Experiment No. 7

Aim: To implement Line Clipping Algorithm: Liang Barsky

Objective:
To understand the concept of Liang Barsky algorithm to efficiently determine the portion of a line segment that lies within a specified clipping window. This method is particularly effective for lines predominantly inside or outside the window.

Theory:

This Algorithm was developed by Liang and Barsky. It is used for line clipping as it is more efficient because it uses more efficient parametric equations to clip the given line.

These parametric equations are given as:

x = x1 + tdx

y = y1 + tdy, 0 <= t <= 1

Where dx = x2 – x1 & dy = y2 – y1

Algorithm

1. Read 2 endpoints of line as p1 (x1, y1) & p2 (x2, y2).

2. Read 2 corners (left-top & right-bottom) of the clipping window as (xwmin, ywmin, xwmax, ywmax).

3. Calculate values of parameters pi and qi for i = 1, 2, 3, 4 such that

p1 = -dx, q1 = x1 – xwmin

p2 = dx, q2 = xwmax – x1

p3 = -dy, q3 = y1 – ywmin

p4 = dy, q4 = ywmax – y1

4. if pi = 0 then line is parallel to ith boundary if qi < 0 then line is completely outside boundary so discard line

else, check whether line is horizontal or vertical and then check the line endpoints with the corresponding boundaries.

5. Initialize t1 & t2 as

t1 = 0 & t2 = 1

6. Calculate values for qi/pi for i = 1, 2, 3, 4.

7. Select values of qi/pi where pi < 0 and assign maximum out of them as t1.

8. Select values of qi/pi where pi > 0 and assign minimum out of them as t2.

9. if (t1 < t2)
{
xx1 = x1 + t1dx

xx2 = x1 + t2dx

yy1 = y1 + t1dy

yy2 = y1 + t2dy

line (xx1, yy1, xx2, yy2)
}

10. Stop.

Program:

```
#include<stdio.h>

#include<graphics.h>

#include<math.h>
```

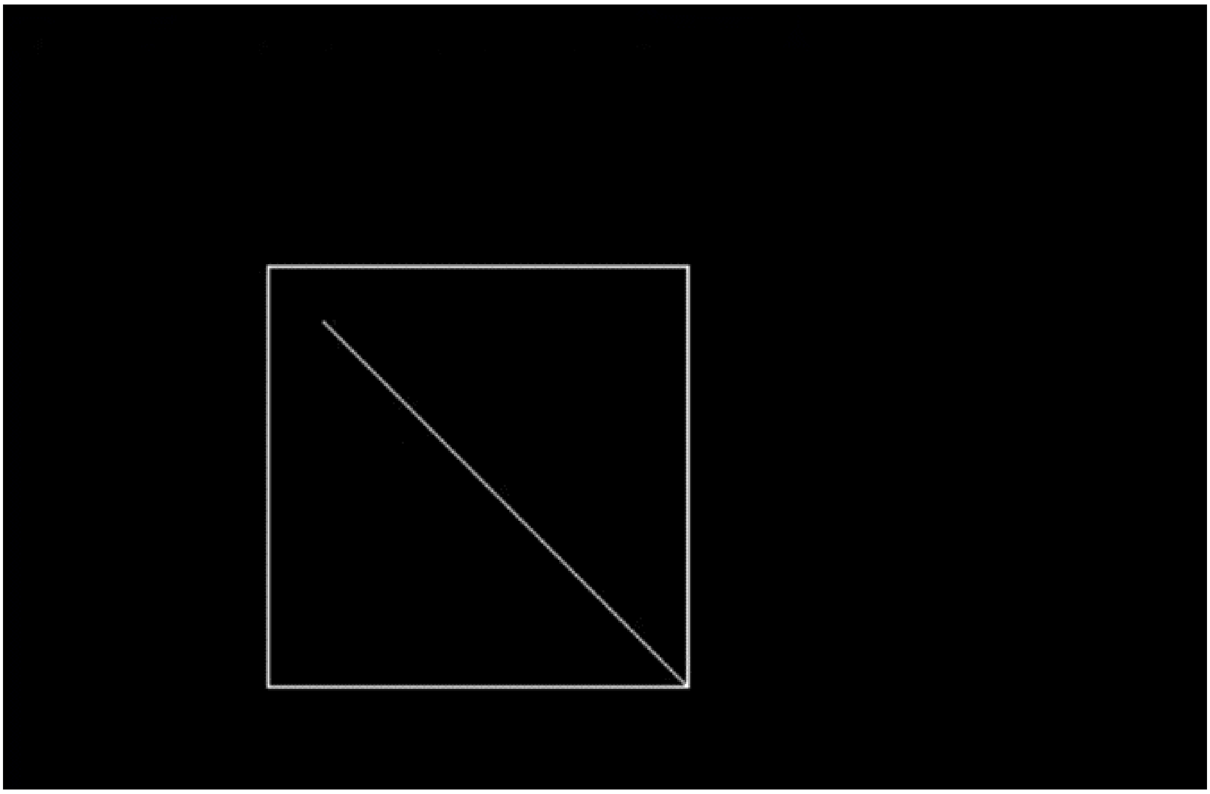
```
#include<dos.h>


int main()

{

int i,gd=DETECT,gm;

int x1,y1,x2,y2,xmin,xmax,ymin,ymax,xx1,xx2,yy1,yy2,dx,dy;

float t1,t2,p[4],q[4],temp;

x1=120;

y1=120;

x2=300;

y2=300;

xmin=100;

ymin=100;

xmax=250;

ymax=250;

initgraph(&gd,&gm," ");

rectangle(xmin,ymin,xmax,ymax);

dx=x2-x1;

dy=y2-y1;

p[0]=-dx;

p[1]=dx;

p[2]=-dy;

p[3]=dy;

q[0]=x1-xmin;
```

```
q[1]=xmax-x1;
q[2]=y1-ymin;
q[3]=ymax-y1;
for(i=0;i<4;i++)
{
if(p[i]==0)
{
printf("line is parallel to one of the clipping boundary");
if(q[i]>=0)
{
if(i<2)
{
if(y1<ymin)
{
y1=ymin;
}
if(y2>ymax)
{
y2=ymax;
}
line(x1,y1,x2,y2);
}
if(i>1)
{
```

```
if(x1<xmin)
{
x1=xmin;
}
if(x2>xmax)
{
x2=xmax;
}
line(x1,y1,x2,y2);
}
}
}
}
t1=0;
t2=1;
for(i=0;i<4;i++)
{
temp=q[i]/p[i];
if(p[i]<0)
{
if(t1<=temp)
t1=temp;
}
else
```

```
{
if(t2>temp)
t2=temp;
}
}
if(t1<t2)
{
xx1 = x1 + t1 * p[1];
xx2 = x1 + t2 * p[1];
yy1 = y1 + t1 * p[3];
yy2 = y1 + t2 * p[3];
line(xx1,yy1,xx2,yy2);
}
delay(5000);
closegraph();
}
```

Output:



Conclusion:

The Liang-Barsky line clipping algorithm efficiently determines the portion of a line segment that lies within a specified clipping window. This algorithm, developed by Liang and Barsky, uses parametric equations for effective line clipping, making it a valuable tool for graphics and computer-aided design applications.