Department of Computer Science and Engineering
Data Science

Academic Year: 2022-2023
Semester: III
Class / Branch: SE Data Science
Subject: Computer Graphics Lab
Name of Instructor: Prof. Poonam Pangarkar

Name of Student: Arya Patil
Student ID: 21107009
Date Of Performance: 04/08/2022
Date Of Submission: 04/08/2022

Experiment No. 1

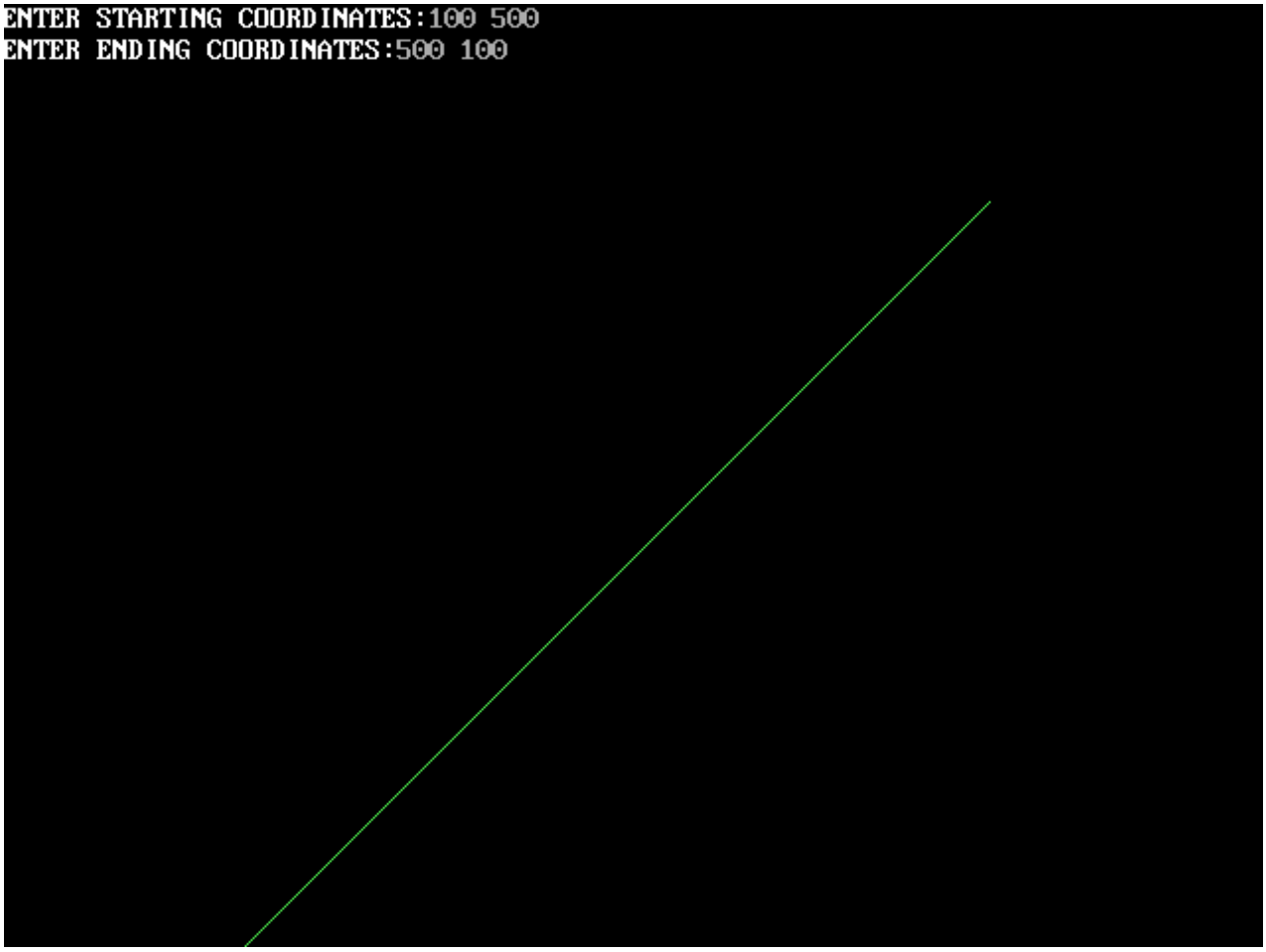
Aim:- To implement Digital Differential Analyzer Line Drawing Algorithm

Program :

```
#include<stdio.h>
#include<conio.h>
#include<graphics.h>
#include<dos.h>
#include<math.h>
void main()
{
int x1,y1,x2,y2,dx,dy.step,i;
float x,y,xinc,yinc;
int gd=DETECT,gm;
clrscr();
initgraph(&gd,&gm,"C:\\TC\\BGI");
printf("ENTER STARTING COORDINATES:");
scanf("%d%d",&x1,&y1);
printf("ENTER ENDING COORDINATES:");
scanf("%d%d",&x2,&y2);
dx=x2-x1;
dy=y2-y1;
if(abs(dx)>abs(dy))
step=abs(dx);
else
step=abs(dy);
xinc=dx/(float)step;
yinc=dy/(float)step;
x=x1;
y=y1;
putpixel(x,y,10);
for(i=0;i<=step;i++)
{
putpixel(x,y,10);
```

```
x=x+xinc;
y=y+yinc;
delay(10);
}
getch();
}
```

Output:-



Department of Computer Science and Engineering
Data Science

Academic Year: 2022-2023
Semester: III
Class / Branch: SE Data Science
Subject: Computer Graphics Lab
Name of Instructor: Prof. Poonam Pangarkar

Name of Student: Arya Patil
Student ID: 21107009
Date Of Performance: 11/08/2022
Date Of Submission: 12/08/2022

Experiment No. 2

Aim:- To Implement Bresenham's Line Drawing AlgorithmAssignment

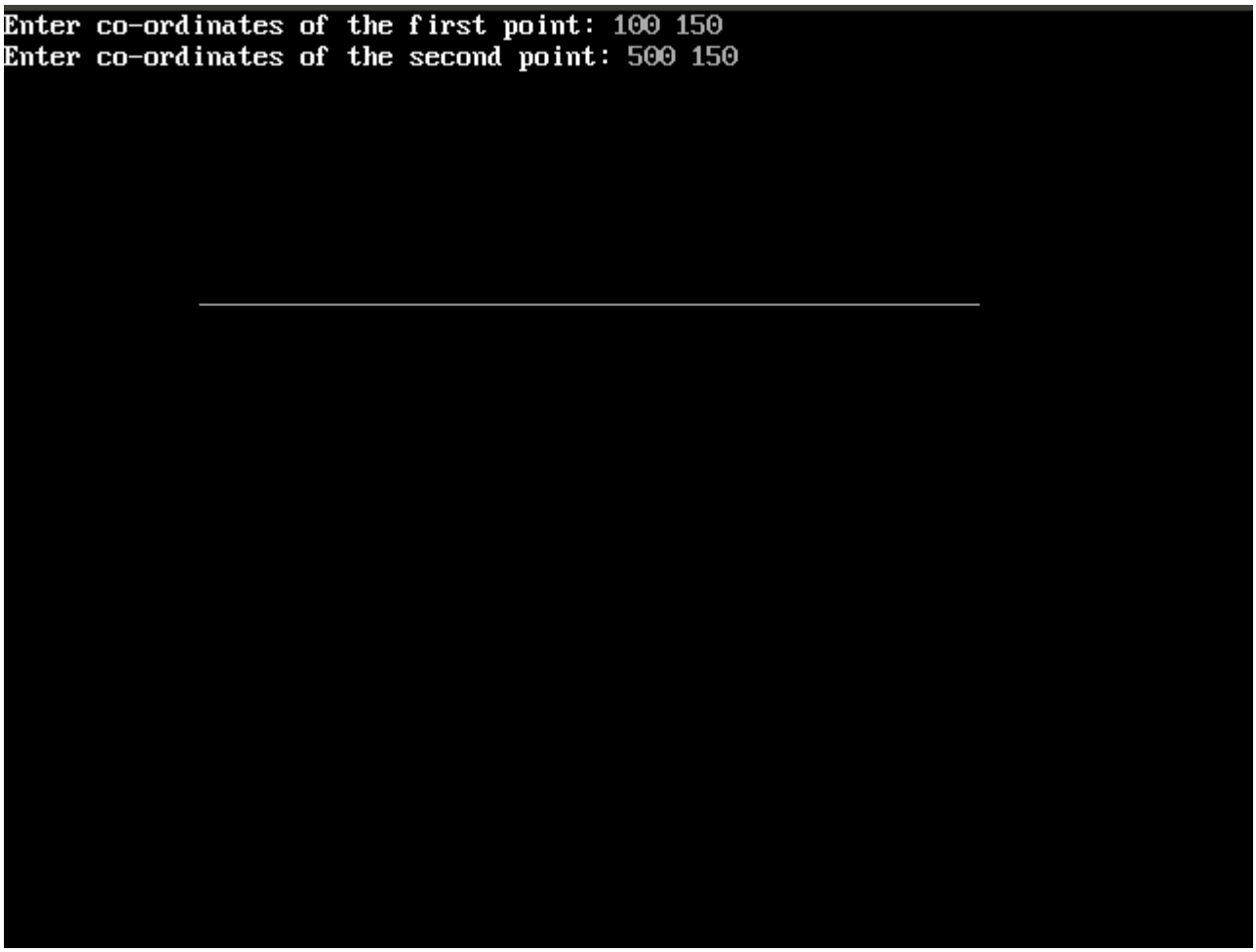
Program

```
#include<conio.h>

#include<stdio.h>

#include<graphics.h>

#include<stdlib.h>

void drawline(int x0,int y0,int x1,int y1)

{

int dx,dy,p,x,y;

dx=x1-x0;

dy=y1-y0;

x=x0;

y=y0;

p=2*dy-dx;
```

```
while(x<x1)
{
if(p>=0)
{
putpixel(x,y,20);
y=y+1;
p=p+2*dy-2*dx;
}
else
{
putpixel(x,y,7);
p=p+2*dy;
}
x=x+1;
}
}
void main()
{
int gdriver=DETECT,gmode,x0,y0,x1,y1;
initgraph(&gdriver,&gmode,"C:\\TC\\BGI");
printf("Enter co-ordinates of the first point: ");
```

```
scanf("%d%d",&x0,&y0);

printf("Enter co-ordinates of the second point: ");

scanf("%d%d",&x1,&y1);

drawline(x0,y0,x1,y1);

getch();

}
```

Output:-



Department of Computer Science and Engineering
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Semester: III
Class / Branch: SE Data Science
Subject: Computer Graphics Lab
Name of Instructor: Prof. Poonam Pangarkar

Name of Student: Arya Patil
Student ID: 21107009
Date Of Performance: 18/08/2022
Date Of Submission: 18/08/2022

Experiment No. 3

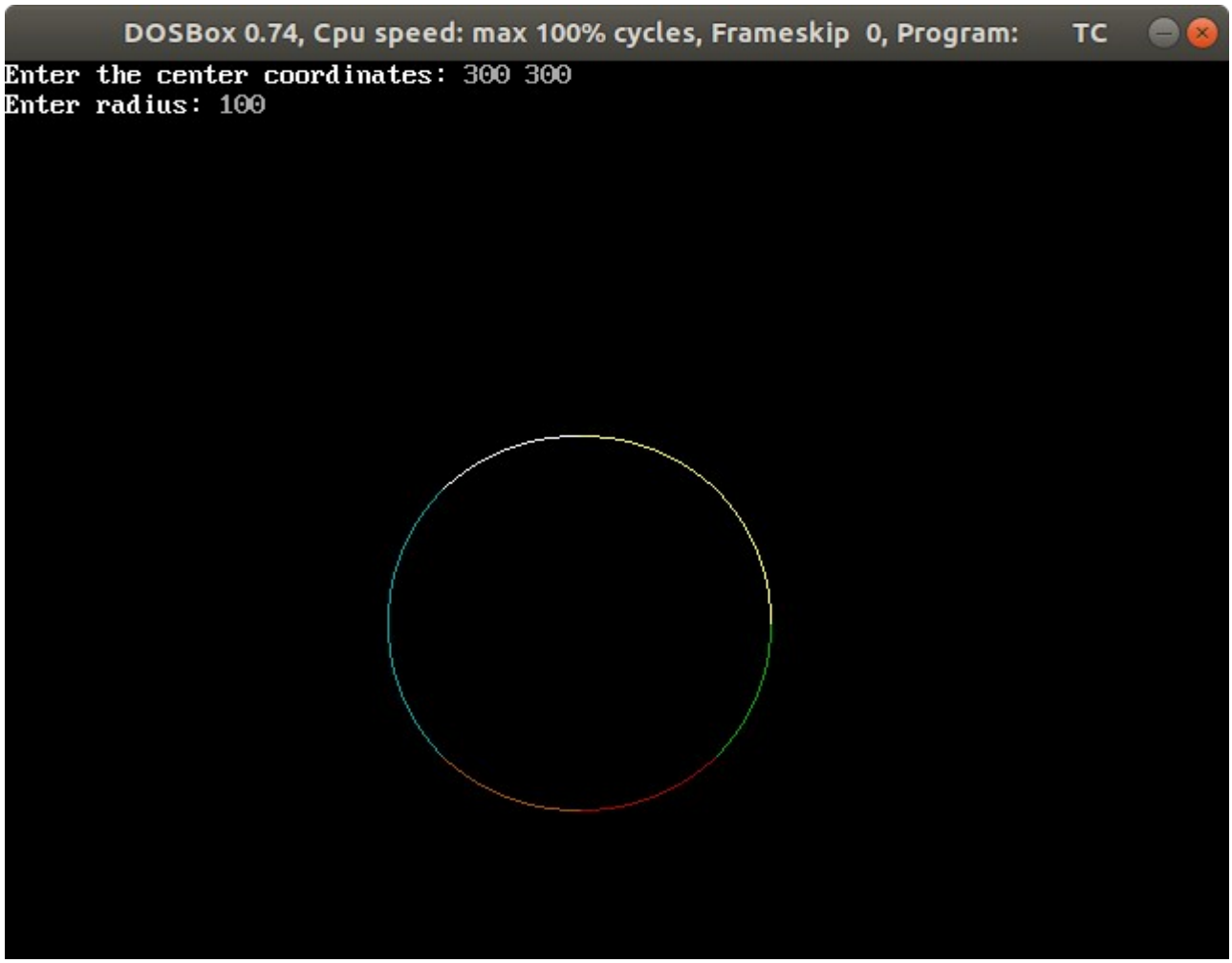
Aim:- To Implement Midpoint Circle Drawing AlgorithmAssignment

Program :

```
#include<stdio.h>
#include<graphics.h>
#include<conio.h>
#include<math.h>
#include<dos.h>
void plot_pts(int,int,int,int);

void main()
{
int gdriver=DETECT,gmode;
int xc,yc,x,y;
float p,r;
clrscr();
initgraph(&gdriver,&gmode,"C:\\TC\\BGI");
printf("Enter the center coordinates: ");
scanf("%d%d",&xc,&yc);
printf("Enter radius: ");
scanf("%f",&r);
x=0;
y=r;
p=(5/4)-r;
do
{
plot_pts(xc,yc,x,y);
if(p<0)
{
```

```
p=p+((2*x)+1);
}
else
{
p=p+((2*(x-y))+1);
y--;
}
x++;
}
while(x<y);
if(x==y)
plot_pts(xc,yc,x,y);
getch();
closegraph();
}
void plot_pts(int x,int y,int x1,int y1)
{
putpixel(x+x1,y+y1,RED);
delay(10);
putpixel(x-x1,y+y1,BROWN);
delay(10);
putpixel(x+x1,y-y1,YELLOW);
delay(10);
putpixel(x-x1,y-y1,WHITE);
delay(10);
putpixel(x+y1,y+x1,GREEN);
delay(10);
putpixel(x-y1,y+x1,CYAN);
delay(10);
putpixel(x+y1,y-x1,YELLOW);
delay(10);
putpixel(x-y1,y-x1,CYAN);
delay(10);
}
```

Output:-


DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC
Enter the center coordinates: 300 300
Enter radius: 100

Department of Computer Science and Engineering
Data Science

Academic Year: 2022-2023 | **Name of Student: Arya Patil**
Semester: III | **Student ID: 21107009**
Class / Branch: SE Data Science | **Date Of Performance: 08/09/2022**
Subject: Computer Graphics Lab | **Date Of Submission:08/09/2022**
Name of Instructor: Prof. Poonam Pangarkar

Experiment No. 4

Aim:- To Implement Boundary Fill and Flood Fill Polygon filling Algorithm.

Program : Boundary Fill

```
#include<stdio.h>
#include<conio.h>
#include<dos.h>
#include<graphics.h
>

void boundaryfill(int x,int y,int fill,int boundary)
{
 int current; current=getpixel(x,y);
if((current!=boundary)&&(current!=fill
)) {
```

```
setcolor(fill); putpixel(x,y,fill);
delay(20); boundryfill(x+1,y,fill,boundry);
boundryfill(x-1,y,fill,boundry);
boundryfill(x,y+1,fill,boundry); boundryfill(x,y-
1,fill,boundry);
 }
}
void main() {
int gd=DETECT,gm; initgraph(&gd,&gm,"C:\\TC\\BGI"); setcolor(10);
rectangle(250,200,310,260); boundarfill(280,250,12,10); getch();
}
```

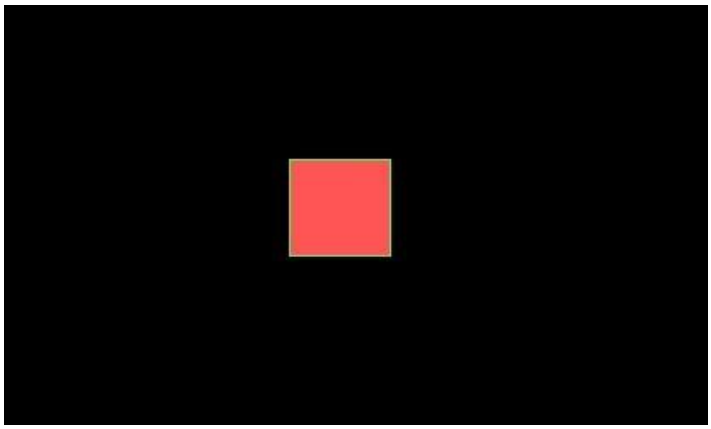
Program : Flood Fill

```
#include<stdio.h>
#include<conio.h>
#include<graphics.h> #include<dos.h>

void flood(int x,int y,int fillcolor,int oldcolor)
{ int current;
current=getpixel(x,y);
if(current==oldcolor)
{
```

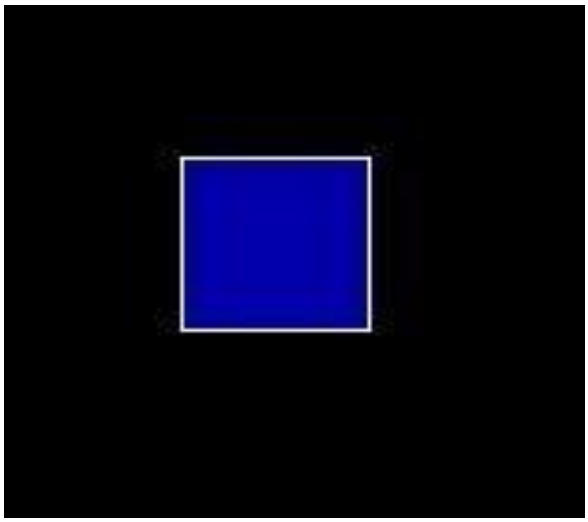
```
 delay(10);  putpixel(x,y,fillcolor);
flood(x+1,y,fillcolor,oldcolor);
flood(x-1,y,fillcolor,oldcolor);
flood(x,y+1,fillcolor,oldcolor);
flood(x,y-1,fillcolor,oldcolor);
 } } void
main()
{
int gd=DETECT,gm; initgraph(&gd,&gm,"C:\\TC\\BGI");
rectangle(50,50,100,100); flood(55,55,RED,0);
flood(55,55,BLUE,RED);
 getch(); closegraph();
}
```

Output:-

Boundary Fill



Flood Fill



Department of Computer Science and Engineering
Data Science

Academic Year: 2022-2023
Semester:3
Class / Branch: DS
Subject:CG
Name of Instructor: Prof. Poonam Pangarkar

Name of Student: Arya Patil
Student ID:21107009
Date of Performance:14/09/2022
Date of Submission:25/09/2022

Experiment No.05

Aim:- To implement Scan Line Fill Polygon Filling Algorithm

Program:-

```
#include <stdio.h>

#include <conio.h>

#include <graphics.h>

voidmain()

{

int n,i,j,k,gd,gm,dy,dx; int x,y,temp; int

a[20][2],xi[20]; float slope[20]; clrscr();

printf("\n\n\tEnter the no. of edges of polygon : ");

scanf("%d",&n);

printf("\n\n\tEnter the cordinates of polygon :\n\n\n "); for(i=0;i;i<n;i++)
```

```
{
printf("\tX%d Y%d : ",i,i);
scanf("%d  %d",&a[i][0],&a[i][1]);
}
a[n][0]=a[0][0]; detectgraph(&gd,&gm);
initgraph(&gd,&gm,"C:\YOGISOFT\TC\BIN");
/*- draw polygon -*/ for(i=0;i<n;i++)
{
 line(a[i][0],a[i][1],a[i+1][0],a[i+1][1]);
} getch();
for(i=0;i<n;i++)
{
dy=a[i+1][1]-a[i][1];
dx=a[i+1][0]-a[i][0];
if(dy==0) slope[i]=1.0;
if(dx==0)slope[i]=0.0;
if((dy!=0)&&(dx!=0))
/*- calculate inverse
slope -*/

{
```

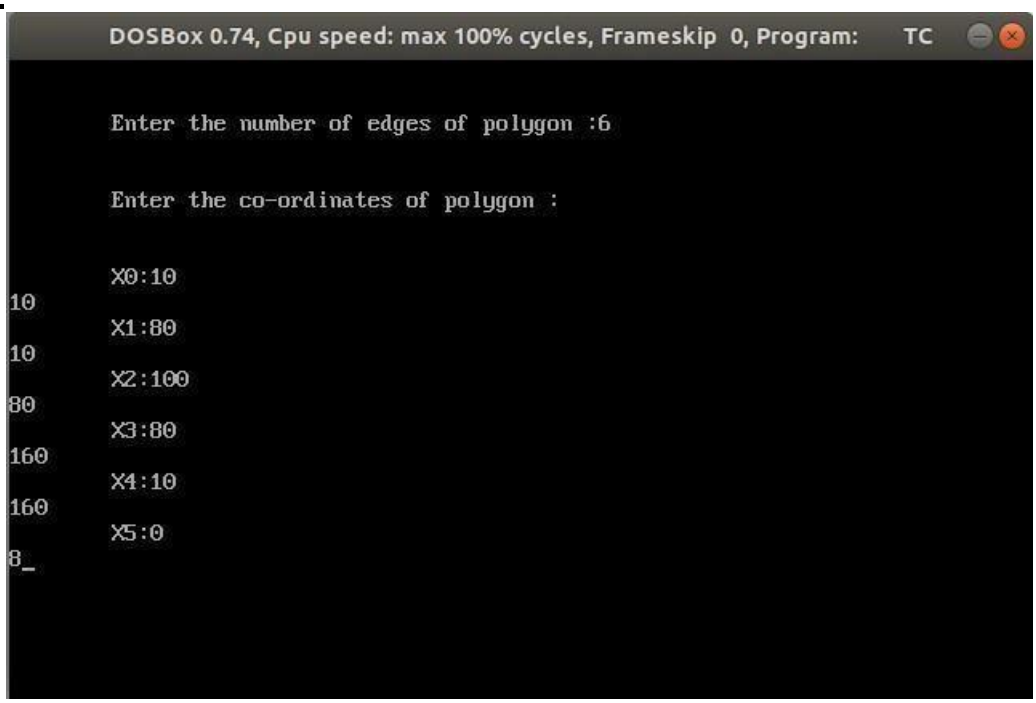
```
slope[i]=(float)

dx/dy;

}

}
```

```
for(y=0;y< 480;y++)
    {
    k=0; for(i=0;i<n;i++) { if(
    ((a[i][1]<=y)&&(a[i+1][1]>y))||
    a[n][1]=a[0][1];
    detectgraph(&gd,&gm); initgraph(&gd,&gm,"C:\YOGISOFT\TC\BIN");
    /*- draw polygon -*/ for(i=0;i<n;i++)
    {
    line(a[i][0],a[i][1],a[i+1][0],a[i+1][1]);
    } getch();
    for(i=0;i<n;i++)
    { dy=a[i+1][1]-
    a[i][1];
    dx=a[i+1][0]-
    a[i][0];
    if(dy==0)
    slope[i]=1.0;
    if(dx==0)slope[
    i]=0.0;
```

```
if((dy!=0)&&(d
x!=0))
/*- calculate inverse slope -*/
{ slope[i]=(float)
dx/dy;
}
}
for(y=0;y< 480;y++)
{
k=0; for(i=0;i<n;i++) { if(
((a[i][1]<=y)&&(a[i+1][1]>y))||
((a[i][1]>y)&&(a[i+1][1]<=y)))
{ xi[k]=(int)(a[i][0]+slope[i]*(y-a[i][1]));
k++;
} } for(j=0;j<k-1;j++) /*- Arrange x-intersections in
order -*/ for(i=0;i<k-1;i++)
{ if(xi[i]>xi[i+1])
{ temp=xi[i];
xi[i]=xi[i+1];
xi[i+1]=temp;
```

```
} } setcolor(3);
for(i=0;i<k;i+=2)
{ line(xi[i],y,xi[i+1]+1,y);
getch();
}
}
}
```

Output:-



Department of Computer Science and Engineering
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Name of Student: Arya Patil
Student ID: 21107009
Date Of Performance: 23/09/2022
Date Of Submission: 23/09/2022

Experiment No. 6

Aim:- To Implement 2D Transformation on an object - Translation, Rotation, Reflection, Scaling and Shear .

Program :

```
#include<graphics.h>
#include<stdlib.h>
#include<stdio.h>
#include<conio.h>
#include<math.h>
void main()
{
int gm;
int gd=DETECT;
int x1,x2,x3,y1,y2,y3,nx1,nx2,nx3,ny1,ny2,ny3,c;
int sx,sy,xt,yt,r;
float t;
initgraph(&gd,&gm,"C:\\TC\\BGI");
printf("\t Program for basic transformation");
printf("\n\t Enter the points of triangle");
setcolor(1);
scanf("%d%d%d%d%d%d",&x1,&y1,&x2,&y2,&x3,&y3);
line(x1,y1,x2,y2);
line(x2,y2,x3,y3);
line(x3,y3,x1,y1);
getch();
printf("\n 1.Translation \n 2.Rotation \n 3.Scalling \n 4.Exit");
printf("Enter your choice:");
scanf("%d",&c);
switch(c)
{
case 1:
printf("\n Enter the translation factor");
scanf("%d%d",&xt,&yt);
nx1=x1+xt;
ny1=y1+yt;
```

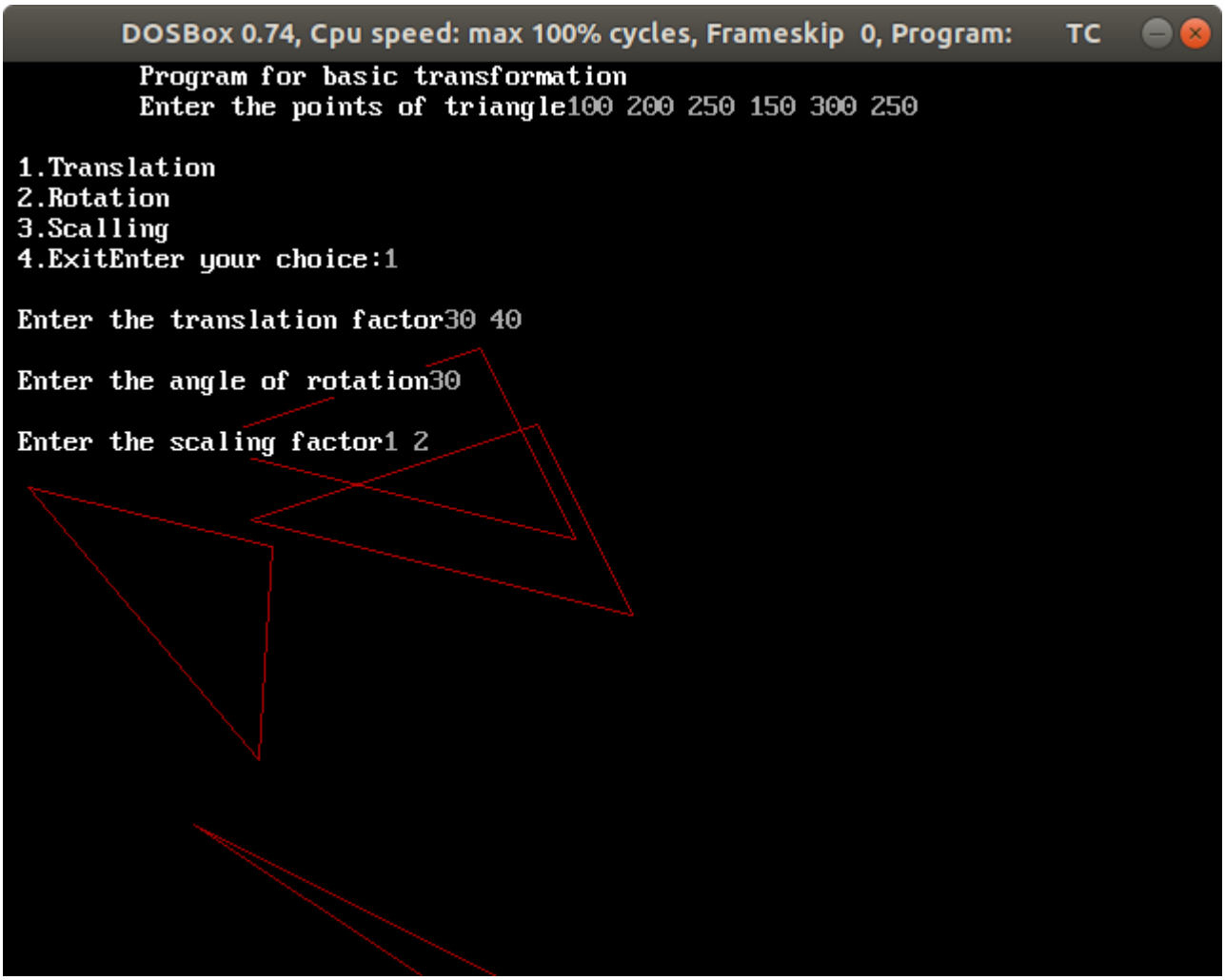
```
nx2=x2+xt;
ny2=y2+yt;
nx3=x3+xt;
ny3=y3+yt;
line(nx1,ny1,nx2,ny2);
line(nx2,ny2,nx3,ny3);
line(nx3,ny3,nx1,ny1);
getch();

case 2:
printf("\n Enter the angle of rotation");
scanf("%d",&r);
t=3.14*r/180;
nx1=abs(x1*cos(t)-y1*sin(t));
ny1=abs(x1*sin(t)+y1*cos(t));
nx2=abs(x2*cos(t)-y2*sin(t));
ny2=abs(x2*sin(t)+y2*cos(t));
nx3=abs(x3*cos(t)-y3*sin(t));
ny3=abs(x3*sin(t)+y3*cos(t));
line(nx1,ny1,nx2,ny2);
line(nx2,ny2,nx3,ny3);
line(nx3,ny3,nx1,ny1);
getch();

case 3:
printf("\n Enter the scaling factor");
scanf("%d%d",&sx,&sy);
nx1=x1*sx;
ny1=y1*sy;
ny2=x2*sy;
nx2=x2*sx;
nx3=x3*sx;
ny3=y3*sy;
line(nx1,ny1,nx2,ny2);
line(nx2,ny2,nx3,ny3);
line(nx3,ny3,nx1,ny1);
getch();

case 4:
break;
deafult:
printf("Enter the correct choice");
}
//closegraph();
}
```

Output:-


DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Program: TC
Program for basic transformation
Enter the points of triangle100 200 250 150 300 250
1.Translation
2.Rotation
3.Scalling
4.ExitEnter your choice:1
Enter the translation factor30 40
Enter the angle of rotation30
Enter the scaling factor1 2

Department of Computer Science and Engineering
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Academic Year: 2022-2023
Semester: III
Class / Branch: SE Data Science
Subject: Computer Graphics Lab
Name of Instructor: Prof. Poonam Pangarkar

Name of Student: Arya Patil
Student ID: 21107009
Date Of Performance: 30/09/2022
Date Of Submission: 30/09/2022

Experiment No. 7

Aim:- To Implement Cohen Sutherland and Liang Barsky Line Clipping Algorithm.

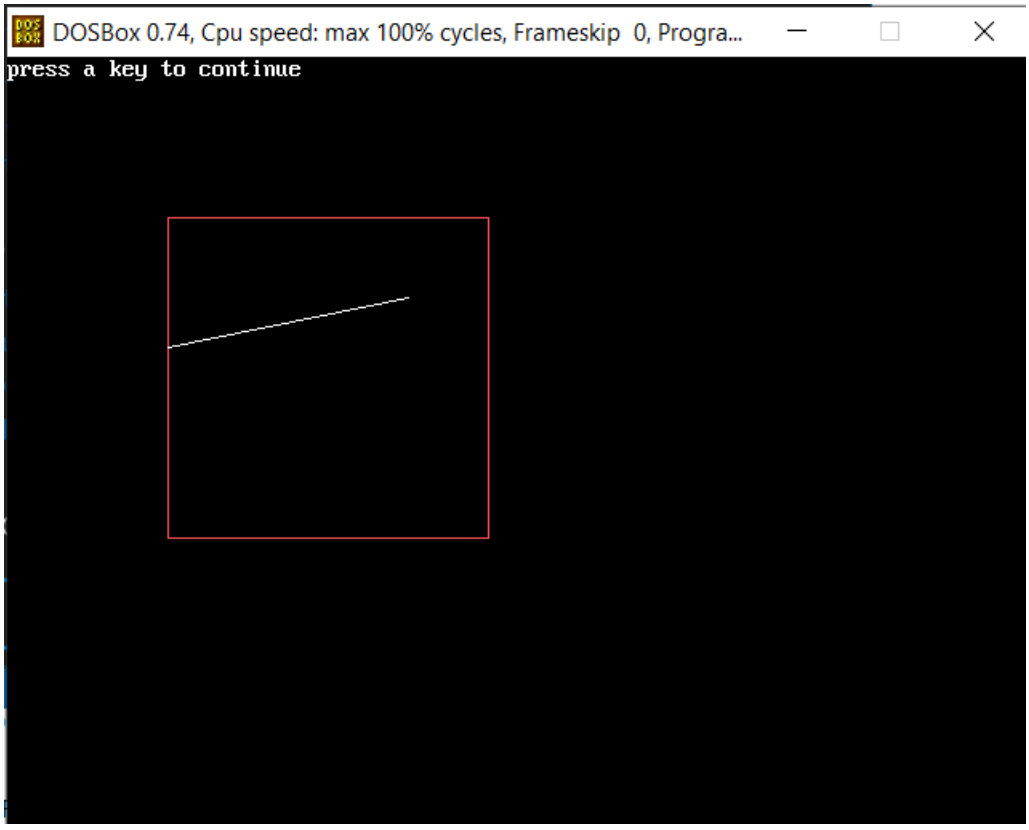
Program :

```
#include<conio.h>
#include<stdio.h>
#include<graphics.h>
#include<math.h>



void main()
{
int a[4],b[4];
float m,xnew,ynew;
float x1=100,y1=100,xh=300,yh=300,xa=10,ya=200,xb=250,yb=150;
int gd=DETECT,gm; initgraph(&gd,&gm,"C:\\TURBO3\\BIN");
setcolor(5);
line(xa,ya,xb,yb);
setcolor(12);
rectangle(x1,y1,xh,yh);
m = (yb-ya)/(xb-xa);

if(xa<x1) a[3]=1;


      else a[3]=0;


if(xa>xh) a[2]=1;
else a[2]=0;
```

```
if(ya<y1) a[1]=1;
else a[1]=0;


if(ya>yh) a[0]=1;
else a[0]=0;


if(xb<x1) b[3]=1;
else b[3]=0;


if(xb>xh) b[2]=1;
else b[2]=0;


if(yb<y1) b[1]=1;
else b[1]=0;



if(yb>yh) b[0]=1;
else b[0]=0;


printf("press a key to continue"); getch();
if(a[0] == 0 && a[1] == 0 && a[2] == 0 && a[3] == 0 && b[0] == 0 && b[1] == 0
&& b[2] == 0 && b[3] == 0)
{


printf("no clipping"); line(xa,xb,ya,yb);
}
else if(a[0]&&b[0] || a[1]&&b[1] || a[2]&&b[2] || a[3]&&b[3])
{
clrscr();
printf("line discarded"); rectangle(x1,y1,xh,yh);
}
else
{
if(a[3] == 1 && b[3] == 0)
{
ynew = (m*(x1-xa)) + ya; setcolor(12);


      rectangle(x1,y1,xh,yh); setcolor(0); line(xa,ya,xb,yb); setcolor(15);
line(x1,ynew,xb,yb);
}
else if(a[2] == 1 && b[2] == 0)
{
xnew = xa + (y1-ya)/m; setcolor(0); line(xa,ya,xb,yb); setcolor(15);
line(xnew,yh,xb,yb);
```

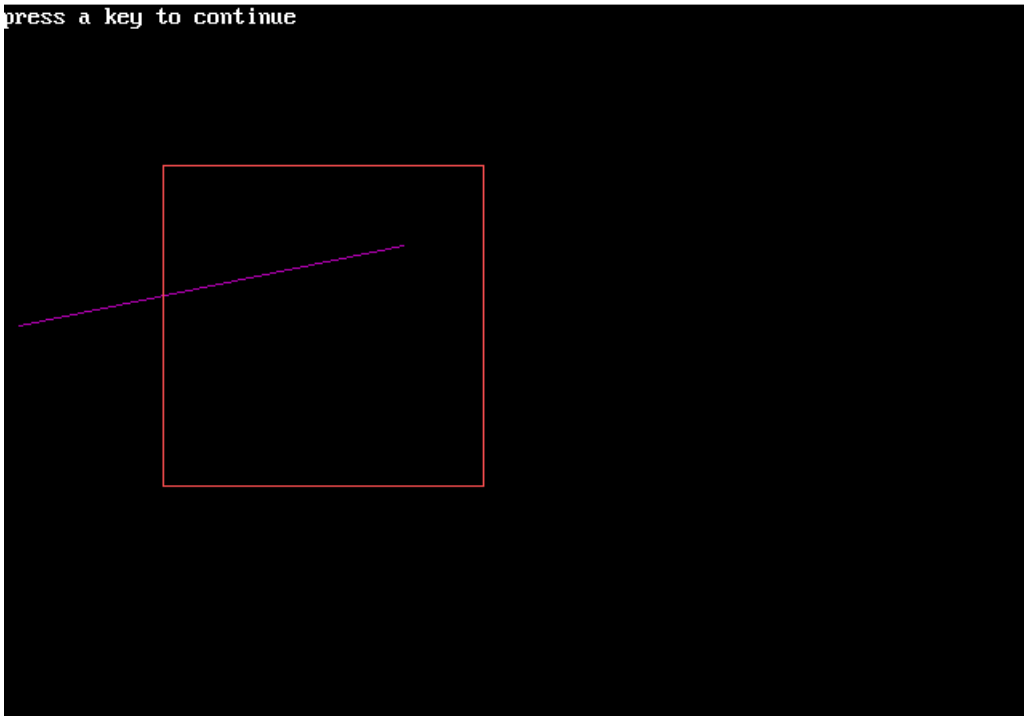
```
}


else if(a[0] == 1 && b[0] == 0)
{
xnew = xa + (yh-ya)/m; setcolor(0); line(xa,ya,xb,yb); setcolor(15);
line(xnew,yh,xb,yb);
}
}
getch();
closegraph();     }
```

Output:-



DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Progra...

press a key to continue



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Student ID: 21107009
Date Of Performance: 30/09/2022
Date Of Submission: 30/09/2022

Experiment No. 8

Aim:- To implement Sutherland Hodgeman Polygon Clipping Algorithm

Program :

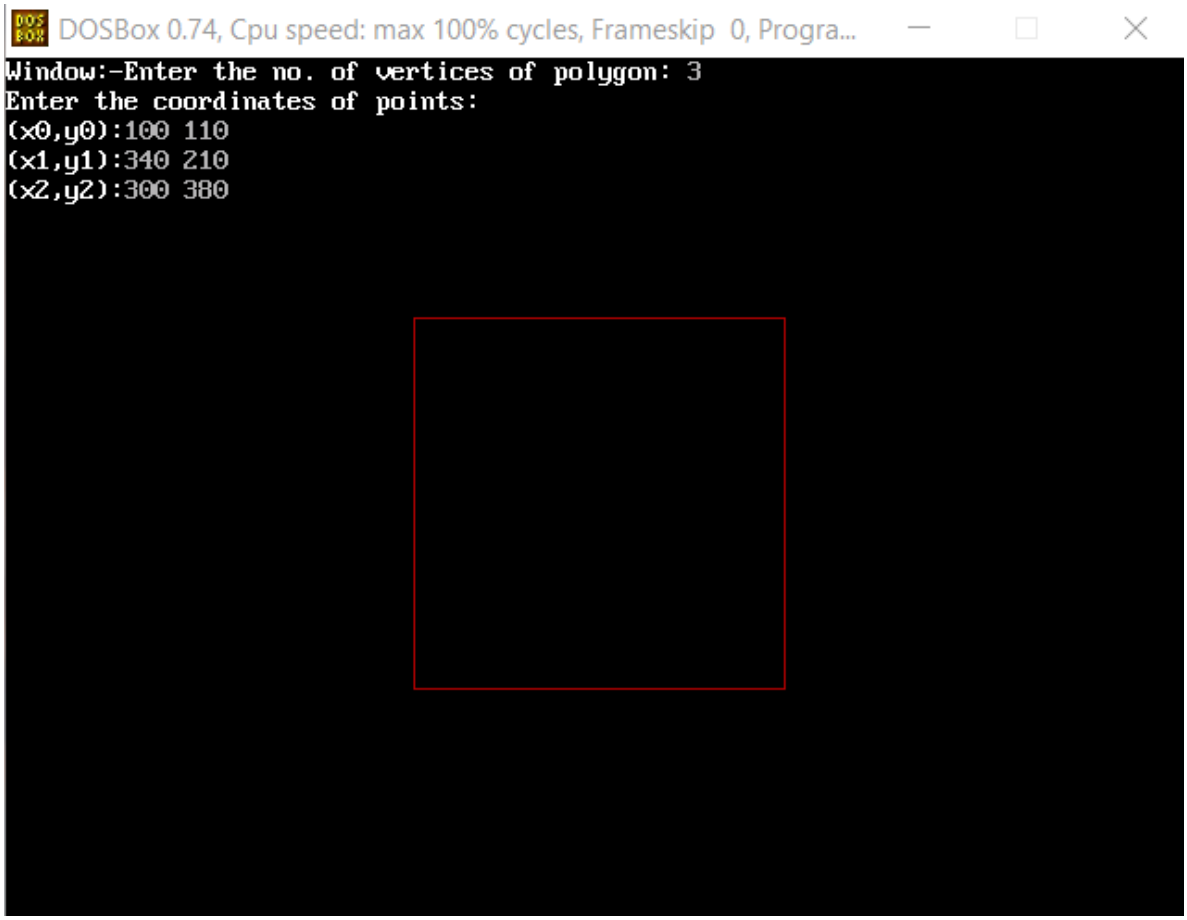
```
#include<stdio.h>
#include<graphics.h>
#include<conio.h>
#include<stdlib.h>

int main()
{
int n,*x,i,k=0;
//int wx1=220,wy1=140,wx2=420,wy2=140,wx3=420,wy3=340,wx4=220, wy4=340;
int w[]={220,140,420,140,420,340,220,340,220,140};
//array for drawing window
int gd=DETECT,gm;
initgraph(&gd,&gm,"C:\\TURBOC3\\BGI");
printf("Window:-");
setcolor(RED);
//red colored window
drawpoly(5,w);
//window drawn
printf("Enter the no. of vertices of polygon: ");
scanf("%d",&n);
x = malloc(n*2+1);
printf("Enter the coordinates of points:\n");
k=0;
for(i=0;i<n*2;i+=2) //reading vertices of polygon
{
printf("(x%d,y%d):",k,k);
scanf("%d%d",&x[i],&x[i+1]);
k++;
}
```

```
x[n*2]=x[0]; //assigning the coordinates of first vertex to last additional
vertex for drawpoly method.
x[n*2+1]=x[1];
setcolor(WHITE);
drawpoly(n+1,x);
printf("\nPress a button to clip a polygon..");
getch();
setcolor(RED);
drawpoly(5,w);
setfillstyle(SOLID_FILL,BLACK);
floodfill(2,2,RED);
gotoxy(1,1); //bringing cursor at starting position printf("\nThis is the
clipped polygon..");
getch();


cleardevice();
closegraph();
return 0;
}
```

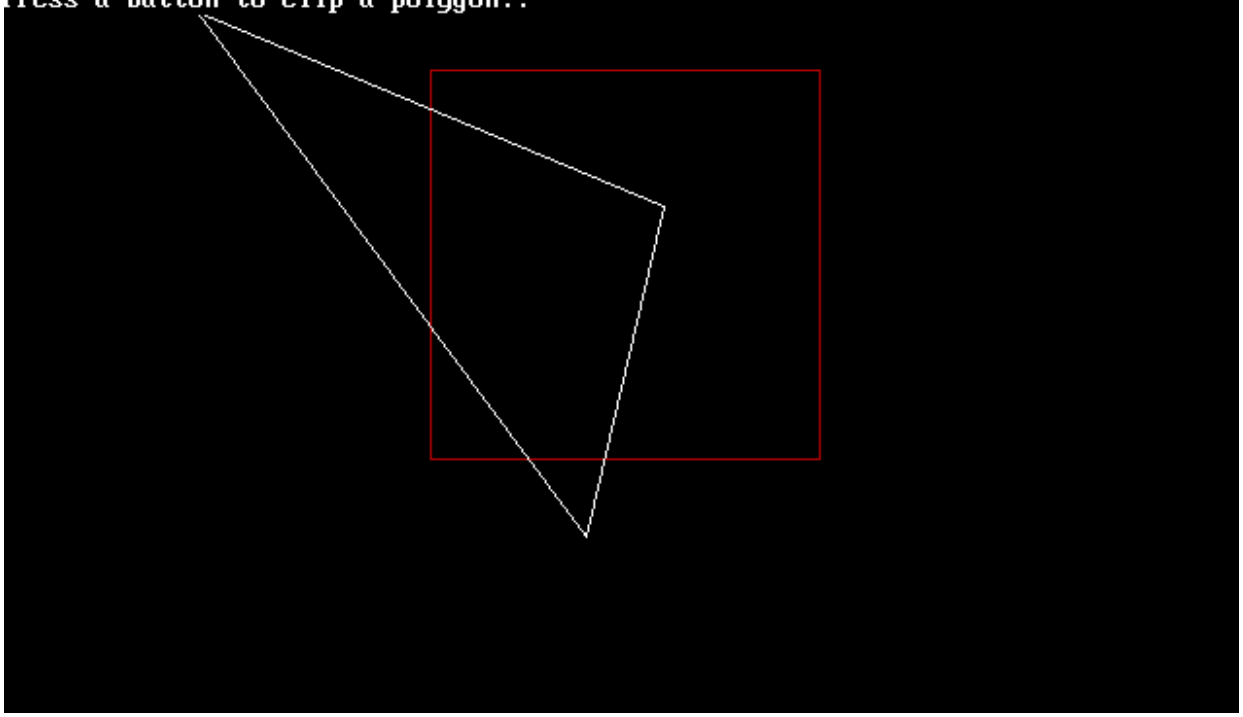
Output:-

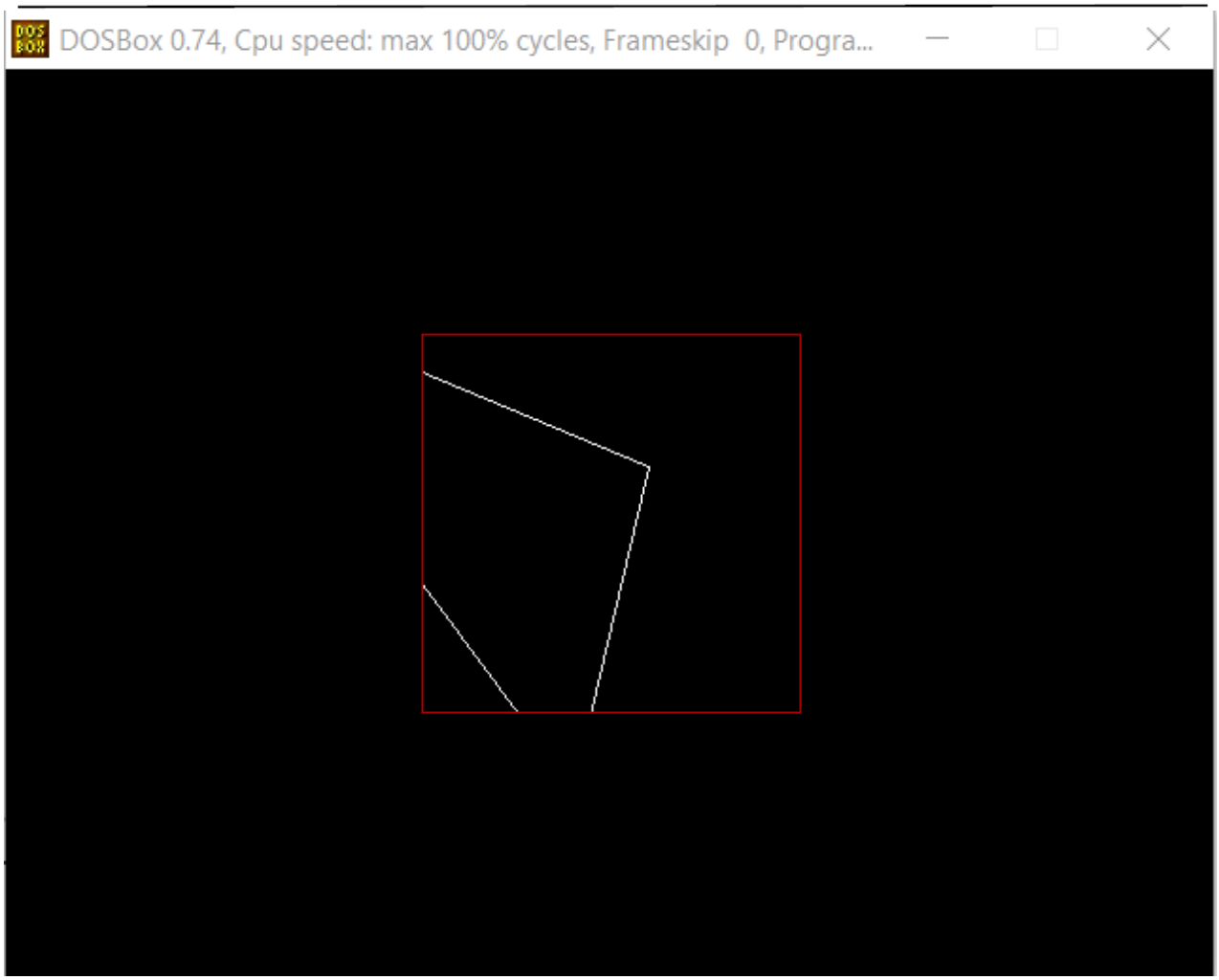


DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Progra...

```
Window:-Enter the no. of vertices of polygon: 3
Enter the coordinates of points:
(x0,y0):100 110
(x1,y1):340 210
(x2,y2):300 380

Press a button to clip a polygon..
```




DOSBox 0.74, Cpu speed: max 100% cycles, Frameskip 0, Progra...

Department of Computer Science and Engineering
Data Science

Academic Year: 2022-2023 | **Name of Student: Arya Patil**
Semester: III | **Student ID: 21107009**
Class / Branch: SE Data Science | **Date Of Performance: 10/10/2022**
Subject: Computer Graphics Lab | **Date Of Submission:10/10/2022**
Name of Instructor: Prof. Poonam Pangarkar

Experiment No. 9

Aim:- To perform projection 3D object on Projection plane:Parallel andPerpspective.

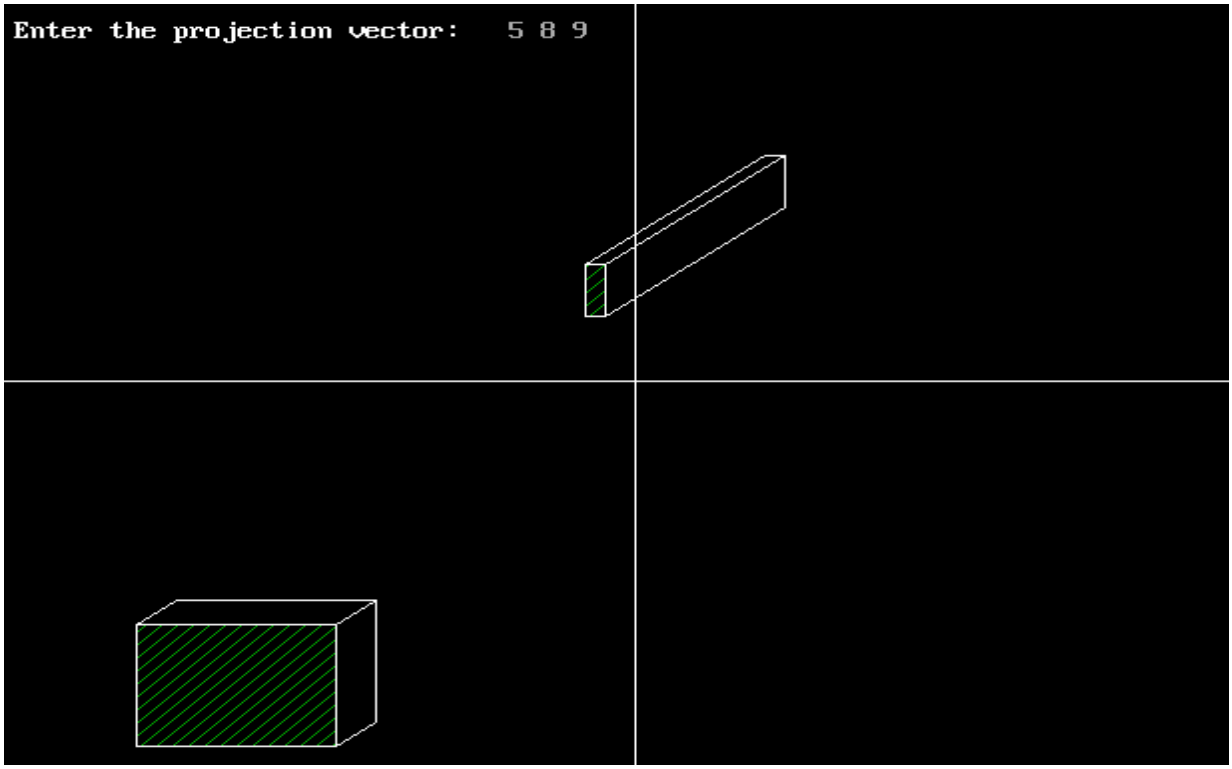
Program :

```
#include<stdio.h>
#include<conio.h>
#include<graphics.h>
#include<math.h>
int midx,midy,maxx,maxy;
void main()
{
  int  gd,gm,x,y,z;
  clrscr();
  detectgraph(&gd,&gm);
  initgraph(&gd,&gm,"C:\\tc\\bgi");
  setfillstyle(3,2);
  maxx=getmaxx();
  maxy=getmaxy();
  midx=maxx/2;
  midy=maxy/2;
  line(midx,0,midx,maxy);
  line(0,midy,maxx,midy);
  bar3d(midx-250,midy+150,midx-150,midy+225,20,4);
  printf("\n Enter the projection vector:\t");
  scanf("%d%d%d",&x,&y,&z);
   bar3d(midx-(x*5),midy-(y*9),midx-(x*3),midy-(y*5),10*z,4);
```

```
  getch();
  closegraph();

}
```

Output:-



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Name of Student: Arya Patil
Student ID: 21107009
Date Of Performance: 10/10/2022
Date Of Submission: 10/10/2022

Experiment No. 10

Aim:- To perform projection of a 3D object on Projection Plane: Parallel and Perspective.

Program :

```
#include<stdio.h>
#include<conio.h>
#include<graphics.h>
#include<math.h>
int midx,midy,maxx,maxy;
void main()
{
int gd,gm,x,y,z;
clrscr();
detectgraph(&gd,&gm);
initgraph(&gd,&gm,"C:\\tc\\bin");
setfillstyle(3,2);
maxx=getmaxx();
maxy=getmaxy();
midx=maxx/2;
midy=maxy/2;
line(midx,0,midx,maxy);
line(0,midy,maxx,midy);
bar3d(midx-250,midy+150,midx-150,midy+225,20,4);
printf("\n Enter the projection vector:\t");
```

```
scanf("%d%d%d",&x,&y,&z);
bar3d(midx-(x*5),midy-(y*9),midx-(x*3),midy-(y*5),10*z,4);
getch();
closegraph();
}
```

Output:-