

For Example: Screen savers. Map representation of the data. Graphic elements are used in the text, document, and PDF presentation. Static images are used in mobile applications and websites. Business graphics are used as brochures, business cards, menu of the hotel.

1. Raster Graphics: In raster graphics, the image is presented as a rectangular grid of colored squares. Raster images are also called bitmap images. Bitmap images are stored as the collection of small individual dots called pixels. Bitmap images require high resolution and anti-aliasing for a smooth appearance. For example– Paint, Photoshop, etc.

2. Vector Graphics: In vector graphics, the image is represented in the form of continuous geometric objects: line, curve, etc. Vector images are not based on pixel pattern. They use mathematical formulas to draw line and curves. The lines and curves can be combined to create an image. For Example– PowerPoint, Corel Draw, etc.



Difference between Raster and Vector Graphics:

Raster Graphics Vector Graphics Raster images are the collection of the pixel.

The Vector images are composed of paths. Scan conversion is required. Scan Conversion is not required. Raster Graphics are less costly. Vector Graphics are more costly compared to raster graphics. Raster image takes less space to store. Vector image takes more space. Raster graphics can draw mathematical curves, polygons, and boundaries. Vector graphics can only draw continuous and smooth lines. File Extension: .BMP, .TIF, .JPG etc. File Extension: .SVG, .PDF, .AI etc.

Video Display Devices

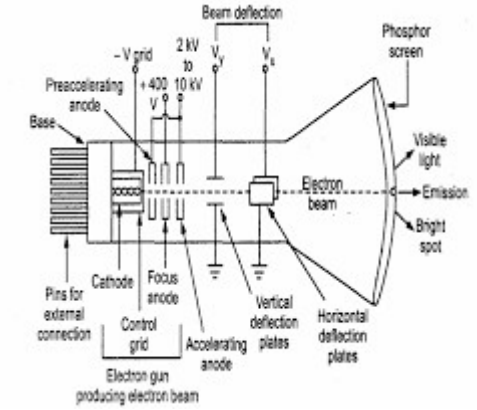
Cathode Ray Tube: CRT stands for Cathode ray tube. It is a technology which is used in traditional computer monitor and television. Cathode ray tube is a particular type of vacuum tube that displays images when an electron beam collides on the radiant surface. The primary output device in a graphical system is the video monitor.

Component of CRT: E**lectron Gun:** The electron gun is made up of several elements, mainly a heating filament (heater) and a cathode. The electron gun is a source of electrons focused on a narrow beam facing the CRT. F**ocusing & Accelerating Anodes:** These anodes are used to produce a narrow and sharply focused beam of electrons.

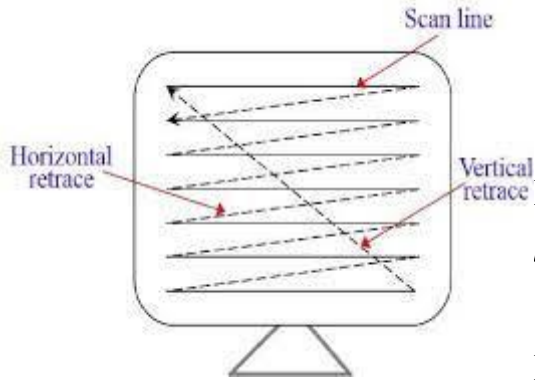
Horizontal & Vertical Deflection Plates: These plates are used to guide the path of the electron the beam. The plates produce an electromagnetic field that bends the electron beam through the area as it travels. **Phosphorus-coated Screen:** The phosphorus coated screen is used to produce bright spots when the high-velocity electron beam hits it.

The main element of a video monitor is the Cathode Ray Tube CRT, shown in the following illustration.

The operation of CRT is very simple − The electron gun emits a beam of electrons cathode rays. The electron beam passes through focusing and deflection systems that direct it towards specified positions on the phosphor-coated screen. When the beam hits the screen, the phosphor emits a small spot of light at each position contacted by the electron beam. It redraws the picture by directing the electron beam back over the same screen points quickly.



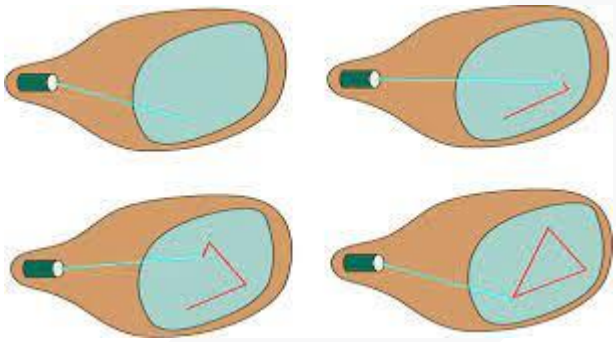
Raster Scan In a raster scan system, the electron beam is swept across the screen, one row at a time from top to bottom. As the electron beam moves across each row, the beam intensity is turned on and off to create a pattern of illuminated spots. Picture definition is stored in memory area called the **Refresh Buffer or Frame Buffer.** This memory area holds the set of intensity values for all the screen points. Stored intensity values are then retrieved from the refresh buffer and "painted" on the screen one row scan line at a time as shown in the following illustration. Each screen point is referred to as a pixel picture element or pel. At the end of each scan line, the electron beam returns to the left side of the screen to begin displaying the next scan line.



Random Scan /Vector Scan

In this technique, the

electron beam is directed only to the part of the screen where the picture is to be drawn rather than scanning from left to right and top to bottom as in raster scan. It is also called vector display, stroke-writing display, or calligraphic display. Picture definition is stored as a set of line-drawing commands in an area of memory referred to as the refresh display file. To display a specified picture, the system cycles through the set of commands in the display file, drawing each component line in turn. After all the line-drawing commands are processed, the system cycles back to the first line command in the list. Random-scan displays are designed to draw all the component lines of a picture 30 to 60 times each second.



APPLICATION OF COMPUTER GRAPHICS

Computer Graphics has numerous applications, some of which are listed below

Computer graphics user interfaces GUIs − A graphic, mouse-oriented paradigm which allows the user to interact with a computer. Business presentation graphics − "A picture is worth a thousand words".

Cartography − Drawing maps.

Weather Maps − Real-time mapping, symbolic representations.

Satellite Imaging − Geodesic images.

Photo Enhancement − Sharpening blurred photos

Engineering drawings − mechanical, electrical, civil, etc. - Replacing the blueprints of the past.