Introduction to computer graphics

Definition of Computer Graphics involves Display, manipulation and storage of pictures and experimental data for proper visualization using a computer.

Typical graphics system buffer comprises of a host computer with support of fast Display devices(color monitors)

- Input Devices (Mouse, keyboard, joystick, touch screen, trackball)
- Output Devices (LCD panels, Laser printer, Color printer, plotter)

Typical applications areas are :-

1- GUI (Graphical user Interface) Typical Components used :-

- Menus
- Icons
- Cursers
- Dialog Boxes
- Scroll Bars

2- Plotting in business

3- Office Automation

4- Disk top publishing

5- Plotting in science and technology

6- Web /business /commercial and advertisements

7- CAD/CAM design

8- Scientific Visualization

9- Entertainment (TV, Movie, Games)

10- Simulation studies

11- Simulators

12- Cartography

13- Multimedia

14- Virtual reality: overlaying artificial information on real -world scene

15- Process monitoring

16- Digital Image Processing

17- Education and training

18- Computer vision : inverse of computer graphics, and decipher scene information from images.

19- Geographic Information Systems (GIS)

20- animation, games

Components of Computer Graphics

1- Modeling: Defining objects in terms of *primitives*, *coordinates* and *characteristics*

2- Storing: storing scenes and images in memory and on disk

3- Manipulating: changing the shape, position and characteristics of objects

4- Rendering: applying physically based procedures to generate (photorealistic) images from scenes (using lighting and shading).

5-Viewing: displaying images from various viewpoints on various device

Image Processing

Although methods **used** in computer graphics and Image processing overlap, the two areas are concerned with fundamentally different operations.

In computer graphics, a computer is used to create a picture. Image **processing,** on the other hand applies techniques to modify or interpret existing pictures, such as photographs and **TV scans.** Two principal applications of image processing are (1) Improving picture quality **and (2)** machine perception of visual information, as used in robotics.

To apply image processing methods, we first digitize a photograph or other picture into an image file. Then digital methods can be applied to rearrange pic**ture** parts, to enhance color separations, or to improve the quality of shading.

2.3 Basic geometric objects

The basic geometric objects in computer graphics are usually called *primitives* or *graphics output primitives*. They include geometric entities like points, straight and curved lines and areas as well as character strings. The basic primitives are the following ones.

Points that are uniquely defined by their *x*- and *y*-coordinate. Their main function is the description of other objects like lines that can be defined by their two endpoints.

Lines, *polylines* or *curves* can be defined by two or more points. Whereas for a line two points are needed, curves require additional control points. Polylines are connected sequences of lines. *Areas* are usually bounded by *closed polylines* or *polygons*. Areas can be filled with a color or a texture.

The simplest curve is a line segment or simply a line. A sequence of line where the following line starts where the previous one ends is called a *polyline*.

If the last line segment of a polyline ends where the first line segment started, the polyline is called a *polygon*.