Computer Graphics

Definition of Computer Graphics-

Computer graphics is the technology that concerns with designs of images and pictures on a computers.

"Computer graphics is the use of a computer to define, store, manipulate, interrogate, and represent the pictorial output."

The term computer graphics has been used to define "almost everything on the computer, including text or sound." Generally, the term computer graphics refer to the following things:

- Computer representation and manipulation of image data.
- Various technologies for creating and manipulating images.
- Computer graphics study is a sub-field of computer science that studies methods for digitally incorporating and manipulating visual content.

Types of Computer Graphics

a) 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

b) Non- Interactive Computer 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.

Representation of graphics

- **a)Raster (Bitmap) Graphics**
- **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.

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.

Applications of Computer Graphics

- **Graphical User Interface (GUI):** It is a way of interacting with a computer using the icon, menu, and other visual, graphics by which user easily interacts.
- **Art:** Many artists and designers use illustrator, coral draw, Photoshop, adobe muse, and other types of applications for creating new designs.
- **Entertainment:** Computer graphics allow the user to make animated movies and games. Computer graphics are used to create scenes. Computer graphics are also used for special effects and animations.
- **Presentations:** Computer graphics are used for making charts, bar diagrams, and other images for the presentation purpose, with the graphical presentation the user, can easily understand the points.
- **Engineering Drawings:** Computer Graphics has also provided us the flexibility to make 3D models, house circuits and engineering drawings, etc. which is helpful for us.
- **Education and Training:** Computer graphics are also used to provide training to students with simulators. The students can learn about the machines without physically trying them.
- **Medical Imaging:** MRIs, CT scans, and other internal scans are possible because of computer graphics.
- **Flight Simulator:** Computer graphic is used to provide training to pilots of aircraft. The pilots give much time to a flight simulator on the ground instead of real airplanes.
- **Printing Technology: Computer** graphics are used in textile designing and flex printing.
- **Typography:** Use of character pictures to replace the rough form of the past in printing.
- **Satellite Imaging:** Computer graphics are used to forecast the movement of the cloud and to predict the weather.
- **Cartography:** Computer graphics are used in map drawing.
- **CAD/CAM:** CAD/CAM is also known as Computer-aided design and computer-aided manufacturing. CAD/CAM is used to design and build prototypes, finished products, and manufacturing processes.

Advantages of Computer graphics

- Increase Productivity
- Computer graphics give us tools for creating pictures of solid objects as well as of theoretical, engineered objects.
- Computer graphics also point out the moving images.
- The computer can store complex drawings and display complex pictures.
- Sound cards are used to make computers produce sound effects led to other uses of graphics.

Disadvantages of Computer graphics

- Hardware characteristics and cost.
- Technical issues.
- Coupling issues (display-to-simulation).
- Define the motion.
- Structure of drawings (making the structure explicit).
- Hidden line removal.
- Program instrumentation and visualization.