Practical File
Of
Computer Graphics

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D2 CSE A1
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Practical 1

Write a program for creating a simple two-dimensional shape of any object using lines, circle, etc.

Program:

```
#include<graphics.h>
int main()
{
   int i;
   int gd = DETECT,gm,color;
   initgraph(&gd,&gm, NULL);
   for(i=0;i<100;i++)
   {
      putpixel(50+i,60, WHITE);
      putpixel(50,60+i, WHITE);
      putpixel(150,60+i, WHITE);
      putpixel(50+i,160, WHITE);
   }
   delay(100000);
   closegraph();
   return 0;
}
```

OUTPUT

Program 2

Write a program to Draw a color cube and spin it using transformation matrices.

Program:

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

GLfloat vertices[]={-0.5f,-0.5f,-0.5f, -0.5f,0.5f,-0.5f, 0.5f,0.5f,-
0.5f, 0.5f,-0.5f,-0.5f, -0.5f,-0.5f,0.5f, -0.5f,0.5f,0.5f,
0.5f,0.5f,0.5f, 0.5f,-0.5f,0.5f};

GLfloat colors[] = {0,0,0, 0,0,1, 0,1,0, 0,1,1, 1,0,0, 1,0,1,1,1,0,
1,1,1};

GLbyte faces[] = {0,1,2,3,2,3,7,6, 4,5,6,7,4,5,1,0, 5,6,2,1,
0,3,7,4};

GLint currentBtn = GLUT_MIDDLE_BUTTON;

void mouse(int btn, int state, int x, int y) {
currentBtn = btn;
}

void display() {
glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
glRotated(0.06,
currentBtn == GLUT_LEFT_BUTTON,
currentBtn == GLUT_MIDDLE_BUTTON,
currentBtn == GLUT_RIGHT_BUTTON);
glDrawElements(GL_QUADS, 24, GL_UNSIGNED_BYTE, faces);
glFlush();
}

void glInit(int w, int h) {
glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
glMatrixMode(GL_PROJECTION);
```

```
glLoadIdentity();

glEnableClientState(GL_COLOR_ARRAY);
glEnableClientState(GL_VERTEX_ARRAY);
glVertexPointer(3, GL_FLOAT, 0, vertices);
glColorPointer(3, GL_FLOAT, 0, colors);
glEnable(GL_DEPTH_TEST);

glViewport(0, 0, w, h);
if (h > w)
glOrtho(-1.0, 1.0, (GLfloat) -h / w, (GLfloat) h / w, -1.0, 1.0);
else
glOrtho((GLfloat) -w / h, (GLfloat) w / h, -1.0, 1.0, -1.0, 1.0);
}

int main(int argc, char *argv[]) {
glutInit(&argc, argv);
glutInitWindowSize(720, 720);
glutCreateWindow("Spin a cube");
glutDisplayFunc(display);
glutIdleFunc(display);
glutReshapeFunc(glInit);
glutMouseFunc(mouse);
glutMainLoop();
}
```

Program 3

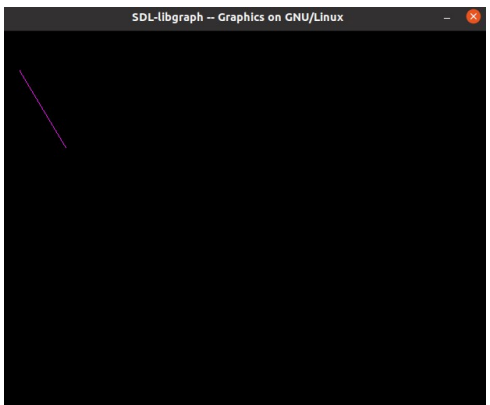
Implement the DDA algorithm for drawing line (programmer is expected to shift the origin to the center of the screen and divide the screen into required quadrants).

Program:

```
#include <graphics.h>
#include <iostream>
#include <math.h>
```

```
using namespace std;

int main()
{
   float x,y,x1,y1,x2,y2,dx,dy,step;
   int i,gd=DETECT,gm;
   initgraph(&gd,&gm,NULL);
   cout<<"Enter The Value Of x1 And y1 : ";
   cin>>x1>>y1;
   cout<<"Enter The Value Of x2 And y2: ";
   cin>>x2>>y2;
   dx=abs(x2-x1);
   dy=abs(y2-y1);
   if(dx>=dy)
      step=dx;
   else
      step=dy;

   dx=dx/step;
   dy=dy/step;
   x=x1;
   y=y1;
   i=1;
   while(i<=step)
   {
      putpixel(x,y,5);
      x=x+dx;
      y=y+dy;
      i=i+1;
      }
   delay(100000);
   closegraph();
}
```

OUTPUT



Program 4

Write a program to input the line coordinates from the user to generate a line using Bresenham’s Algorithm.

Program:

```
#include<iostream>
#include<graphics.h>
using namespace std;

void drawline(int x1, int y1, int x2, int y2)
{
   int dx, dy, p, x, y;
   dx=x2-x1;
   dy=y2-y1;
   x=x1;
   y=y1;
   p=2*dy-dx;
   while(x<x2)
   {
      if(p>=0)
      {
         putpixel(x,y,7);
         y=y+1;
         p=p+2*dy-2*dx;
      }
      else
      {
         putpixel(x,y,7);
         p=p+2*dy;
      }
      x=x+1;
   }
}

int main()
{
   int gd = DETECT, gm, error, x1, y1, x2, y2;
```

```
    initgraph(&gd, &gm,NULL);

    cout<<"Enter The Value Of x1 And y1 : ";
    cin>>x1>>y1;
    cout<<"Enter The Value Of x2 And y2: ";
    cin>>x2>>y2;

    drawline(x1, y1, x2, y2);
    delay(100000);
    closegraph();
    return 0;
}
```

OUTPUT

Program 5

Write a program to generate a complete moving wheel using Midpoint circle drawing algorithm and DDA line drawing algorithm.

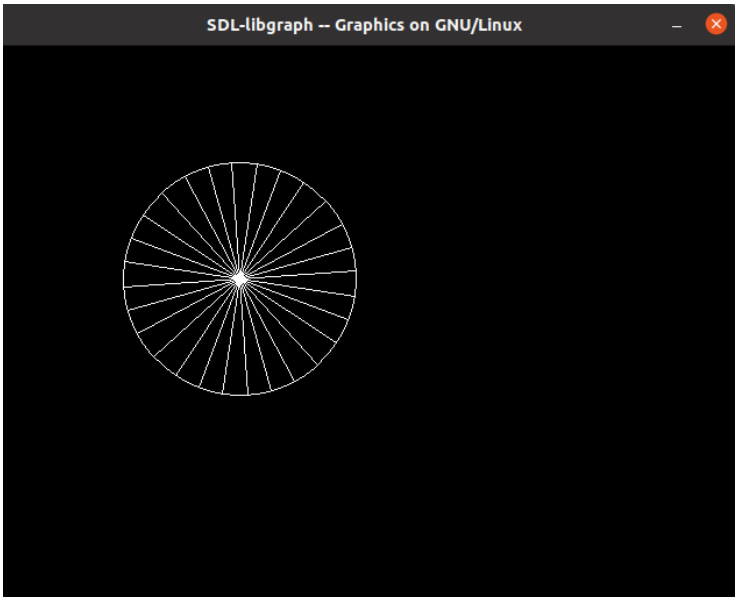
Program:

```
#include<iostream>
```

```
#include<graphics.h>
using namespace std;

void drawcircle(int x1, int y1, int radius)
{
   int x = radius;
   int y = 0;
   int err = 0;
   while (x >= y)
   {
      putpixel(x1 + x, y1 + y, 7);
      putpixel(x1 + y, y1 + x, 7);
      putpixel(x1 - y, y1 + x, 7);
      putpixel(x1 - x, y1 + y, 7);
      putpixel(x1 - x, y1 - y, 7);
      putpixel(x1 - y, y1 - x, 7);
      putpixel(x1 + y, y1 - x, 7);
      putpixel(x1 + x, y1 - y, 7);
      if (err <= 0)
      {
         y += 1;
         err += 2*y + 1;
      }
      if (err > 0)
      {
         x -= 1;
         err -= 2*x + 1;
      }
   }
}

int main()
{
   int gd = DETECT, gm, x, y, r;
   initgraph(&gd, &gm, NULL);

   cout<<"Enter Radius Of Circle: ";
   cin>>r;
   cout<<"Enter Co-ordinates Of Center: ";
   cin>>x>>y;
   drawcircle(x, y, r);
```

```
    delay(100000);
    return 0;
}
```

OUTPUT



Program 6

Write a program to draw an ellipse using the Midpoint ellipse generation algorithm for both the regions.

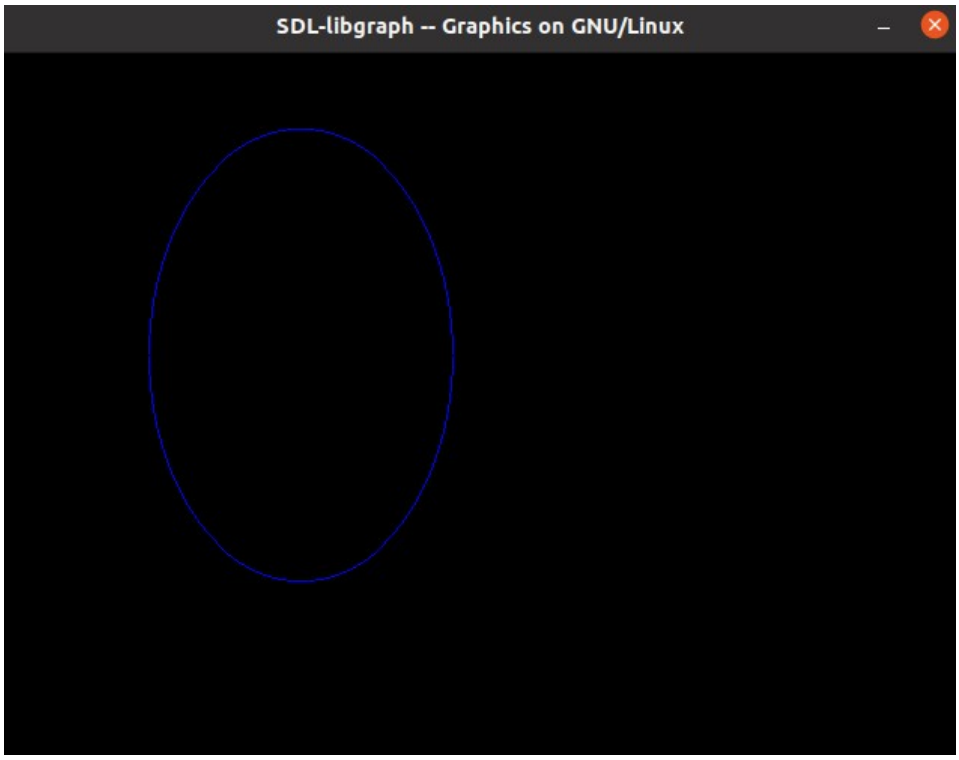
Program:

```
#include<iostream>
#include<graphics.h>
using namespace std;

int main()
{
    long x,y,x_center,y_center;
    long a_sqr,b_sqr, fx,fy, d,a,b,tmp1,tmp2;
```

```
int gd = DETECT,gm;
initgraph(&gd,&gm, NULL);
cout<<"Enter The Coordinates x and y: ";
cin >> x_center >> y_center;
cout<<"Enter The Constants a and b: ";
cin >> a >> b;
x=0;
y=b;
a_sqr=a*a;
b_sqr=b*b;
fx=2*b_sqr*x;
fy=2*a_sqr*y;
d=b_sqr-(a_sqr*b)+(a_sqr*0.25);

while(fx<fy)
{
   putpixel(x_center+x,y_center+y,1);
   putpixel(x_center-x,y_center-y,1);
   putpixel(x_center+x,y_center-y,1);
   putpixel(x_center-x,y_center+y,1);
   if(d<0)
   {
      d=d+fx+b_sqr;
   }
   else
   {
      y=y-1;
      d=d+fx+-fy+b_sqr;
      fy=fy-(2*a_sqr);
   }
   x=x+1;
   fx=fx+(2*b_sqr);
}

tmp1=(x+0.5)*(x+0.5);
tmp2=(y-1)*(y-1);
d=b_sqr*tmp1+a_sqr*tmp2-(a_sqr*b_sqr);

while(y>0)
{
   putpixel(x_center+x,y_center+y,1);
   putpixel(x_center-x,y_center-y,1);
```

```
        putpixel(x_center+x,y_center-y,1);
        putpixel(x_center-x,y_center+y,1);
        if(d>=0)
            d=d-fy+a_sqr;
        else
        {
            x=x+1;
            d=d+fx-fy+a_sqr;
            fx=fx+(2*b_sqr);
        }
        y=y-1;
        fy=fy-(2*a_sqr);
    }

    delay(100000);
    closegraph();
    return 0;
}
```

OUTPUT



Program 7

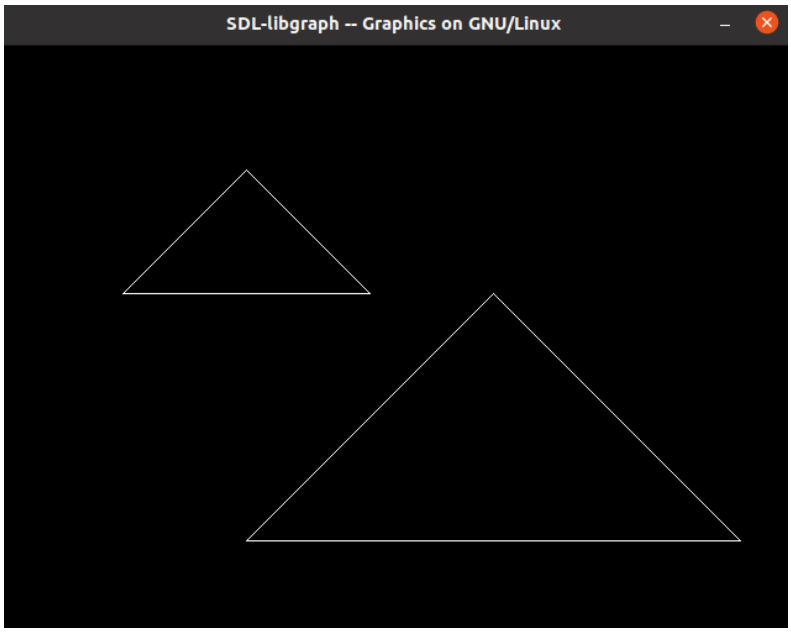
Write a program to draw any 2-D object and perform the transformations on it according to the input parameters from the user.

Program:

```
#include<graphics.h>

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)
{
   line(x[0], y[0], x[1], y[1]);
   line(x[1], y[1], x[2], y[2]);
   line(x[2], y[2], x[0], y[0]);

   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];
```

```
    }

    line(x[0], y[0], x[1], y[1]);
    line(x[1], y[1], x[2], y[2]);
    line(x[2], y[2], x[0], y[0]);
}

int main()
{
    int x[] = { 100, 200, 300 };
    int y[] = { 200, 100, 200 };
    int sx = 2, sy = 2;

    int gd = DETECT,gm;
    initgraph(&gd,&gm, NULL);

    scale(x, y, sx,sy);
    delay(100000);
    return 0;
}
```

OUTPUT



Program 8

Write a program to rotate a triangle about any one of its end coordinates.

Program:

```
#include<iostream>
#include<graphics.h>
#include<math.h>
using namespace std;

int main()
{
   double s,c, angle;
   int gd = DETECT,gm,x1,y1,x2,y2,x3,y3;
   initgraph(&gd, &gm,NULL);

   cout << "Enter Coordinates of Triangle: ";
   cin >> x1 >> y1 >> x2 >> y2 >> x3 >> y3;
   line(x1,y1,x2,y2);
   line(x2,y2, x3,y3);
   line(x3, y3, x1, y1);

   cout << "Enter Rotation Angle: ";
   cin >> angle;

   c = cos(angle *M_PI/180);
   s = sin(angle *M_PI/180);
   x1 = floor(x1 * c + y1 * s);
   y1 = floor(-x1 * s + y1 * c);
   x2 = floor(x2 * c + y2 * s);
   y2 = floor(-x2 * s + y2 * c);
   x3 = floor(x3 * c + y3 * s);
   y3 = floor(-x3 * s + y3 * c);
   line(x1, y1 ,x2, y2);
   line(x2,y2, x3,y3);
   line(x3, y3, x1, y1);

   delay(100000);
   closegraph();
   return 0;
```

```
}
```

OUTPUT