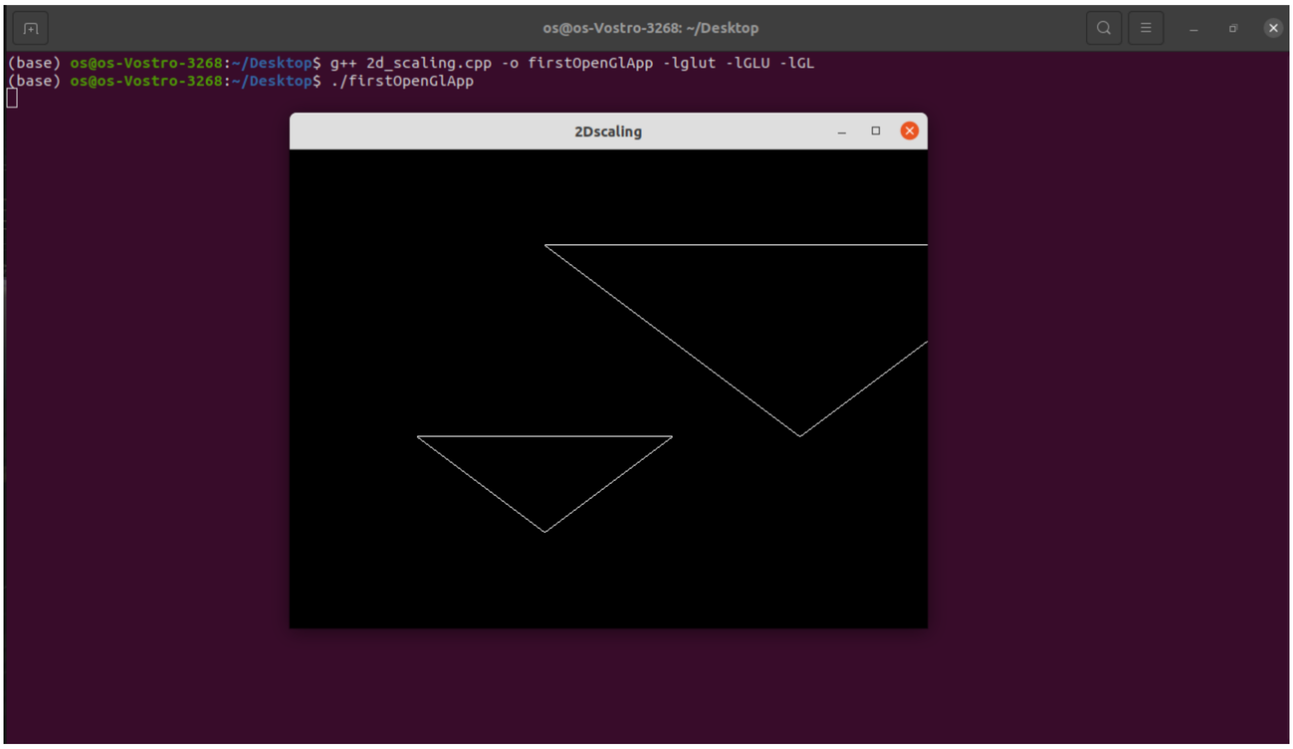
2DSCALING

```
#include <GL/glut.h>
#include <iostream>
#include <math.h>
using namespace std;
void findnewcoordinate(int s[][2], int p[][1]){
int temp[2][1] = {0};
for (int i = 0;i<2;i++)
  for(int j = 0;j<1;j++)
     for (int k = 0;k<2;k++)
         temp[i][j] += (s[i][k] * p[k][j]);
    p[0][0] = temp[0][0];
    p[1][0] = temp[1][0];
}
void scale(int x[], int y[], int sx, int sy){
glBegin(GL_LINE_LOOP);
glVertex2f(x[0],y[0]);
glVertex2f(x[1],y[1]);
glVertex2f(x[1],y[1]);
glVertex2f(x[2],y[2]);
glVertex2f(x[2],y[2]);
glVertex2f(x[0],y[0]);
glEnd();
int s[2][2] = {sx, 0, 0, sy};
int p[2][1];
for(int i = 0;i<3;i++){
p[0][0]=x[i];
p[1][0]=y[i];
findnewcoordinate(s,p);
x[i] = p[0][0];
y[i] = p[1][0];
}
glBegin(GL_LINE_LOOP);
glVertex2f(x[0],y[0]);
glVertex2f(x[1],y[1]);
glVertex2f(x[1],y[1]);
glVertex2f(x[2],y[2]);
glVertex2f(x[2],y[2]);
glVertex2f(x[0],y[0]);
glEnd();
glFlush();
}
void init(void){
glClearColor(0.0,0.0,0.0,0.0);
gluOrtho2D(0,500,0,500);
}
int main(int argc ,char** argv) {
   int x[] = {100,200,300};
   int y[] = {200,100,200};
   int sx = 2,sy = 2;
```

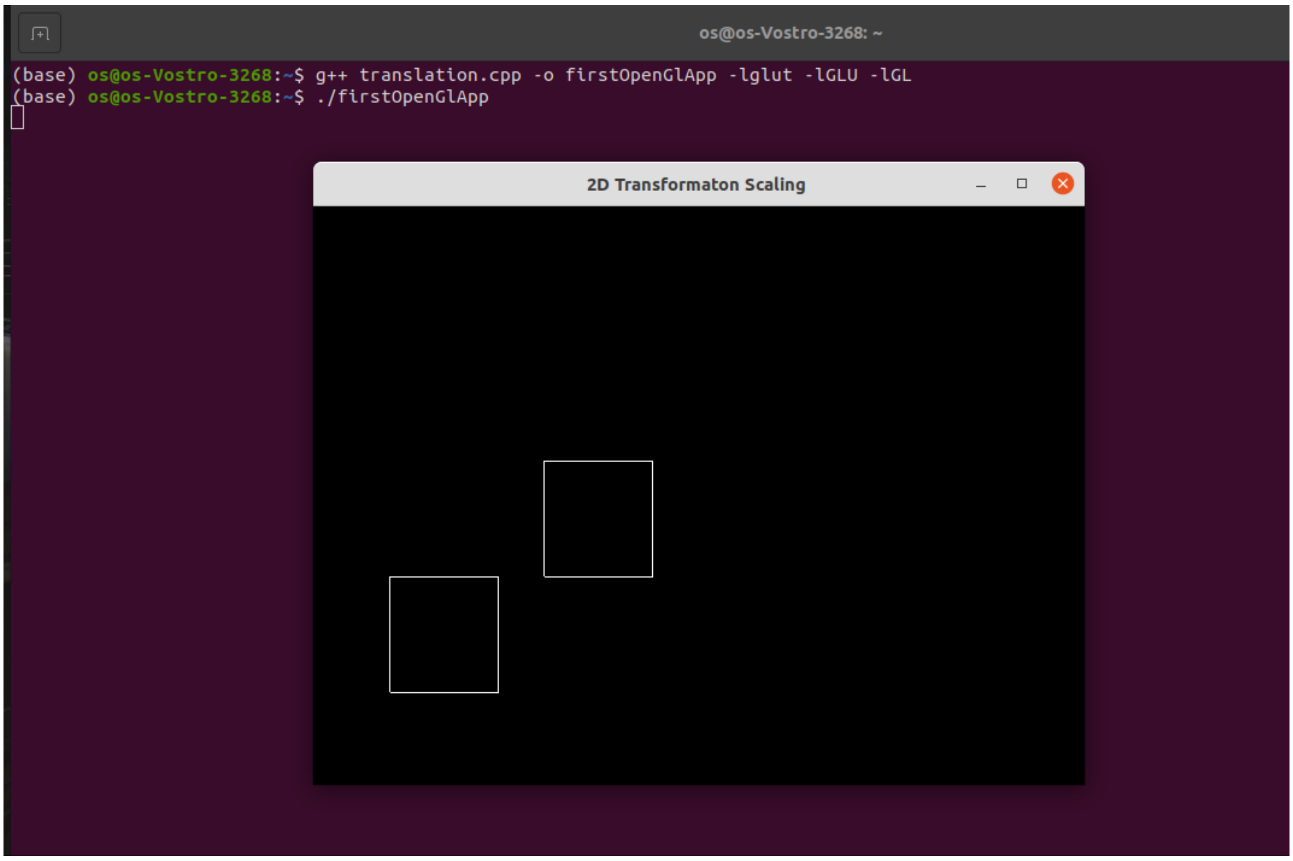
```
    glutInit(&argc, argv);
    glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
    glutInitWindowSize(640, 480);
    glutInitWindowPosition(0,0);
    glutCreateWindow("2Dscaling");
     init();
     scale(x,y,sx,sy);
     glutMainLoop();
     return 0;

}
```



```
(base) os@os-Vostro-3268:~/Desktop$ g++ 2d_scaling.cpp -o firstOpenGlApp -lglut -lGLU -lGL
(base) os@os-Vostro-3268:~/Desktop$ ./firstOpenGlApp
```

2DTRANSLATION

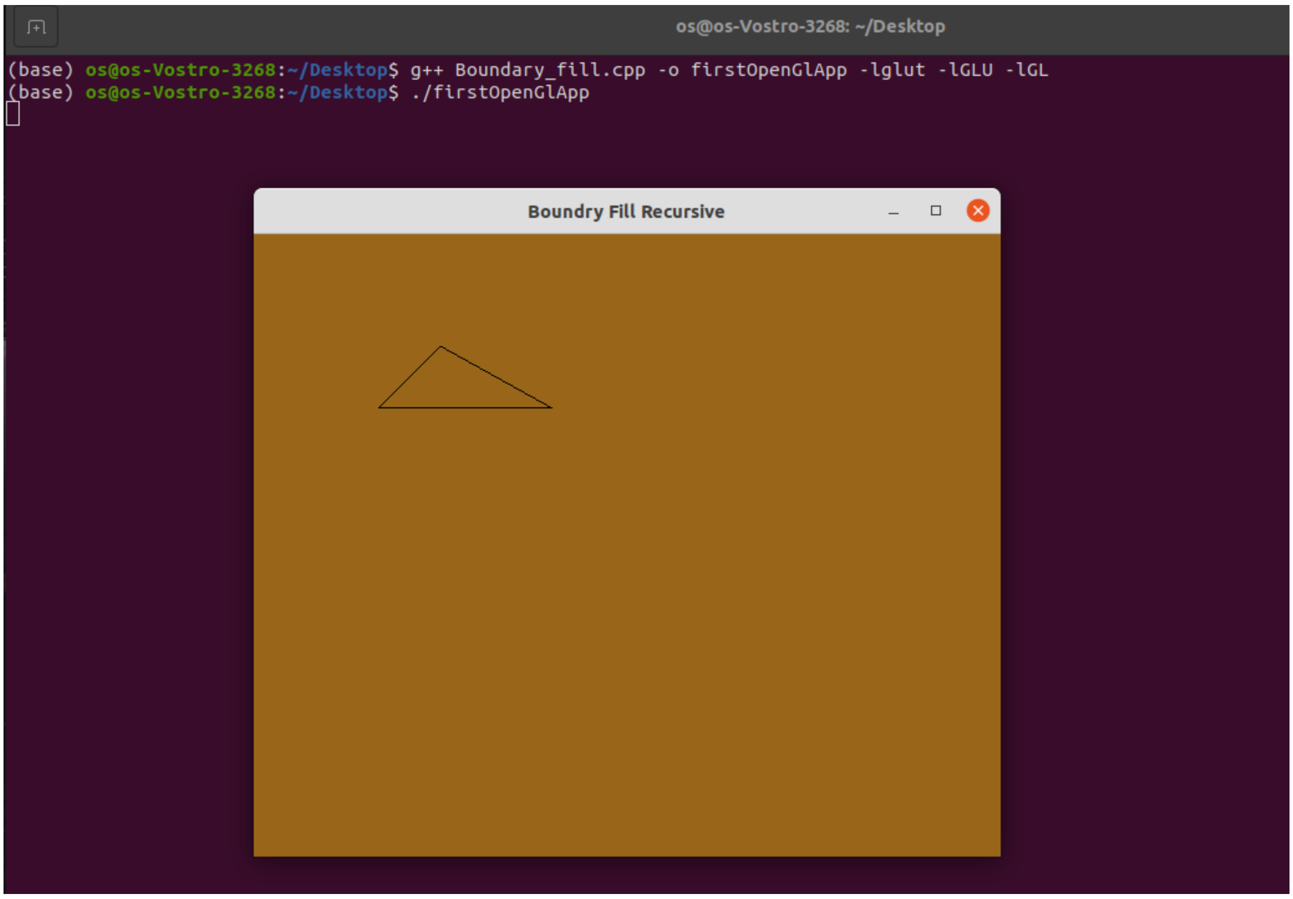
```
#include<GL/glut.h>
#include <iostream>
#include <math.h>
using namespace std;
void translateRectangle(int P[][2], int T[]){
glBegin(GL_LINE_LOOP);
glVertex2f(P[0][0], P[0][1]);
glVertex2f(P[1][0], P[0][1]);
glVertex2f(P[1][0], P[1][1]);
glVertex2f(P[0][0], P[1][1]);
glEnd(); // calculating translated coordinates
P[0][0] = P[0][0] + T[0];
P[0][1] = P[0][1] + T[1];
P[1][0] = P[1][0] + T[0];
P[1][1] = P[1][1] + T[1];
glBegin(GL_LINE_LOOP);
glVertex2f(P[0][0], P[0][1]);
glVertex2f(P[1][0], P[0][1]);
glVertex2f(P[1][0], P[1][1]);
glVertex2f(P[0][0], P[1][1]);
glEnd();
glFlush();
}
void init(void){
glClearColor(0.0, 0.0, 0.0, 0.0);
gluOrtho2D(0, 500, 0, 500);
}
int main(int argc, char** argv){
int P[2][2] = { 50, 80, 120, 180 };
int T[] = { 100, 100 }; // translation factor
glutInit(&argc, argv);
glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
glutInitWindowSize(640, 480);
glutInitWindowPosition(0, 0);
glutCreateWindow("2D Transformaton Scaling ");
init();
translateRectangle(P, T);
glutMainLoop();
return 0;
}
```



```
(base) os@os-Vostro-3268:~$ g++ translation.cpp -o firstOpenGlApp -lglut -lGLU -lGL
(base) os@os-Vostro-3268:~$ ./firstOpenGlApp
```

BOUNDARY FILL

```
#include<GL/glut.h>
#include<iostream>
#include<math.h>
int ww = 600, wh = 500;
float fillCol[3] = {0.4,0.0,0.0};
float borderCol[3] = {0.0, 0.0,0.0};
void setPixel(int pointx, int pointy, float f[3])
{
        glBegin(Gl_POINTS);
                glColor3fv(f);
                glVertex2i(pointx,pointy);
        glEnd();
        glFlush();
}
void getPixel(int x, int y, float pixels[3])
{       glReadPixels(x, y, 1.0, 1.0,GL_RGB, GL_FLOAT,pixels);
}

void drawPolygon(int x1,int y1,int x2,int y2)
{
        glColor3f(0.0,0.0,0.0);
        glBegin(GL_LINES);
                glVertex2i(x1,y1);
                glVertex2i(x1,y2);
        glEnd();
        glBegin(GL_LINES);
                glVertex2i(x2,y1);
                glVertex2i(x2,y2);
        glEnd();
        glBegin(GL_LINES);
                glVertex2i(x1,y1);
                glVertex2i(x2,y1);
        glEnd();
        glBegin(GL_LINES);
                glVertex2i(x1,y2);
                glVertex2i(x2,y2);
        glEnd();
        glFlush();
}
void display(){

         glClearColor(0.6,0.4,0.1,1.0);
         glClear(GL_COLOR_BUFFER_BIT);
         drawPolygon(150,250,200,300);
         glFlush();
}

void boundaryFill4(int x,int y,float fillColor[3],float borderColor[3])
{
        float interiorColor[3];
        getPixel(x,y,interiorColor);

        if ((interiorColor[0] != borderColor[0] && interiorColor[1] != borderColor[1] &&
interiorColor[2] != borderColor[2])&& (interiorColor[0] != fillColor[0] && interiorColor[1] !=
fillColor[1] && interiorColor[2] != fillColor[2]))

{
        setPixel(x,y,fillColor);
        boundaryFill4(x,y-1,fillColor,borderColor);
        boundaryFill4(x,y+1,fillColor,borderColor);
        boundaryFill4(x+1,y,fillColor,borderColor);
        boundaryFill4(x-1,y,fillColor,borderColor);

}
}

void mouse(int btn, int state, int x ,int y)
{
        if(btn == GLUT_LEFT_BUTTON && state == GLUT_DOWN)
{
        int xi = x;
        int yi = (wh - y);
        boundaryFill4( xi , yi , fillCol, borderCol);
}
}
void myinit()
{
        glViewport(0,0,ww,wh);
        glMatrixMode(GL_PROJECTION);
        glLoadIdentity();
        gluOrtho2D(0.0,(GLdouble)ww,0.0,(GLdouble)wh);
        glMatrixMode(GL_MODELVIEW);
        }
int main (int argc , char **argv)
{
  glutInit(&argc,argv);
  glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
  glutInitWindowSize(ww , wh);
  glutCreateWindow("Boundry Fill Recursive");
  glutDisplayFunc(display);
  myinit();
  glutMouseFunc(mouse);
  glutMainLoop();
  return 0;
  }
```

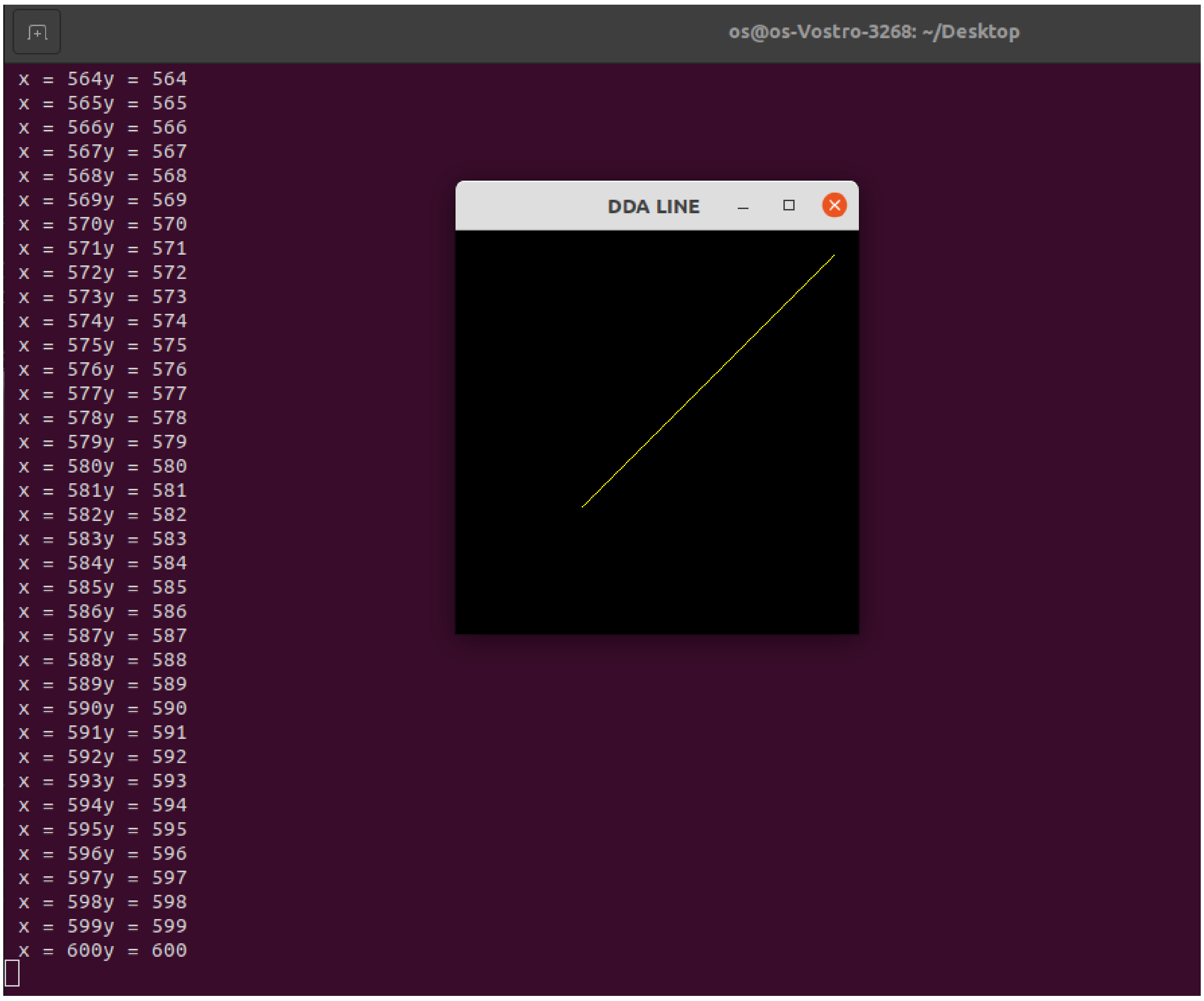


```
(base) os@os-Vostro-3268:~/Desktop$ g++ Boundary_fill.cpp -o firstOpenGlApp -lglut -lGLU -lGL
(base) os@os-Vostro-3268:~/Desktop$ ./firstOpenGlApp
```

BRESENHAM LINE

```
#include<iostream>
#include<GL/glut.h>
#include<math.h>
using namespace std;
float r,g,b,x,y;
float x_1,x_2,y_1,y_2;

bool flag = true;

void mouse(int button , int state, int mousex, int mousey){
        if(button == GLUT_LEFT_BUTTON && state == GLUT_DOWN){
                flag = true;
                x = mousex;
                y = 480-mousey;
        }
        cout<<"mousex = "<<x;
        cout<<"mousey = "<<y;
}

int sgn(float a){
        if(a==0){
        return 0;
        }
        if(a<0){
        return -1;
        }
        else{
        return 1;
        }
}

void Line(){
        cout<<"x_1=" << x_1 <<"y_1=" << y_1;
        cout<<"x_2=" << x_2 <<"y_2=" << y_2;

        float dx,dy,length,G;
        //x_2 = x;
        //y_2 = y;
        dy = y_2 - y_1;
        dx = x_2 - x_1;
        G = (2*dy)-dx;

        if(abs(dx) >= abs(dy)){
                length = abs(dx);
        }
        else{
        length = abs(dy);
        }
        int j =0;
```

```
            x = x_1;
            y = y_1;

            while(j <= length){
                        if(abs(dx) >= abs(dy)){
                                    x = x+1;
                                    if(G>=0){
                                    y = y+1;
                                    G = G+2*(dy-dx);
                                    }
                                    else{
                                    G = G + (2*dy);
                                    }
                        }
                        else{
                                    y = y+1;
                                    if(G>=0){
                                    x = x+1;
                                    G = G+2*(dy-dx);
                                    }
                                    else{
                                    G = G+ (2*dy);
                                    }
                        }
                        cout<< "\n x = " << x;
                        cout<< "y = " << y;
                        glBegin(GL_POINTS);
                        glVertex2i(x,y);
                        glEnd();
                        j++;
            }
            glFlush();

}

void init(void)
{
            glClearColor(0,0,0,0);
            glColor3f(1.0,1.0,0.0);
            gluOrtho2D(0,640,0,640);
            glClear(GL_COLOR_BUFFER_BIT);
}

int main(int argc, char **argv)
{
            cout<<"Enter x1,y1 point";
 cin>>x_1>>y_1;
 cout<<"Enter x2,y2 point";
 cin>>x_2>>y_2;
 glutInit(&argc,argv);
 glutInitDisplayMode(GLUT_SINGLE| GLUT_RGB);
 glutInitWindowSize(0,600);
 glutCreateWindow("DDA LINE ");
 init();
 //glutMouseFunc(mouse);
 glutDisplayFunc(Line);
 glutMainLoop();
 return 0;
}
```



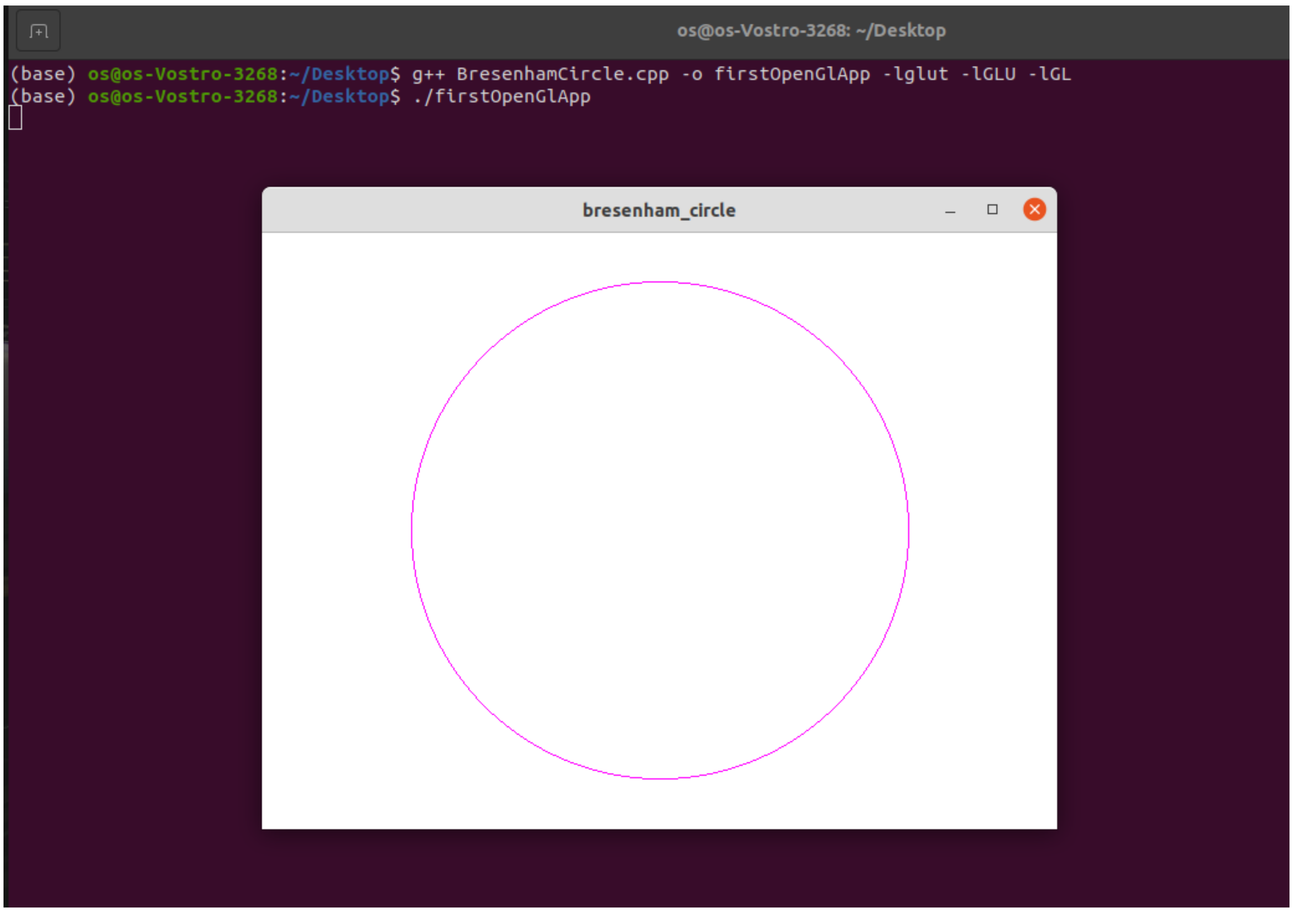
```
x = 564y = 564
x = 565y = 565
x = 566y = 566
x = 567y = 567
x = 568y = 568
x = 569y = 569
x = 570y = 570
x = 571y = 571
x = 572y = 572
x = 573y = 573
x = 574y = 574
x = 575y = 575
x = 576y = 576
x = 577y = 577
x = 578y = 578
x = 579y = 579
x = 580y = 580
x = 581y = 581
x = 582y = 582
x = 583y = 583
x = 584y = 584
x = 585y = 585
x = 586y = 586
x = 587y = 587
x = 588y = 588
x = 589y = 589
x = 590y = 590
x = 591y = 591
x = 592y = 592
x = 593y = 593
x = 594y = 594
x = 595y = 595
x = 596y = 596
x = 597y = 597
x = 598y = 598
x = 599y = 599
x = 600y = 600
```

}

BRESENHAM CIRCLE

```
#include<stdio.h>
#include<math.h>
#include<GL/glut.h>

int xc = 320, yc = 240;

void plot_point(int x, int y){
	glBegin(GL_POINTS);
	glVertex2i(xc+x, yc+y);
	glVertex2i(xc+x, yc-y);
	glVertex2i(xc+y, yc+x);
	glVertex2i(xc+y, yc-x);
	glVertex2i(xc-x, yc-y);
	glVertex2i(xc-x, yc+y);
	glVertex2i(xc-y, yc-x);
	glVertex2i(xc-y, yc+x);
	glEnd();
}

void bresenham_circle(int r){
	int x = 0, y = r;
	float pk =(5.0, 4.0)-r;

	plot_point(x,y);
	int k;
	while (x<y){
		x = x+1;
		if(pk<0)
		pk = pk + 2*x+1;
		else{
			y = y-1;
			pk = pk + 2*(x-y)+1;
		}
		plot_point(x,y);
	}
	glFlush();
}

void concentric_circles(void){
	glClear(GL_COLOR_BUFFER_BIT);

	int radius = 200;
	bresenham_circle(radius);
}

void Init(){
	glClearColor(1.0,1.0,1.0,0);
	glColor3f(5.0,0.0,7.0);
```

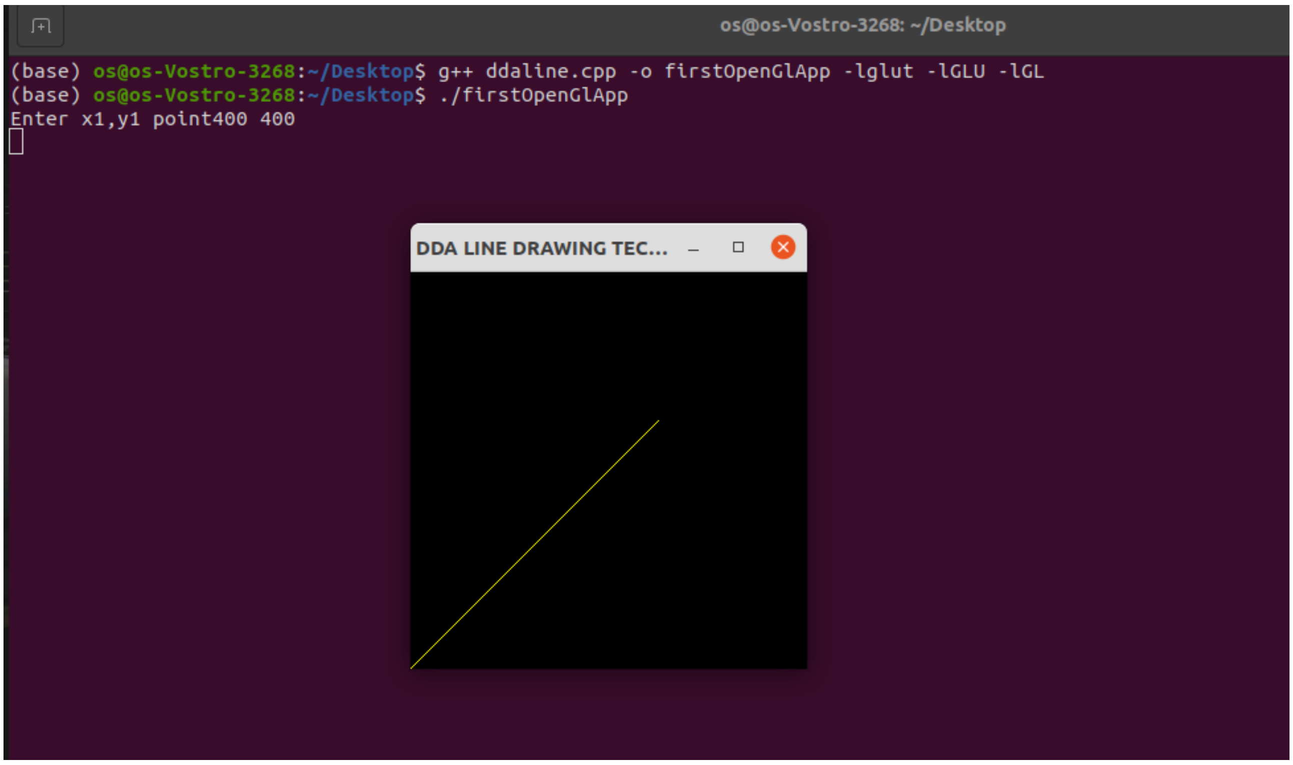
```
        gluOrtho2D(0,640,0,480);
}

int main(int argc, char **argv){
        glutInit(&argc, argv);
        glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
        glutInitWindowPosition(0,0);
        glutInitWindowSize(640, 480);
        glutCreateWindow("bresenham_circle");
        Init();
        glutDisplayFunc(concentric_circles);
        glutMainLoop();
}
```



```
os@os-Vostro-3268: ~/Desktop
(base) os@os-Vostro-3268:~/Desktop$ g++ BresenhamCircle.cpp -o firstOpenGlApp -lglut -lGLU -lGL
(base) os@os-Vostro-3268:~/Desktop$ ./firstOpenGlApp
```

DDA LINE

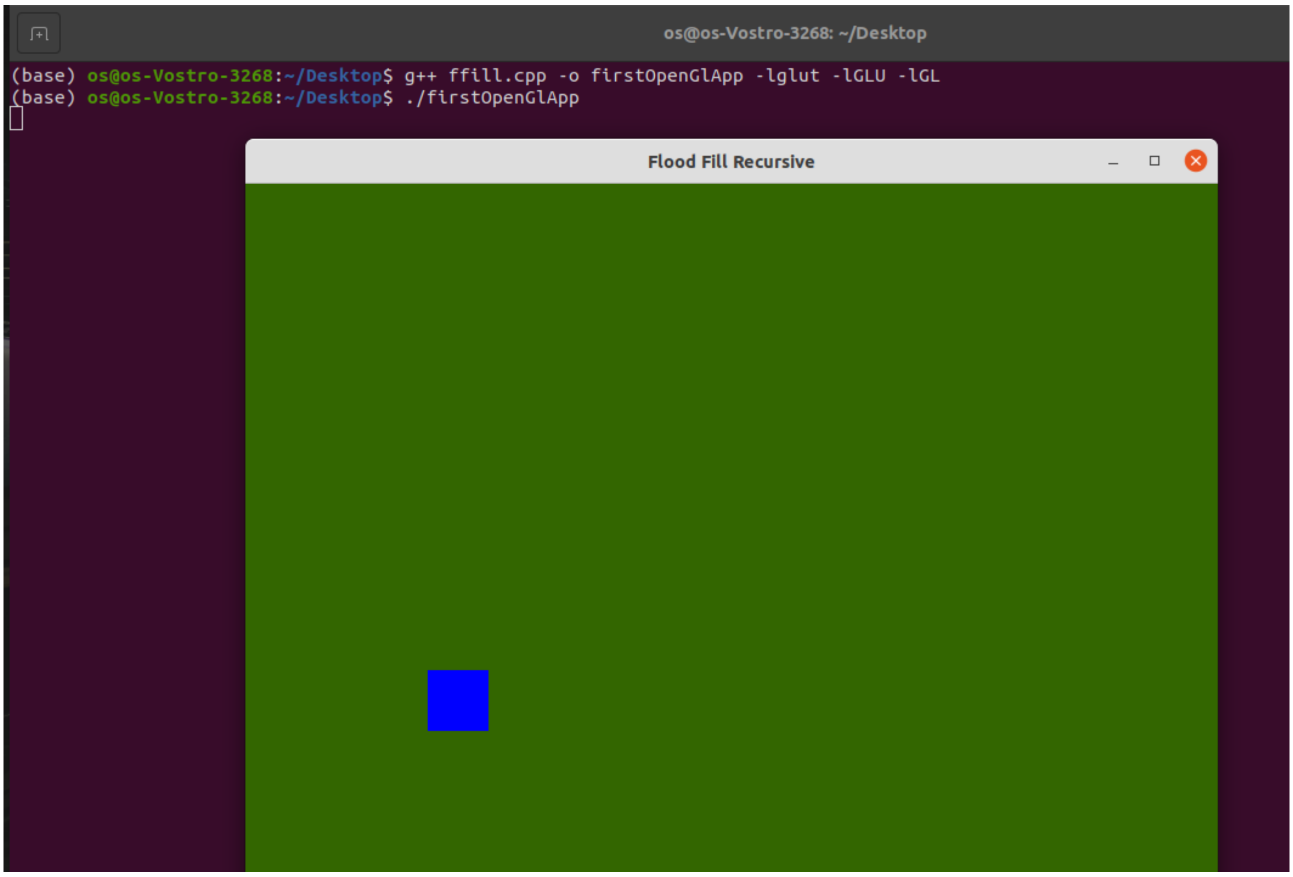
```
#include<GL/glut.h>
#include<iostream>
#include<math.h>
using namespace std;
float r, g, b, x, y;
float x_1,x_2,y_1,y_2;
float xin, yin,length;
bool flag = true;
void mouse(int button,int state,int mousex,int mousey)
{
  if(button == GLUT_LEFT_BUTTON
     && state == GLUT_DOWN){
     flag = true;
     x = mousex;
     y = 640 - mousey;
     }
}
int sgn(float a){
     if(a == 0){
     return 0;
     }
     if(a < 0){
     return -1;
     }
     else
     return 1;
}
void Line(){
cout<< "x_1="<<x_1<<"y_1="<<y_1;
cout<< "x_2="<<x_2<<"y_2="<<y_2;

float dy, dx, length;
x_2 = x;
y_2 = y;
dy = y_2 - y_1;
dx = x_2 - x_1;
if(abs(dx)>=abs(dy)){
    length = abs(dx);
}
else{
length = abs(dy);
}
float xin, yin;
xin=(x_2 - x_1)/length;
yin=(y_2 - y_1)/length;
 float x, y;
 x=x_1+0.5*sgn(xin);
 y=y_1+0.5*sgn(yin);
 int i=0;
 while(i<=length)
 {
 glBegin(GL_POINTS);
 glVertex2i(x,y);
 glEnd();
 x=x+xin;
 y=y+yin;
 i++;
 }
 glFlush();
 }
 void init(void){
glClearColor(0,0,0,0);
glColor3f(1.0,1.0,0.0);
gluOrtho2D(0,640,0,640);
glClear(GL_COLOR_BUFFER_BIT);
 }
 int main(int argc, char** argv){
 cout<<"Enter x1,y1 point";
 cin>>x_1>>y_1;
 glutInit(&argc,argv);
 glutInitDisplayMode(GLUT_SINGLE| GLUT_RGB);
 glutInitWindowSize(0,640);
 glutCreateWindow("DDA LINE DRAWING TECHNIQUE");
 init();
 glutMouseFunc(mouse);
 glutDisplayFunc(Line);
 glutMainLoop();
 return 0;
 }
```



```
(base) os@os-Vostro-3268:~/Desktop$ g++ ddaline.cpp -o firstOpenGlApp -lglut -lGLU -lGL
(base) os@os-Vostro-3268:~/Desktop$ ./firstOpenGlApp
Enter x1,y1 point400 400
```

FLOOD FILL

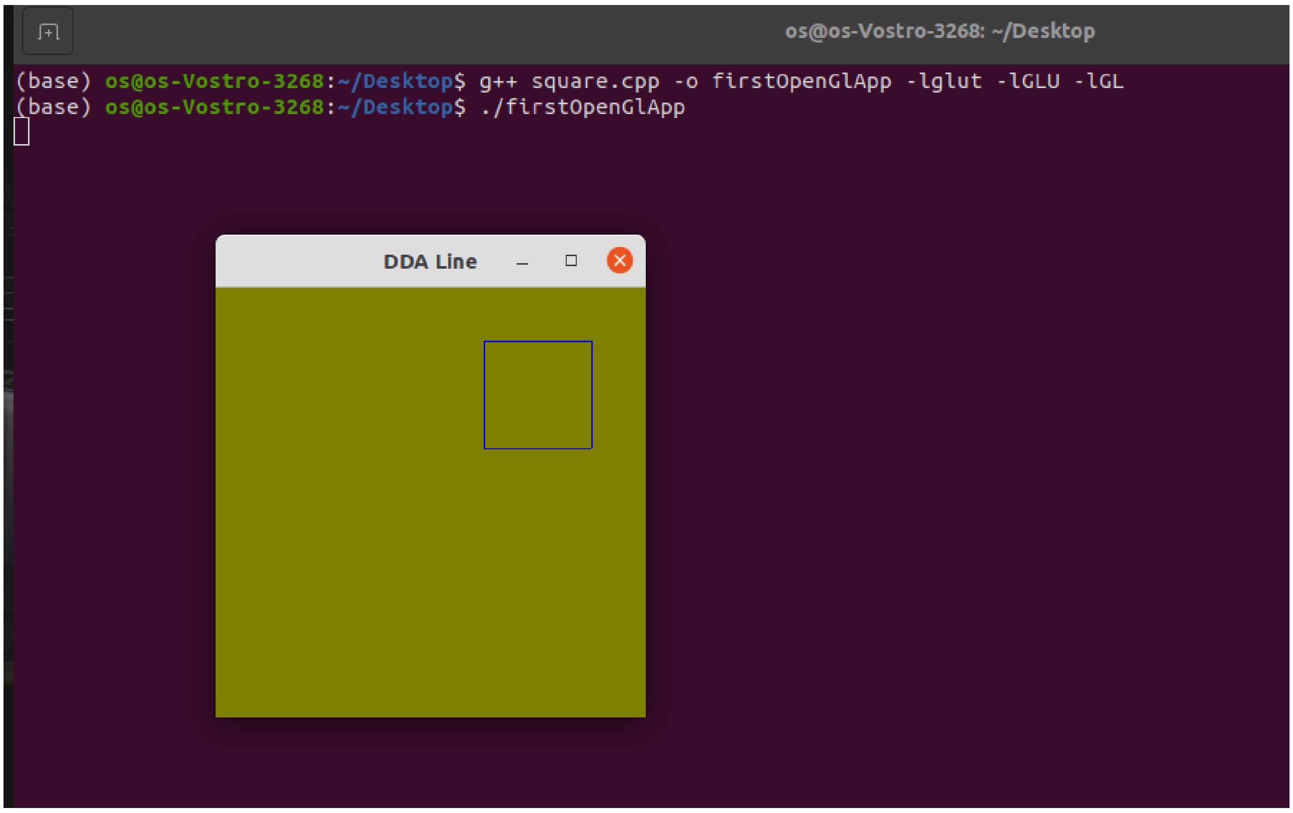
```
#include<GL/glut.h>
#include<iostream>
#include<math.h>
int ww = 800, wh = 700;
  float bgCol[3]={0.2,0.4,0.0};
  float intCol[3]={0.0,0.0,1.0};
  float fillCol[3] = {0.4 ,0.0,0.0};
  void setPixel(int pointx, int pointy, float f[3])
  {
         glBegin(GL_POINTS);
         glColor3fv(f);
         glVertex2i(pointx, pointy);
         glEnd();
         glFlush();
      }
      void getPixel(int x, int y, float pixels[3])
      {
      glReadPixels(x, y, 1.0, 1.0,GL_RGB,GL_FLOAT, pixels);
      }
      void drawPolygon(int x1, int y1, int x2, int y2)
      {
      glColor3f(0.0,0.0,1.0);
      glBegin(GL_POLYGON);
      glVertex2i(x1,y1);
      glVertex2i(x1,y2);
      glVertex2i(x2,y2);
      glVertex2i(x2,y1);
      glEnd();
      glFlush();
      }
   void display()
   {
   glClearColor(0.2,0.4,0.0,1.0);
   glClear(GL_COLOR_BUFFER_BIT);
   drawPolygon(150,250,200,300);
   glFlush();
   }
   void floodfill4(int x, int y, float oldColor[3], float newcolor[3])
   {
   float color[3];
   getPixel(x, y, color);
   if(color[0]==oldColor[0]&&(color[1])==oldColor[1]&&(color[2])==oldColor[2])
   {
   setPixel(x, y, newcolor);
   floodfill4(x+1, y,oldColor,newcolor);
   floodfill4(x-1, y,oldColor,newcolor);
   floodfill4(x, y+1,oldColor,newcolor);
   floodfill4(x, y-1,oldColor,newcolor);
   }
   }
   void mouse(int btn,int state, int x, int y)
   {
   if(btn==GLUT_LEFT_BUTTON && state == GLUT_DOWN)
   {
     int xi = x;
     int yi = (wh - y);
     floodfill4(xi, yi, intCol, fillCol);
   }
   }
   void myinit()
   {
           glViewport(0,0,ww,wh);
           glMatrixMode(GL_PROJECTION);
           glLoadIdentity();
           gluOrtho2D(0.0,(GLdouble)ww,0.0,(GLdouble)wh);
           glMatrixMode(GL_MODELVIEW);
           }
int main (int argc , char **argv)
{
  glutInit(&argc,argv);
  glutInitDisplayMode(GLUT_SINGLE|GLUT_RGB);
  glutInitWindowSize(ww , wh);
  glutCreateWindow("Flood Fill Recursive");
  glutDisplayFunc(display);
  myinit();
  glutMouseFunc(mouse);
  glutMainLoop();
  return 0;
  }
```



```
(base) os@os-Vostro-3268:~/Desktop$ g++ ffill.cpp -o firstOpenGlApp -lglut -lGLU -lGL
(base) os@os-Vostro-3268:~/Desktop$ ./firstOpenGlApp
```

SQUARE

```
#include <GL/glut.h>
void init() {
        glClearColor(0.0,0.0,0.0,0.0);
        glOrtho(0.0,1.0,0.0,1.0,-1.0,1.0);
        glLoadIdentity();
  }
void display() {
        glClear(GL_COLOR_BUFFER_BIT);
        glColor3f(0.0,0.0,1.0);
        glBegin(GL_LINE_LOOP);
        glVertex3f(0.25,0.25,0.75);
        glVertex3f(0.75,0.25,0.25);
        glVertex3f(0.75,0.75,0.25);
        glVertex3f(0.25,0.75,0.75);

        glEnd();
        glFlush();
 }
int main(int argc, char** argv){

    glutInit(&argc, argv);
    glutInitDisplayMode(GLUT_SINGLE | GLUT_RGB);
    glutInitWindowSize(0, 600);
    glutCreateWindow("DDA Line");
    init();
    glutDisplayFunc(display);
    glutMainLoop();
    return 0;
 }
```



```
os@os-Vostro-3268: ~/Desktop
(base) os@os-Vostro-3268:~/Desktop$ g++ square.cpp -o firstOpenGlApp -lglut -lGLU -lGL
(base) os@os-Vostro-3268:~/Desktop$ ./firstOpenGlApp
```