

COMPUTER GRAPHICS

EX 603

Lecture : 3
Tutorial : 1
Practical : 3/2

Year : III
Part : I

Course Objectives:

History of computer graphics, Applications of computer graphics, Hardware: Raster-Scan Displays, Vector Displays, Hard copy devices, Input Hardwares, Display Architectures, Applications in various fields like medicine, engineering, art, uses in virtual realism.

1. Introduction and application (2 hours)

History of computer graphics, Applications of computer graphics, Hardware: Raster-Scan Displays, Vector Displays, Hard copy devices, Input Hardwares, Display Architectures, Applications in various fields like medicine, engineering, art, uses in virtual realism.

2. Scan-Conversion (6 hours)

- 2.1 Scan-Converting A Point
- 2.2 Scan-Converting A Straight Line: DDA Line Algorithm, Bresenham's Line Algorithm
- 2.3 Scan-Converting a Circle and an Ellipse: Mid-Point Circle and Ellipse Algorithm

3. Two –Dimensional Transformations (6 hours)

- 3.1 Two –dimensional translation, rotation, scaling, reflection, shear transforms
- 3.2 Two-dimensional composite transformation
- 3.3 Two-dimensional viewing pipeline, world to screen viewing transformations and clipping (Cohen-Sutherland Line Clipping, Liang-Barsky Line Clipping)

4. Three-Dimensional Graphics (6 hours)

- 4.1 Three –dimensional translation, rotation, scaling, reflection, shear transforms
- 4.2 Three-dimensional composite transformation
- 4.3 Three-dimensional viewing pipeline, world to screen viewing transformation, projection concepts (orthographic, parallel, perspective projections)

5. Curve Modeling (4 hours)

Introduction to Parametric cubic Curves, Splines, Bezier curves

6. Surface modeling (4 hours)

Polygon surface, vertex table, edge table, polygon table, surface normal and spatial orientation of surfaces

7. Visible Surface Determination (6 hours)

7.1 Image Space and Object Space techniques

7.2 Back Face Detection, Z-Buffer, A-Buffer, Scan-Line method

8. Illumination and Surface Rendering methods (8 hours)

8.1 Algorithms to simulate ambient, diffuse and specular reflections

8.2 Constant, Gouraud and Phong shading models

9. Introduction to Open GL (3 hours)

Introduction to OpenGL, callback functions, Color commands, drawing pixels, lines, and polygons using OpenGL, Viewing, Lighting.

Practical:

There shall be 5 to 6 lab exercise including following concepts:

1. DDA Line Algorithm
2. Bresenham's Line algorithm
3. Mid Point Circle Algorithm
4. Mid Point Ellipse Algorithm
5. Lab on 2-D Transformations
6. Basic Drawing Techniques in OpenGL

References

1. Donald Hearn and M. Pauline Baker, "Computer Graphics C version"
2. Donald D. Hearn and M. Pauline Baker, "Computer Graphics with OpenGL"
3. Foley, Van Dam, Feiner, Hughes "Computer Graphics Principles and Practice"