Practical No.:5

Title: Cohen Suterland polygon clipping algorith
Name: Samruddhi Sangram Yadav.
Roll No.:S564

```
#include <stdio.h>

//#include <GL/gl.h>

//#include <GL/glu.h>

#include <GL/glut.h>

#include <math.h>

typedef struct // structure that holds the information of points

{

   float x;

   float y;

} PT;

// global variables

int n;

int i, j;

PT p1, p2, p[20], pp[20];

void left() // left clipper

{

   i = 0;

   j = 0;

   for (i = 0; i < n; i++)

   {

      if (p[i].x < p1.x && p[i + 1].x >= p1.x) //Case-1:    outside to inside

      {

         if (p[i + 1].x - p[i].x != 0)

         {
```

```
        pp[j].y = (p[i + 1].y - p[i].y) / (p[i + 1].x - p[i].x) * (p1.x - p[i].x) + p[i].y; // save point of intersection
    }
    else
    {
        pp[j].y = p[i].y;
    }
    pp[j].x = p1.x;
    j++;
    pp[j].x = p[i + 1].x; // save that point that lie inside our clipping window // consult theory
    pp[j].y = p[i + 1].y;
    j++;
}
if (p[i].x >= p1.x && p[i + 1].x >= p1.x) //Case-2:   inside to inside
{
    pp[j].y = p[i + 1].y; // only save second point that lie inside our clipping window // consult theory
    pp[j].x = p[i + 1].x;
    j++;
}
if (p[i].x >= p1.x && p[i + 1].x < p1.x) // Case-3:   inside to outside
{
    if (p[i + 1].x - p[i].x != 0)
    {
        pp[j].y = (p[i + 1].y - p[i].y) / (p[i + 1].x - p[i].x) * (p1.x - p[i].x) + p[i].y; // only save point of intersection
    }
    else
    {
        pp[j].y = p[i].y;
    }
```

```
            pp[j].x = p1.x;
            j++;
        }
    }
    for (i = 0; i < j; i++)
    {
        p[i].x = pp[i].x;
        p[i].y = pp[i].y;
    }
    p[i].x = pp[0].x;
    p[i].y = pp[0].y;
    n = j;
}
void right() // right clipper
{
    i = 0;
    j = 0;
    for (i = 0; i < n; i++)
    {
        if (p[i].x > p2.x && p[i + 1].x <= p2.x) //Case-1:    outside to inside
        {
            if (p[i + 1].x - p[i].x != 0)
            {
                pp[j].y = (p[i + 1].y - p[i].y) / (p[i + 1].x - p[i].x) * (p2.x - p[i].x) + p[i].y; // save point of intersection
            }
            else
            {
                pp[j].y = p[i].y;
```

```
        }
        pp[j].x = p2.x;
        j++;
        pp[j].x = p[i + 1].x; // save that point that lie inside our clipping window // consult theory
        pp[j].y = p[i + 1].y;
        j++;
    }
    if (p[i].x <= p2.x && p[i + 1].x <= p2.x) // Case-2:  inside to inside
    {
        pp[j].y = p[i + 1].y; // only save second point that lie inside our clipping window // consult theory
        pp[j].x = p[i + 1].x;
        j++;
    }
    if (p[i].x <= p2.x && p[i + 1].x > p2.x) // Case-3:   inside to outside
    {
        if (p[i + 1].x - p[i].x != 0)
        {
            pp[j].y = (p[i + 1].y - p[i].y) / (p[i + 1].x - p[i].x) * (p2.x - p[i].x) + p[i].y; // only save point of intersection
        }
        else
        {
            pp[j].y = p[i].y;
        }
        pp[j].x = p2.x;
        j++;
    }
}
```

```
    for (i = 0; i < j; i++)
    {
        p[i].x = pp[i].x;
        p[i].y = pp[i].y;
    }
    p[i].x = pp[0].x;
    p[i].y = pp[0].y;
}
void top() // top clipper
{
    i = 0;
    j = 0;
    for (i = 0; i < n; i++)
    {
        if (p[i].y > p2.y && p[i + 1].y <= p2.y) //Case-1:    outside to inside
        {
            if (p[i + 1].y - p[i].y != 0)
            {
                pp[j].x = (p[i + 1].x - p[i].x) / (p[i + 1].y - p[i].y) * (p2.y - p[i].y) + p[i].x; // save point of intersection
            }
            else
            {
                pp[j].x = p[i].x;
            }
            pp[j].y = p2.y;
            j++;
            pp[j].x = p[i + 1].x; // save that point that lie inside our clipping window // consult theory
            pp[j].y = p[i + 1].y;
```

```
        j++;
    }
    if (p[i].y <= p2.y && p[i + 1].y <= p2.y) // Case-2:  inside to inside
    {
        pp[j].y = p[i + 1].y; // only save second point that lie inside our clipping window // consult theory
        pp[j].x = p[i + 1].x;
        j++;
    }
    if (p[i].y <= p2.y && p[i + 1].y > p2.y) // Case-3:   inside to outside
    {
        if (p[i + 1].y - p[i].y != 0)
        {
            pp[j].x = (p[i + 1].x - p[i].x) / (p[i + 1].y - p[i].y) * (p2.y - p[i].y) + p[i].x; // only save point of intersection
        }
        else
        {
            pp[j].x = p[i].x;
        }
        pp[j].y = p2.y;
        j++;
    }
}
for (i = 0; i < j; i++)
{
    p[i].x = pp[i].x;
    p[i].y = pp[i].y;
}
p[i].x = pp[0].x;
```

```
    p[i].y = pp[0].y;
    n = j;
}
void bottom() // bottom clipper
{
    i = 0;
    j = 0;
    for (i = 0; i < n; i++)
    {
        if (p[i].y < p1.y && p[i + 1].y >= p1.y) // Case-1:   outside to inside
        {
            if (p[i + 1].y - p[i].y != 0)
            {
                pp[j].x = (p[i + 1].x - p[i].x) / (p[i + 1].y - p[i].y) * (p1.y - p[i].y) + p[i].x; // save point of intersection
            }
            else
            {
                pp[j].x = p[i].x;
            }
            pp[j].y = p1.y;
            j++;
            pp[j].x = p[i + 1].x; // save that point that lie inside our clipping window // consult theory
            pp[j].y = p[i + 1].y;
            j++;
        }

        if (p[i].y >= p1.y && p[i + 1].y >= p1.y) // Case-2:  inside to inside
        {
```

```
        pp[j].x = p[i + 1].x; // only save second point that lie inside our clipping window // consult theory
        pp[j].y = p[i + 1].y;
        j++;
      }
      if (p[i].y >= p1.y && p[i + 1].y < p1.y) // Case-3:   inside to outside
      {
        if (p[i + 1].y - p[i].y != 0)
        {
          pp[j].x = (p[i + 1].x - p[i].x) / (p[i + 1].y - p[i].y) * (p1.y - p[i].y) + p[i].x; // only save point of intersection
        }
        else
        {
          pp[j].x = p[i].x;
        }
        pp[j].y = p1.y;
        j++;
      }
    }
    for (i = 0; i < j; i++)
    {
      p[i].x = pp[i].x;
      p[i].y = pp[i].y;
    }
    p[i].x = pp[0].x;
    p[i].y = pp[0].y;
    n = j;
}
void drawpolygon()
```

```
{
   glColor3f(1.0, 0.0, 0.0);
   for (i = 0; i < n - 1; i++)
   {
      glBegin(GL_LINES);
      glVertex2d(p[i].x, p[i].y);
      glVertex2d(p[i + 1].x, p[i + 1].y);
      glEnd();
   }
   glBegin(GL_LINES);
   glVertex2d(p[i].x, p[i].y);
   glVertex2d(p[0].x, p[0].y);
   glEnd();
}
void myMouse(int button, int state, int x, int y)
{
   if (button == GLUT_LEFT_BUTTON && state == GLUT_DOWN) // On output, please left click on polygon then
and only then clipping performs
   {
      glClear(GL_COLOR_BUFFER_BIT);
      glBegin(GL_LINE_LOOP);
      glVertex2f(p1.x, p1.y);
      glVertex2f(p2.x, p1.y);
      glVertex2f(p2.x, p2.y);
      glVertex2f(p1.x, p2.y);
      glEnd();
      left();
      right();
```

```
        top();
        bottom();
        drawpolygon();
    }
    glFlush();
}
void display(void)
{
    glClear(GL_COLOR_BUFFER_BIT);
    glColor3f(0.4, 1.0, 0.0);
    glBegin(GL_LINE_LOOP);
    glVertex2f(p1.x, p1.y);
    glVertex2f(p2.x, p1.y);
    glVertex2f(p2.x, p2.y);
    glVertex2f(p1.x, p2.y);
    glEnd();
    drawpolygon();
    glFlush();
}
void init(void)
{
    glClearColor(0.0, 0.0, 0.0, 0.0); // clear screen usually black
    gluOrtho2D(0, 500, 0, 500);
}
int main(int argc, char **argv)
{
    printf("Enter Window Coordinates:\n");
    printf("Please Enter two Points:\n"); // P1(x,y) is the bottom left point for clipping window
```

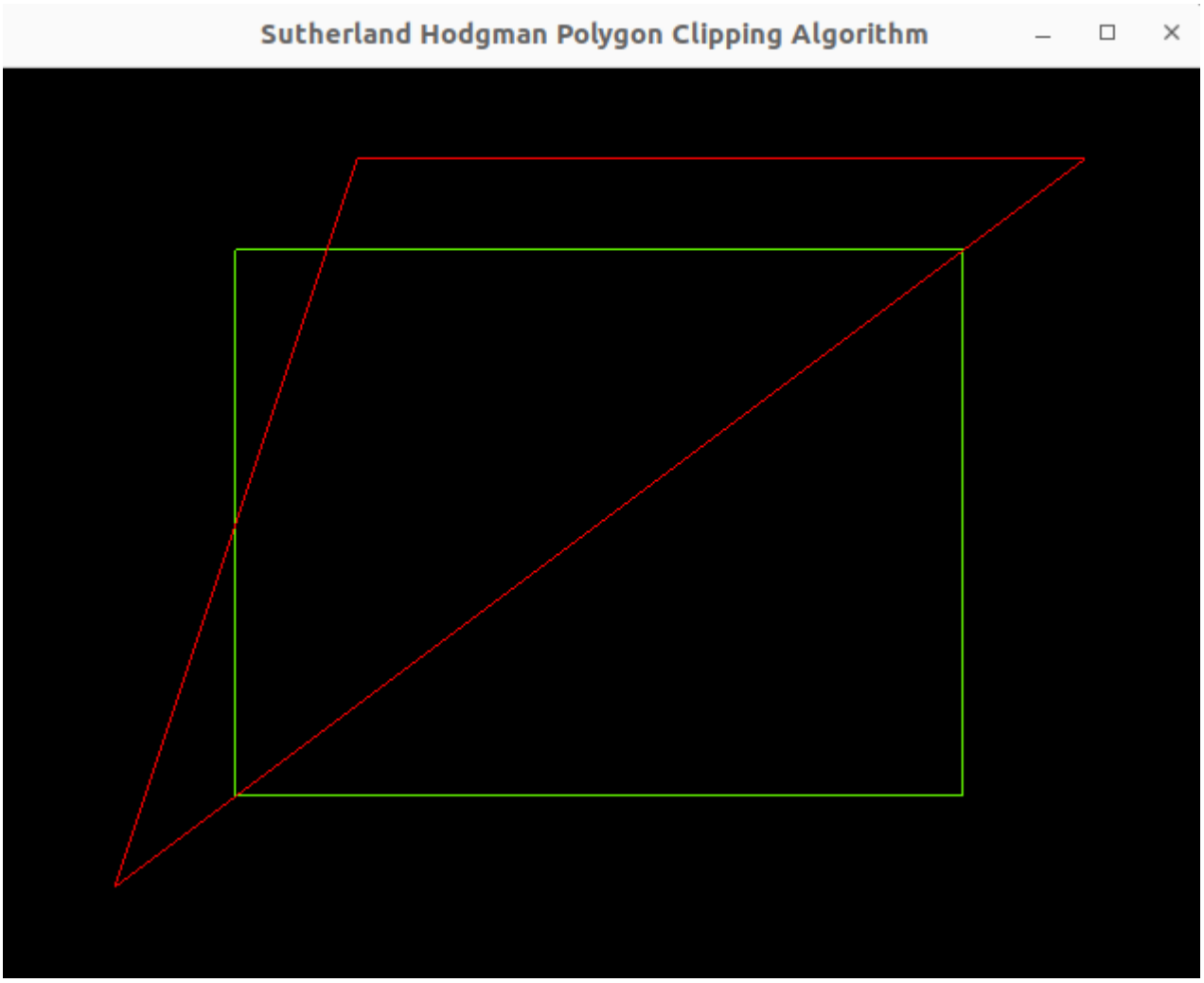
```
   printf("Enter P1(x,y):\n");
   scanf("%f", &p1.x); // if you don't know what value should be given: enter 200
   scanf("%f", &p1.y); // if you don't know what value should be given: enter 200
   printf("Enter P2(x,y):\n"); // P2(x,y) is the top right point for clipping window
   scanf("%f", &p2.x);        // if you don't know what value should be given: enter 400
   scanf("%f", &p2.y);        // if you don't know what value should be given: enter 400
   printf("\nEnter the no. of vertices:"); // if you don't know what value should be given: enter 3
   scanf("%d", &n);
   for (i = 0; i < n; i++)
   {
      printf("\nEnter V%d(x%d,y%d):\n", i + 1, i + 1, i + 1);
      scanf("%f", &p[i].x); // if you don't know what value should be given: enter V1(100,110), V2(340,210),
V3(300,380)
      scanf("%f", &p[i].y);
   }
   p[i].x = p[0].x; // Assign last to first for connected everything
   p[i].y = p[0].y;
   glutInit(&argc, argv);
   glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
   glutInitWindowSize(640, 480);
   glutInitWindowPosition(0, 0);
   glutCreateWindow("Sutherland Hodgman Polygon Clipping Algorithm ");
   init();
   glutDisplayFunc(display);
   glutMouseFunc(myMouse); // notice mouse movement and call user defined function
   glFlush();
   glutMainLoop();
   return 0;
```

```
}
```

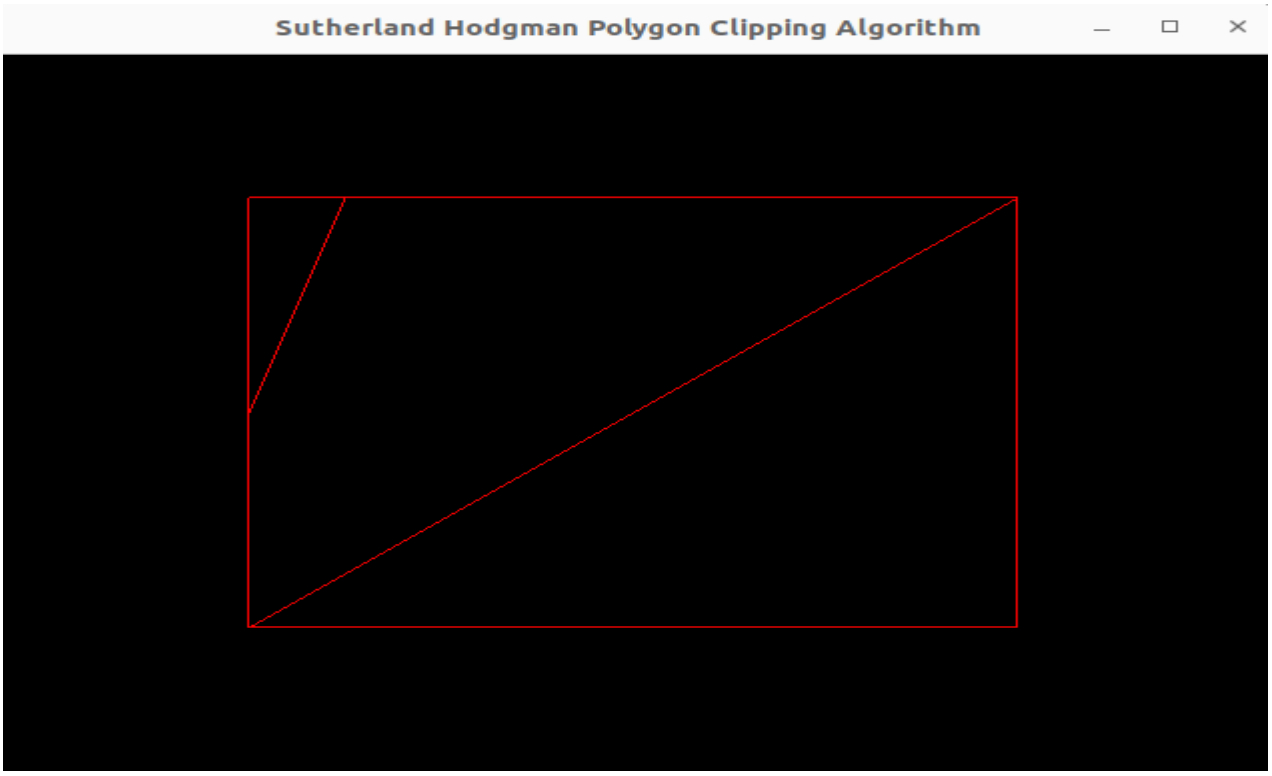
Output:

```
it@it-HP-EliteDesk-800-G2-SFF:~$ g++ pc1.cpp -lGL -lGLU -lglut

it@it-HP-EliteDesk-800-G2-SFF:~$ ./a.out

Enter Window Coordinates:

Please Enter two Points:

Enter P1(x,y):

100

100

Enter P2(x,y):

400

400

Enter the no. of vertices:4

Enter V1(x1,y1):

50 50

Enter V2(x2,y2):

350 350

Enter V3(x3,y3):

450 450

Enter V4(x4,y4):

150 450
```

Before cliping window.



After Cliping window:


Sutherland Hodgman Polygon Clipping Algorithm