Practical No.07

Title:- . Generate fractal patterns using i) Bezier

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Code:-

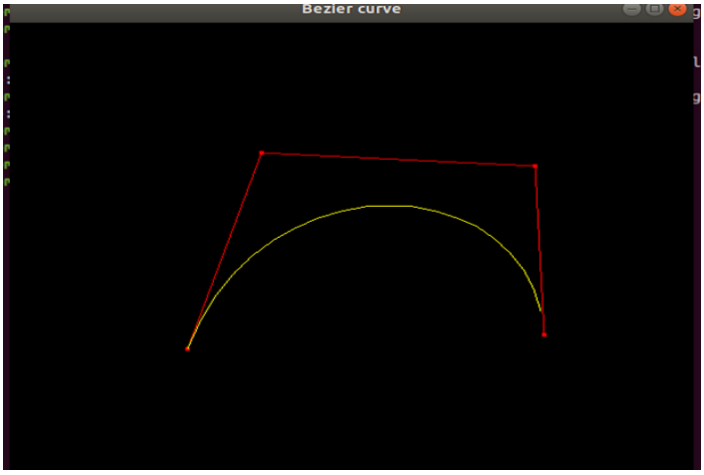
```
//#include<bits/stdc++.h>
//#include<windows.h>
//#include <stdio.h>
#include<iostream>
#include<GL/glut.h>
#include<math.h>

//This is a point class, used to store the coordinates of the point
class Point
{
public:
    int x, y;
    void setxy(int _x, int _y)
    {
        x = _x;
        y = _y;
    }
};

//Number of points
static int POINTSNUM = 0;

//Used to store a collection of points, because the Bezier curves with 4 points are drawn, so the array size is 4
static Point points[4];

//Initialization function
void init(void)
{
    glClearColor(0.0, 0.0, 0.0,0); //Set the background to black
    glColor3f(1.0, 1.0, 1.0); //The drawing color is white
    glPointSize(4.0); //The size of the set point is 2*2 pixels
    glMatrixMode(GL_PROJECTION); // Set the appropriate matrix
    glLoadIdentity(); // is a non-parameter valueless function, its function is to replace the current matrix with a 4×4 identity matrix
    //In fact, it is to initialize the current matrix.
    //That is to say, no matter how many matrix transformations have been performed before, after the execution of this command, the current matrix will be restored to an identity matrix, which is equivalent to no matrix transformation state
    gluOrtho2D(0.0, 600.0, 0.0, 480.0); //Parallel projection, the four parameters are x, y range
}
```

```
//Draw points
void setPoint(Point p)
{
   glBegin(GL_POINTS);
   glVertex2f(p.x, p.y);
   glEnd();
   glFlush();
}

// draw a straight line
void setline(Point p1, Point p2)
{
   glBegin(GL_LINES);
   glVertex2f(p1.x, p1.y);//Set vertex coordinates
   glVertex2f(p2.x, p2.y);
   glEnd();
   glFlush();//Empty the buffer
}

// Draw Bezier curve
Point setBezier(Point p1, Point p2, Point p3, Point p4, double t)
{
   Point p;
   double a1 = pow((1 - t), 3);
   double a2 = pow((1 - t), 2) * 3 * t;
   double a3 = 3 * t*t*(1 - t);
   double a4 = t * t*t;
   p.x = a1 * p1.x + a2 * p2.x + a3 * p3.x + a4 * p4.x;
   p.y = a1 * p1.y + a2 * p2.y + a3 * p3.y + a4 * p4.y;
   return p;
}


//display function
void display()
{
   //glClear(GL_COLOR_BUFFER_BIT);
   //glFlush();
}



// mouse event
void mymouseFunction(int button, int state, int x, int y)
{
   if (state == GLUT_DOWN) // If the mouse is pressed, the left and right buttons are not
distinguished
   {
      points[POINTSNUM].setxy(x, 480 - y); // When looking for the coordinates of the mouse
point here
      // Set the color of the point, draw the point
      glColor3f(1.0, 0.0, 0.0);
```

```
        setPoint(points[POINTSNUM]);
        // Set the color of the line, draw the line
        glColor3f(1.0, 0.0, 0.0);
        if (POINTSNUM > 0) setline(points[POINTSNUM - 1], points[POINTSNUM]);

        //If 4 bezier curves are reached, the counter will be cleared afterwards
        if (POINTSNUM == 3)
        {
            //Draw Bezier curve
            glColor3f(1.0, 1.0, 0.0); // Set the color of the Bezier curve

            Point p_current = points[0]; //Set as starting point
            for (double t = 0.0; t <= 1.0; t += 0.05)
            {
                Point P = setBezier(points[0], points[1], points[2], points[3], t);
                setline(p_current, P);
                p_current = P;
            }

            POINTSNUM = 0;
        }
        else
        {
            POINTSNUM++;
        }
    }
}

int main(int argc, char *argv[])
{
    glutInit(&argc, argv); //Fixed format
    glutInitDisplayMode(GLUT_RGB | GLUT_SINGLE);   //Cache mode
    glutInitWindowSize(600, 480);    //The size of the display box
    glutInitWindowPosition(100, 100); //Determine the position of the upper left corner of the
display box
    glutCreateWindow("Bezier curve");

    init(); // Initialize
    glutMouseFunc(mymouseFunction); // Add mouse event
    glutDisplayFunc(display); // execute display
    glutMainLoop(); //Enter the GLUT event processing loop
    return 0;
}
```

OUTPUT:

svpm@svpm-HP-EliteDesk-800-G2-SFF:~$ g++ Bezier.cpp -lGL -lGLU -lglut svpm@svpm-HP-EliteDesk-800-G2-SFF:~$ ./a.out


Bezier curve