Ex. No. : 4 Date:

Register No.: 231701055 Name: Suga V

Polygon Clipping using Sutherland–Hodgman Algorithm

AIM:

To write a program that clips a polygon to a specified rectangular window using the Sutherland–Hodgman Polygon Clipping Algorithm and displays the clipped polygon.

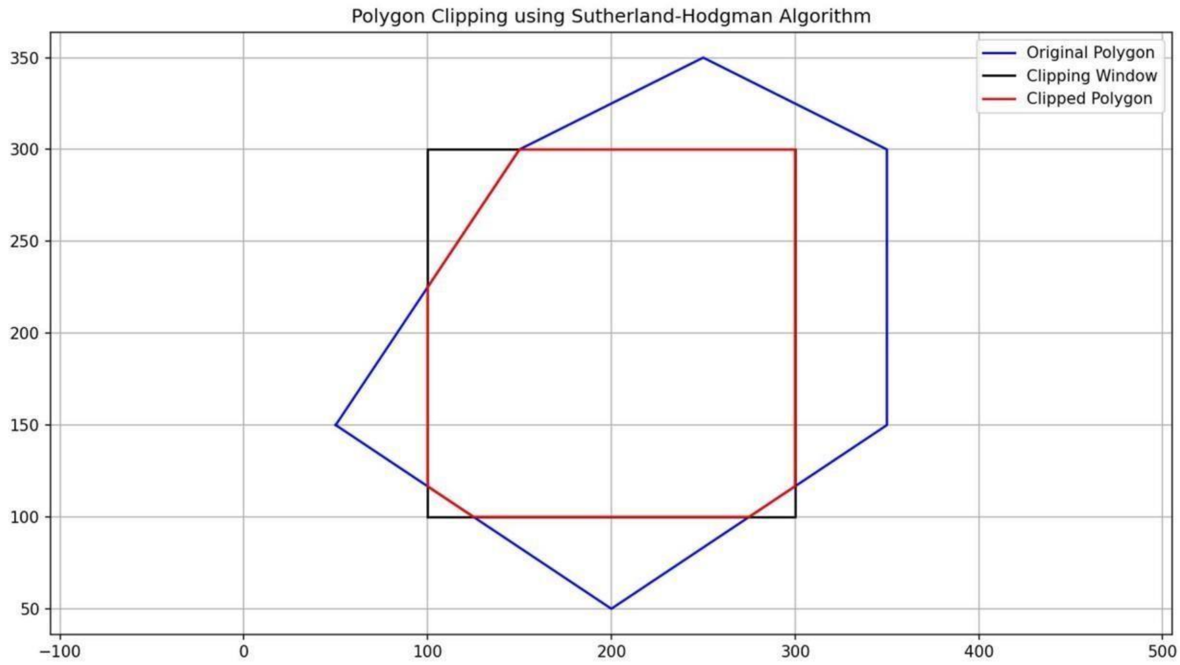
Procedure:

1. Input:
   - Vertices of the polygon.
   - Clipping window boundaries (left, right, top, bottom).
2. Clip the polygon edges one by one against each window edge.
3. For each clipping edge, retain only the portion of the polygon that lies inside.
4. Display the original and the clipped polygon.

Program:

```
import matplotlib.pyplot as plt
LEFT, RIGHT, BOTTOM, TOP = 0, 1, 2, 3 def inside(p,
edge, clip_win):
   x, y = p
   xmin, xmax, ymin, ymax = clip_win     if
edge == LEFT:         return x >= xmin
elif edge == RIGHT:         return x <= xmax
elif edge == BOTTOM:         return y >=
ymin     elif edge == TOP:
    return y <= ymax

def intersect(p1, p2, edge, clip_win):      xmin, xmax, ymin, ymax =
clip_win     x1, y1 = p1     x2, y2 = p2     if edge == LEFT:         x =
xmin          y = y1 + (y2 - y1) * (xmin - x1) / (x2 - x1)     elif edge ==
RIGHT:  x = xmax  y = y1 + (y2 - y1) * (xmax - x1) / (x2 - x1)     elif
edge == BOTTOM:         y = ymin          x = x1 + (x2 - x1) * (ymin -
y1) / (y2 - y1)     elif edge == TOP:         y = ymax
    x = x1 + (x2 - x1) * (ymax - y1) / (y2 - y1)     return
(x, y)


def clip_polygon(polygon, clip_win):     output = polygon
for edge in [LEFT, RIGHT,
BOTTOM, TOP]:        input_list = output        output
= []        if not input_list:            break        s =
input_list[-1]        for p in input_list:             if
inside(p, edge, clip_win):                if not inside(s,
edge, clip_win):
output.append(intersect(s, p, edge, clip_win))
output.append(p)            elif inside(s, edge, clip_win):
output.append(intersect(s, p, edge, clip_win))            s
= p     return output


def draw_polygon(points, color, label):     x, y
= zip(*(points + [points[0]]))     plt.plot(x, y,
color=color, label=label)

# Main   clip_window = (100, 300, 100, 300)  # xmin, xmax, ymin, ymax polygon =
[(50, 150), (200, 50), (350, 150), (350, 300), (250, 350), (150, 300)]
```

```
clipped_poly = clip_polygon(polygon, clip_window)

plt.figure(figsize=(8,   8))          draw_polygon(polygon,   'blue',   "Original   Polygon")
draw_polygon([(clip_window[0], clip_window[2]), (clip_window[1], clip_window[2]),
             (clip_window[1], clip_window[3]), (clip_window[0], clip_window[3])],
            'black', "Clipping Window")   draw_polygon(clipped_poly, 'red', "Clipped
Polygon") plt.legend()  plt.title("Polygon Clipping using Sutherland-Hodgman
Algorithm")  plt.grid(True) plt.axis("equal") plt.show()
```



Result:

The polygon was successfully clipped using the Sutherland–Hodgman algorithm against a rectangular clipping window.