

**Computer Graphics Lab**

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**Batch:** 7

**Experiment -7**

**Line and Polygon clipping Algorithm**

**Q1) Sutherland Hodgeman Polygon Clipping.**

**CODE)**

#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);

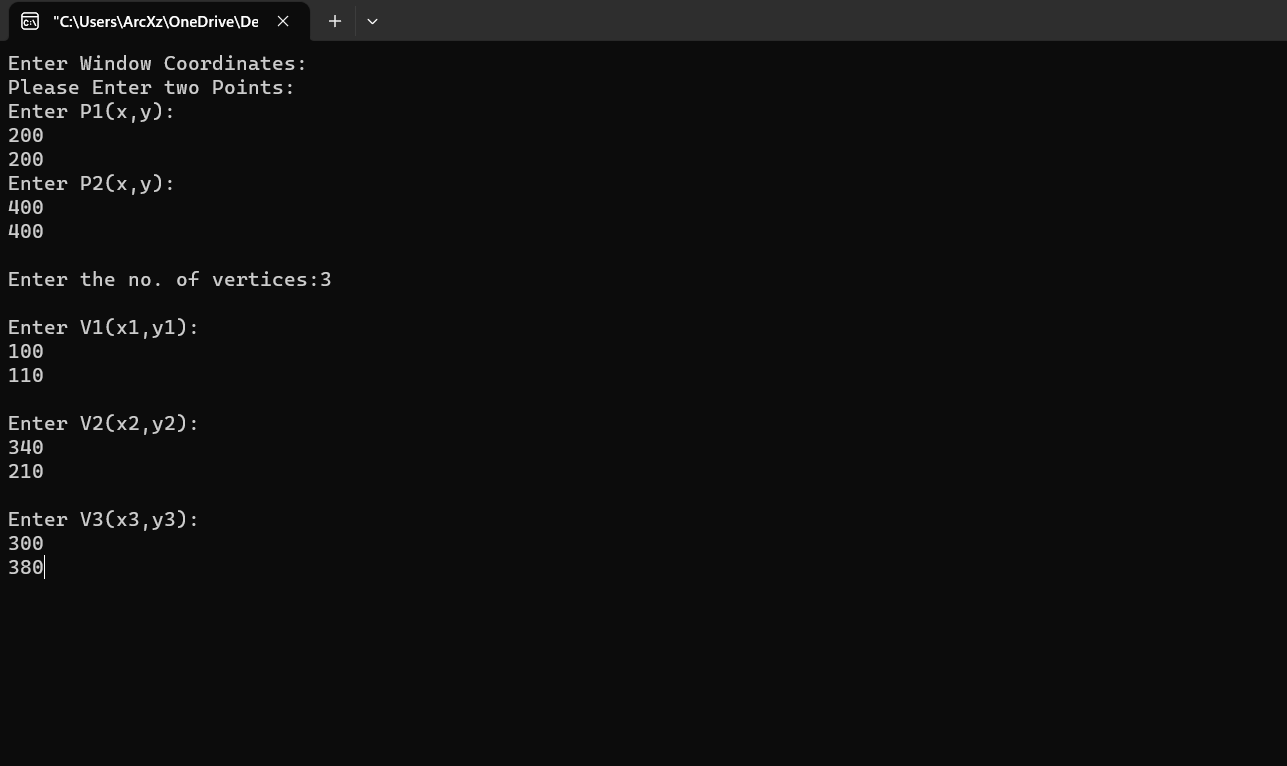
glutMouseFunc(myMouse); // notice mouse movement and call user defined function

glFlush();

glutMainLoop();

return 0;

}



Shape

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Shape

Description automatically generated

Q2) Cohen Sutherland Line Clipping.

CODE)

#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;

}

Text

Description automatically generated with medium confidence

Shape

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