Unit 2: Output Primitives

1. Digitize the endpoint (10, 18), (15, 8) using Bresenham's algorithm.(6)

1. List the major difference between DDA and Bresenham's Line drawing algorithm. Illustrate the DDA algorithm to the line with en points (2, 2) and (9, 2). (3+7)

2. Write a procedure to fill the interior of a given ellipse with a specified pattern.

2. Explain the scan conversion algorithms with example.

2. Use Bresenham's algorithm to draw a line having end points (25, 20) and (15, 10).

2. Derive the equation to draw a line using DDA algorithm when slope is greater than 1.

3. Derive the expression for Bresenham Line Drawing Application.

4. How can you draw circle using mid-point circle algorithm? Explain with algorithm.

4. Derive the Mid-point algorithm.

5. What is a digital differential analyzer (DDA)? How can you draw the line using this algorithm?

5. How can a circle be scan converted using the mid point approach? How can the same goal be achieved if the starting point is (r, 0) and moving in the anti clockwise direction.

5. How can you draw circle? Explain it with algorithm.

5. Plot the 1st octant of a circle centered at origin, having the radius 10 units.

7. How would you digitize a line with end points A(6, 12) and B(10, 5) using Bresenham's line drawing algorithm?

7. Differentiate between incremental algorithms over DDA with example.

5. Trace the Bresenham's Line drawing algorithm for the end points(1, 1) and (8, 5).

8. On an average it takes 20 nano seconds for a Raster Graphics system to access the pixel value from the frame buffer and glow the phosphor dot on the screen. If the total resolution of the screen is 640 x 480 will this access rate produce a flickering effect?

OR

Digitize the octant of the circle with radius r = 7 and center (20, 30).

8. Plot the ellipse centered at (0, 0) with radius $r_x = 8$ and $r_y = 6$, using mid point ellipse drawing algorithm.

Unit 3: Two Dimensional Geometric Transformations

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Unit 4: Two-Dimensional Viewing and Clipping

1. Define window, viewport and viewing transformation. Let ABCD be the regular window with A(20, 20), B(90, 20), C(90, 70),and D(20, 70). Find the region codes for end points and use Cohen Sutherland algorithm to clip the lines P(10, 30) Q(80, 90).

2. Why homogeneous coordinate are used for transformation computations in computer graphics? Explain.

3. Perform the scaling transformation to the triangle with vertices A(6, 9), B(10, 5), C(4, 3) with scaling factors $S_x = 3$ and $S_y = 2$.

2. Derive the window to viewport transformation coefficient matrix. Explain the application of this matrix.

3. Explain the following term with practical applications.

a) 3D Rotation

b) 2D Shear

3. After rotating a triangle with vertex A(0, 0), B(1, 7), C(9, 2)in 60 degree anticlockwise about point (10, 10) what will be the new vertex values?

3. Differentiate between window port and view port. How are lines grouped into visible, invisible and partially visible categories in 2D clipping? Explain.

3. Show that two successive reflection about any line passing through the coordinate origins equivalent to a single rotation about the origin.

4. How would you reflect an object about a line y = 4x? Explain the steps with the matrices.

4. Explain the window to view port transformation with its applications.

4. What do you mean by line clipping? Explain the procedures for line clipping.

4. Where do you require ellipse clipping algorithm? Explain in detail about ellipse clipping algorithm.

4. Explain in detail about line clipping algorithm and its applications.

5. Illustrate the windows to view point transformation with an example.

OR

Write a procedure to implement highlighting as a blinking operation.

5. Translate a triangle ABC with co-ordinates A(0, 0), B(5, 0) and C(5, 5) by 2 units in x-direction and 3 units in y-direction.

8. Find the composite transformation matrix for reflection about a line y = mx + c.(6)

7. Derive the window to viewport transformation coefficient matrix. Explain the application of this matrix.

OR

What are blobby objects? How it is represented? Explain the wireframe representation of 3D objects.

7. What do you mean by homogeneous coordinates? Rotate a triangle A(5,6), B(6,2) and C(4,1) by 45 degree about an arbitrary pivot point (3,3).

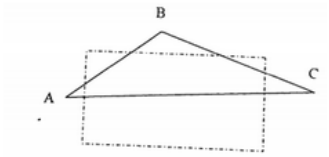
OR

Explain in detail about Diffuse Reflection model.

7. Find the new co-ordinate of the triangle ABC, with co-ordinates A(0,0), B(1,1) and C(5,2) after it has been magnified to twice of its size.

9. What is the differences between a window and a viewport? Why is required to map an object from a window to a viewport? Explain

9. Explain polygon clipping in detail. By using the Sutherland-Hodgemen Polygon clipping algorithm clip the following polygon.



9. Given a clipping window P(0,0), Q(30,20), S(0,20) use the Cohen Sutherland algorithm to determine the visible portion of the line A(10,30) and B(40,0).

11. Describe the requirement for line clipping. Explain the scan line polygon filling algorithm. (1+4)

11. Let ABCD be the rectangular window with A(0 , 0), B(10, 0), C(10, 10) and D(0, 10). Use Liang Barsky line clipping algorithm to clip the line XY, where X(-5, 3) and Y(15, 9).

Unit 5:Three-Dimensional Graphics

1. Differentiate between parallel and perspective protection.

1. Define orthographic, parallel and perspective projections. Consider a region defined by the position vector $P = \begin{bmatrix} 1 & 1 & 2 & 1 \\ 2 & 1 & 2 & 1 \\ 2 & 2 & 2 & 1 \\ 1 & 2 & 2 & 1 \end{bmatrix}$, relative to global XYZ axis system. It is rotated by $+30^0$ about X-axis and passing through point (1.5, 1.5, 1.5). Find the final position of the region. (3+7)

2. How can you represent 3D viewing? Explain it with equation and practical application.

3. Explain the following terms with practical applications.

(a) 3D Translation

(b) 2D Mirror

3. Explain the 2D and 3D transformations.

6. Define window and view port. Describe three dimension windows to view port transformation with matrix representation for each step.(2+4)

6. Explain the following term with practical applications.

a) 2D shearing

b) 3D viewing

6. Differentiate between orthographic, parallel and perspective projections.

8. What is projection? Differentiate between parallel and prospective projection.

6. Derive the relation for three- dimensional translation and rotation.

10. Digitize an ellipse with center (20, 20) and x-radius = 8 and y- radius = 6.(6)

OR

Find the new co-ordinates of a unit cube 90 degree rotated about an axis defined by its end points A(2, 1, 0) and B(3, 3, 1).

Unit 6: Three-Dimensional Object Representation and Curve Modeling

2. How polygon table is used in representing polygon? Explain the representations of any three curves. (6+4)

3. Construct the Bezier curve of order 3 and 4 polygon vertices A(1,1) B(2,3) C(4,3) and D(6,4).

4. Explain about parametric cubic curve. Describe the properties of Bezier curve.(3+3)

4. Define polygon. What are the different types of polygons? Explain with example.

5. Differentiate between periodic B-spline curves and non-periodic B-spline curves.

5. Explain with algorithm of generating curves.

4. Discuss the strength and weakness of the human visual system. Describe Spline representation for the curve.

6. How can you represent 3D object? How can you draw the line using this algorithm?

6. Explain in detail about polygon table. How can you apply in the case of virtual reality?

6. Why polygon description is consider as standard graphics objects? Explain the importance of polygon table.

6. Set up a procedure for establishing polygon tables for any input set of data points defining an object.

7. How curves be generated? Explain it with any suitable algorithm.

6. Define fractal. Explain the Bezier curve and B-Spline curve.

7. Model the Bezier curve. Explain the importance of Bezier curve in graphical modeling.

OR

Write a procedure to perform a two-point perspective projection of an object.

9. Construct the polygon table for a object with six vertex, eight edge and three surface.(6)

OR

Explain the role of computer graphics on animation. Define clipping operation with example.(3+3)

8. Define the following terms (**any two**):

a) 3D viewing

b) Polygon Messes

c) Boundary Representation

d) Sweep Representation

7. What is the purpose of wireframe representation? Describe about boundary and space partitioning.

9. Define clipping. Discuss about cubic spline Interpolation.

Solid Modeling

2. What is the method to recognize boundary point and interior point in solid modeling? Describe how BSP recursively subdivided a space into convex sets. (4+6)

3. Describe the architecture of raster scan display. Explain about sweep, octree and boundary representations for solid modeling.

7. What do you mean by solid modeling? Explain the process for solid modeling with example.

8. What is solid modeling? Explain the basic procedures for solid modeling.

7. Describe how a polygon can be represented using BSP tree with example.

Unit 7: Visible Surface Detection

2. What are the object space and image space method of hidden surface removal? Describe the back face detection method of hic surface removal.(6)

2. List any two disadvantages of BSP tree method in visible surface detection. Make a comparision between Painter's algorithm a Buffer algorithm.

5. Explain the scan line algorithm for removing hidden surfaces.

6. Explain the z-buffer algorithm for removing hidden faces?

7. Define the algorithms for visible surface detection.

8. Explain in detail about plain equation method. Explain which algorithm is better for hidden surface

removal.

OR

Explain in detail about depth buffer method. Justify that is better than plane equation method.

8. Hidden surface removal is required in computer graphics is very important, justify it. Explain in detail about scan line method.

OR

Explain in detail about scan line method. Justify that it is better than plane equation method.

9. Explain the area subdivision method for visible surface detection.

9. Explain the visible surface detection with an algorithms.

8. What is the task of polygon table? Why we have to remove hidden surface? Explain with any one methodology? (2+3)

8. What is the role of ray tracing in visible surface detection? Explain how scan line algorithm is used for back face detection. (1+4)

10. What is the significance of vanishing points in perspective Projection? Explain how Z- Buffer algorithm is used for visible surface detection.

OR

Explain boundary representations techniques to represent the 3D object with suitable example.

10. What is the advantage of real time rendering over offline rendering? Discuss the limitation of Z-Buffer algorithm. (2.5+2.5)

Unit 8: Illumination and Surface Rendering methods

2. Compare and contrast between Gouraud and phong shading model.

3. Define realism in human perception. What is the significance difference between rendering and image synthesis in creating computer generated 3D image? Describe any two polygon rendering methods. (2+2+6)

5. Explain the visual effect that occurs when during animation of a Gouraud shading polyhedron, the center of a highlight moves from one vertex to another along an edge.(6)

OR

Illustrate the difference between orthographic (parallel) and perspective projection.(6)

9. Explain the simple illumination model with example.

OR

Explain the Gourand shading model with example.

10. Why shedding is required in the computer graphics? Explain in detail about constant intensity shading.

OR

List the different type of shading models. Explain in detail about Gouraud shading model.

10. Differentiate between diffuse reflection and specular reflection. Why do we require shading model? Explain it.

OR

Explain in detail about Phong shading model. Compare it with Gouraud Shading model.

9. Define intensity attenuation. Distinguish between Gouraud shading and Phong shading model. (2+3)

10. How can we detect shadows in computer graphics? List the challenged in computing light model.

12. What is quadric surface? Compare between diffuse reflection and specular reflection. (2+3)

12. Define blobby objects. Describe about basic illumination models. (2+3)

Unit 9: Virtual Reality and Animation

3. List some significances of virtual reality. Differentiate between virtual reality and augmented reality with example. Demor how a polygon can be created using OpenGL. (2+4+4)

6. Explain the following term with practical applications.

a) Rotation

b) Computer Animation

6. What are the key issues prevalent in producing a Virtual reality scene? Explain different hardware and software used for this purpose.

10. Explain the virtual reality and its applications in the computer graphics.

10. Explain the basic steps for computer animation.

10. What do you mean by virtual Reality and animation? Explain.

OR

Explain the scan line algorithms with example.

10. Explain the basic steps for computer animation and its application in computer science.

10. What is virtual reality? Explain the importance of virtual reality and its application.

9. How virtual realities differ with our real world? Describe some components of VR system. (2+3)

11. List some applications of VR. What might be the possible navigation techniques and manipulating interfaces in virtual reality? Justify.

Unit 10: Introduction to Open GL

4. Give some basic color model. Give the basic command to draw the pixel and polygon in OpenGL.

10. Write a procedure to draw a line in OpenGL? Describe Painter's algorithm. (2+3)

12. Mention any two color command in OpenGL. Explain about Hermite curve.

Note: See Hermite curve in 3D object Representation chapter