

## Assignment - 04 (OOPCG)

Roll No. 21123

Batch - SEI (FI)

Div. SEI

Dop:

Dos:

# Title - Demonstration scan fill Algorithm.

# Objective - 1) To learn and understand scan fill Algorithm.

# Problem Statement - Write C++ program to draw a concave polygon and fill it with desired color using scan fill Algorithm. Apply the concept of Inheritance.

# Theory:

**Concave polygon** - It will always have an interior angle greater than 180 degrees. It is possible to cut a concave polygon into a set of convex polygons. You can draw at least one straight line through a concave polygon that crosses more than two sides.

**Convex polygon**: In a convex polygon, any line segment joining any two inside points lies inside the polygon is called convex polygon.

**Complex polygon** - It is a polygon whose sides cross each other one or more times.

# Inside outside test (Even-odd test):

We assume that the vertex list for the polygon is already stored and proceed as follows.

1. Inside out test - If the segment cuts the polygon edge odd no. of lines then interior point.

## Polygon filling.

For filling polygon with particular colors, you need to determine the pixel falling on the border of the polygon and those which fall inside the polygon.

### Scan fill.

A scan-line fill of region is performed by first determining the intersection positions of the boundaries of the fill region with the screen scan line  $v$ . Then the fill color are applied to each section of a scan line that lies within the interior of the fill region  $v$ . The scan line fill algorithm identifies the same interior region as the odd-even rule. It is an image space algorithm. It processes one line at a time rather than one pixel at a time. It uses the concept of coherency. This algorithm records edge list, active edge list. So accurate bookkeeping is necessary. The edge list or edge table contains the coordinate of two endpoints. Active edge list (AEL) contains edges a given scan line intersects during its sweep. The active edge list (AEL) should be sorted in increasing order of  $x$ . The AEL is dynamic, growing and shrinking.

## H Algorithm

Step1. Start.

Step2. Initialize the desired data-structure

1. Create a polygon table having color, edge pointers.

Step2. Starting we will process the polygon edge after edge, and store in the edge table.

3. Storing is done by storing the edge in the same scan line edge tuple as the lowermost points y-co-ordinate value of the edge.

4. After addition of any edge in an edge tuple, the tuple is sorted using insertion sort, according to its x or ymin value.

5. After the whole polygon is added to the edge table, the fig. is now filled.

6. filling is started from the first scanline at the bottom, and continued till the top.

7. Now the active edge table is taken and the following thing are repeated for each scanline.

i. copy all edge buckets of the designated scanline to the active edge tuple

ii. perform an insertion sort according to the x or ymin value.

iii. Remove all edge buckets where  $y_{max}$  is equal or greater than the scanline.

4. fill up pairs of edges in active tuple, if any vertex is got follow these instruction:

→ If both lines intersecting at the vertex are on the same side of the scanline, consider it as two points.

→ If lines intersecting at the vertex are at opposite sides of the scanline, consider it as only one point.

5. update the x of ymin by adding slope inverse for each bucket.

Sr.No.	Description	I/p	Excepted O/p	Actual O/p	Result
1.	Plot without any co-ordinates	-	Field cannot be empty	Field cannot be empty	Pass.
2.	Given three co-ordinate but not one	-	Field cannot be empty	Field cannot be empty	Pass.
3.	Giving an character co-ordinate instead of integers	-	co-ordinate cannot be an character	co-ordinate cannot be an character	Pass.
4.	Push clear button.	-	All pixel parameters are set to black.	Cleans the screen	Pass.
5.	Polygon is complete and Push scan fill button	-	The polygon starts filling	The polygon starts filling	Pass.
6.	Push change color button	-	Changes the colour of filling	Changes the colour of filling	Pass.
7.	Conclusion - Hence, we demonstrate the use of scan fill algorithm.	-			