**Introduction to Computer Graphics.**

1. **Introduction**

* Two Types of visualization:

1. Scientific visualization
2. Information visualization

* Uses of Computer graphics:

1. Document processing – to show alpha numeric characters and icons to show tools
2. CAD interface – to specify properties of components and assemble those components virtually to build machinery.
3. Visualize DNA molecule
4. Visualize the traffic in a computer network which cannot be perceived by us.

* Fundamental Questions- How we can create or represent synthesize, and render imagery on a computer display?
* This is the fundamental question that is studied in the field of computer graphics.
* We can frame 4 basic Questions- (Imagery is constructed from its constituent parts)

1. How to represent those parts?
2. How to synthesize the constituting part to form a complete realistic imagery?
3. How to allow the users to manipulate the imagery constituents on-screen?
4. How to create animation(The sense of motion)?

* Definition of Computer Graphics- it is the process of rendering static images or animation (sequence of images.) on computer screens in an efficient way.

1. **Historic Evolution, issues and challenges.**

* The term “computer graphics” was coined by William Fetter of Boeing in 1960.
* Phases of Evolution(By Sylvan Chasen)-
  1. Conception of Birth: 1950-1963.(Gestational period)
  2. Childhood: 1964-1970.
  3. Adolescence:1970-1981.
  4. Adulthood:1981- -
* SAGE- (Semi Automatic Ground Environment ) air defense system used CG.

1. **Generic Architecture**

* It contains a host computer, display controller, video memory, video controller, display screen.
* The stages involved in the generation of color values are together called graphic pipeline.
* First stage(Object Representation): Defining the objects which are going to be a part of image.
* In the subsequent stages the object definition is taken as input to get and render images on screen.
* 2nd Stage (Model Transformation/ Geometric Transformation): Each object is defined in their own local coordinate system. So to put them together to construct image, in its own coordinate system (world coordinate).
* 3rd Stage (Illumination or Lighting): Objects are assigned colors.
* 4th Stage (Viewing Transformation): Map (colored) 3D scene to 2D device coordinate. It is also called viewing pipeline since the taking of snapshot involves several intermediate operations.
  + Viewing Transformation: mapping from world coordinate system to view coordinate system.
  + Projection transformation: transfer of scene to 2D view plane. For projection we define a region in the viewing coordinate space called view volume. Objects inside the volume are projected others are not.
  + The process of removing objects outside view volume is called clipping.
  + In order to capture this viewing effect, the process of hidden surface removal, also known as visible surface detection, is performed.
  + Window-to-viewport Transformation: 2D projected scene (window) is transferred to a region on the device coordinate system (viewport).
* 5th Stage (Scan conversion or rasterization): Device coordinate is a continuous space display contains discrete space (pixel grid).
  + Concern: To minimize distortions (called aliasing effect) that result from transformation from continuous to discrete space.
  + Solution: anti-aliasing techniques.