UCS1712 – GRAPHICS AND MULTIMEDIA LAB

Lab Exercise 7: Cohen Sutherland Line clipping in C++ using OpenGL

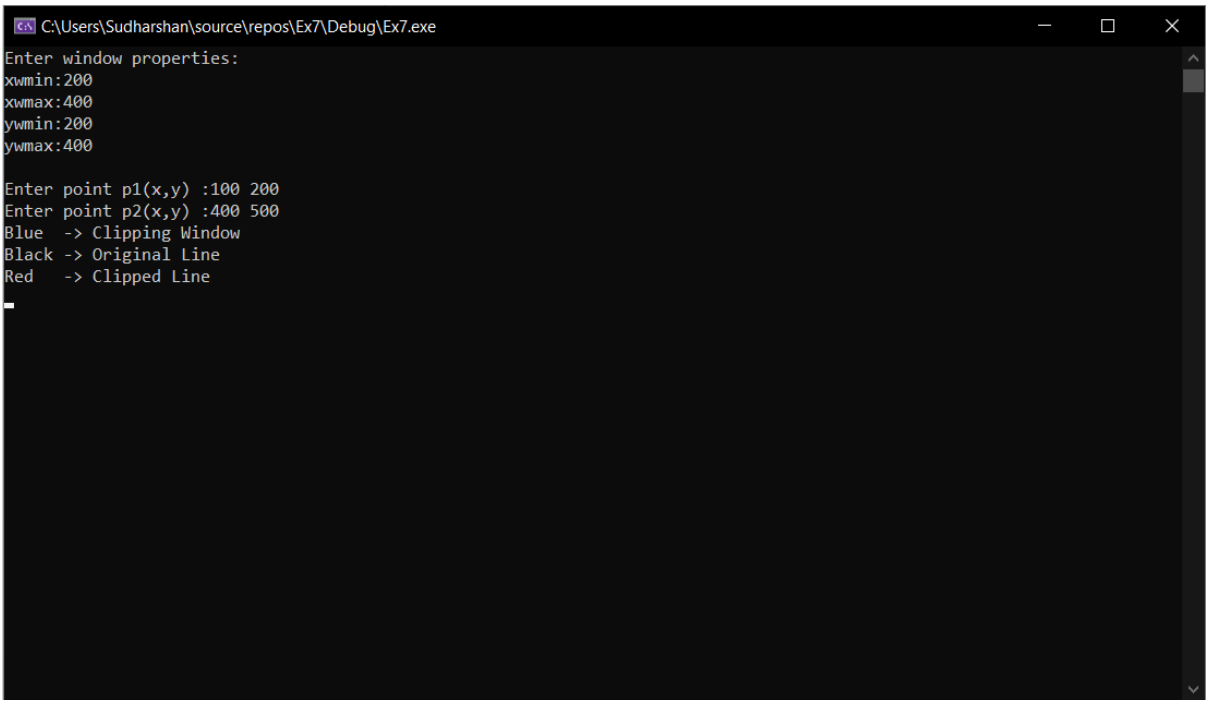
CODE:

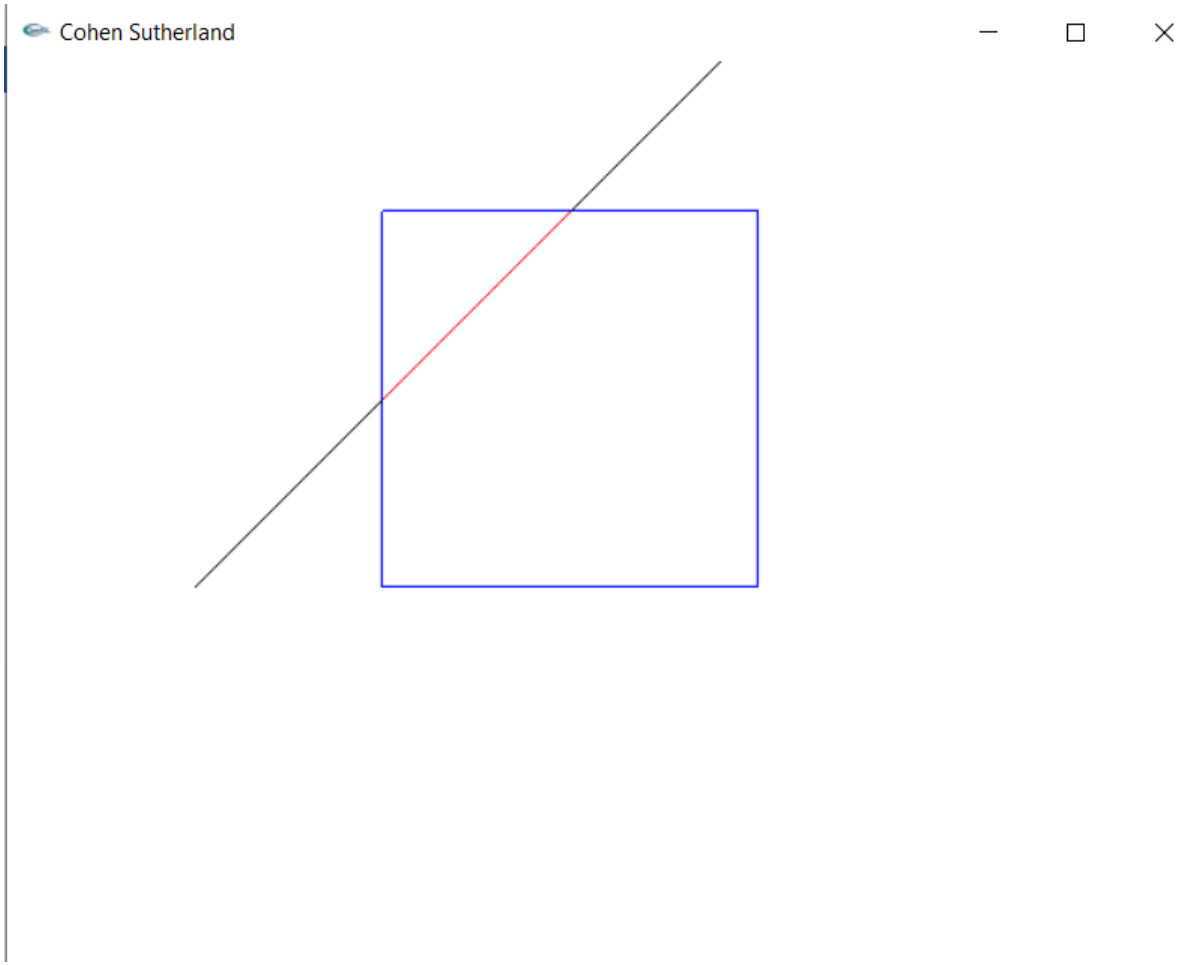
```
#include<gl/glut.h>
#include<iostream>
#include<utility>
using namespace std;

pair<int, int> P1, P2;
int X1, X2, Y1, Y2;
int xwmin, xwmax, ywmin, ywmax;

void myInit()
{
	glClearColor(1.0, 1.0, 1.0, 0.0);
	glColor3f(0.0f, 0.0f, 0.0f);
	glPointSize(10);
	glMatrixMode(GL_PROJECTION);
	glLoadIdentity();
	gluOrtho2D(0.0, 640.0, 0.0, 480.0);
}
void drawWindow() {
	glBegin(GL_LINE_LOOP);
	glVertex2d(xwmin, ywmin);
	glVertex2d(xwmax, ywmin);
	glVertex2d(xwmax, ywmax);
	glVertex2d(xwmin, ywmax);
	glEnd();
}

void drawOriginal() {
	glBegin(GL_LINES);
	glVertex2d(P1.first, P1.second);
	glVertex2d(P2.first, P2.second);
	glEnd();
}

int getRC(pair<int, int>& P)
{
	int rc = 0;
	if (P.first < xwmin) rc |= 1;
	else if (P.first > xwmax) rc |= 1 << 1;
	if (P.second < ywmin) rc |= 1 << 2;
	else if (P.second > ywmax) rc |= 1 << 3;
	return rc;
}
void findIntersection(pair<int, int>& P, double m, int rc) {

	if (rc == 0) return;
	// y = ywmax
	if ((rc >> 3)&1) {
		//x =X1 + (y-Y1)/m
		P.second = ywmax;
		P.first = X1 + (ywmax - Y1) / m;
```

```
			return;
		}
		//y = ywmin
		if ((rc >> 2 )& 1) {
			//x =X1 + (y-Y1)/m
			P.second = ywmin;
			P.first = X1 + (ywmin - Y1) / m;
			return;
		}
		// x= xwmax
		if ((rc >> 1) & 1) {
			//y =Y1 + (x-X1)*m
			P.first = xwmax;
			P.second = Y1 + (xwmax - X1) * m;
			return;
		}
		// x= xwmin
		if (rc & 1) {
			//y =Y1 + (x-X1)*m
			P.first = xwmin;
			P.second = Y1 + (xwmin - X1) * m;
			return;
		}
}
void PerformClipping(pair<int, int>& P1, pair<int, int>& P2)
{
		int rc1 = getRC(P1), rc2 = getRC(P2);
		//Checking for trivial OR
		if (int(rc1 | rc2) == 0) {

			glBegin(GL_LINES);
			glVertex2d(P1.first, P1.second);
			glVertex2d(P2.first, P2.second);
			glEnd();
			return;
		}
		else if (int(rc1 & rc2) != 0) return;
		double m = (Y2-Y1) * 1.0 / (X2-X1);
		findIntersection(P1, m, rc1);
		findIntersection(P2, m, rc2);
		PerformClipping(P1, P2);
}
void myDisplay()
{
		glClear(GL_COLOR_BUFFER_BIT);
		glColor3f(0.0f, 0.0f, 1.0f);
		drawWindow();
		glColor3f(0.0f, 0.0f, 0.0f);
		drawOriginal();
		glColor3f(1.0f, 0.0f, 0.0f);
		PerformClipping(P1, P2);
		glFlush();
}
int main(int argc, char* argv[])
{
		cout << "Enter window properties:" << endl;
		cout << "xwmin:";
		cin >> xwmin;
		cout << "xwmax:";
		cin >> xwmax;
		cout << "ywmin:";
		cin >> ywmin;
```

```
        cout << "ywmax:";
        cin >> ywmax;
        int x, y;
        cout << endl << "Enter point p1(x,y) :";
        cin >> x >> y;
        P1.first = x;
        P1.second = y;
        X1 = x;
        Y1 = y;
        cout << "Enter point p2(x,y) :";
        cin >> x >> y;
        P2.first = x;
        P2.second = y;
        X2 = x;
        Y2 = y;
        cout << "Blue  -> Clipping Window" << endl;
        cout << "Black -> Original Line" << endl;
        cout << "Red   -> Clipped Line" << endl;
        glutInit(&argc, argv);
        glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
        glutInitWindowSize(640, 480);
        glutCreateWindow("Cohen Sutherland");
        glutDisplayFunc(myDisplay);
        myInit();
        glutMainLoop();
        return 1;
}
```

OUTPUT:




Cohen Sutherland