CSE520
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Lab 15

Use the program and to find the knot vector

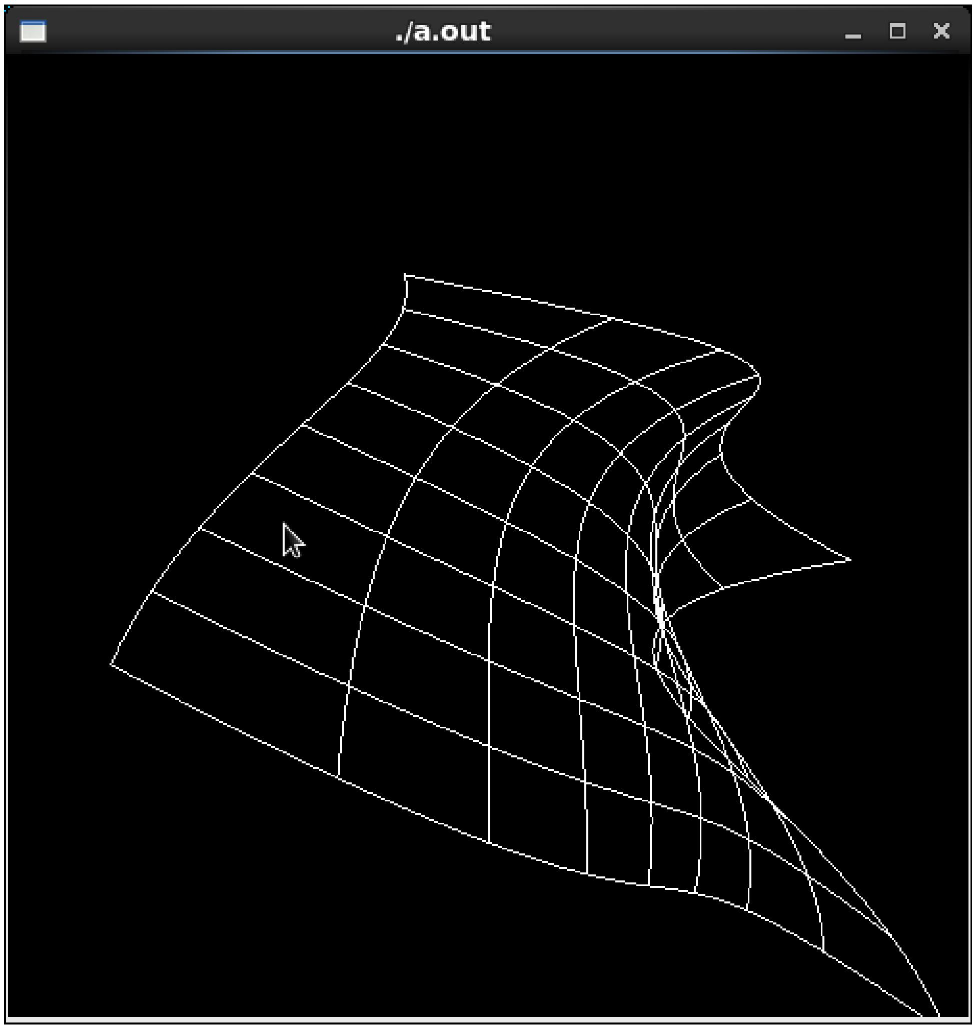
In this lab, we are to use the program given and find the knot vector of a given 3-order B-spline with 7 control points. I have completed the task:

A knot vector of 7 control points, order 3 is the following:

u0 = u1 = u2 = 0

```
u3 = 1
u4 = 2
u5 = 3
u6 = 4

u7 = u8 = u9 = 5
```



Code:

```
/*  bezsurf.c
 *  This program renders a wireframe Bezier surface,
 *  using two-dimensional evaluators.
 */
#include <GL/glut.h>
#include <stdlib.h>

GLfloat ctrlpoints[4][4][3] = {
   {{-2.5, -1.5, 5.0}, {-0.5, -1.5, 3.0},
    {-0.5, -1.5, -1.0}, {1.5, -2.5, 2.0}},

   {{-1.5, -0.5, 1.0}, {-0.5, -0.5, 3.0},
    {0.5, -0.5, 2.0}, {1.5, -0.5, -1.0}},

   {{-3.5, 0.5, 5.0}, {-0.5, 0.5, 2.0},
    {0.5, 0.5, -1.0}, {2.5, 0.5, 5.0}},

   {{-2.5, 1.5, -2.0}, {-0.5, 1.5, -2.0},
    {0.5, 2.5, 0.0}, {1.5, 1.5, -1.0}}
};

void display(void)
{
   int i, j;

   glClear(GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);
   glColor3f(1.0, 1.0, 1.0);
   glPushMatrix ();
   glRotatef(85.0, 1.0, 1.0, 1.0);
   for (j = 0; j <= 8; j++) {
      glBegin(GL_LINE_STRIP);
      for (i = 0; i <= 30; i++)
         glEvalCoord2f((GLfloat)i/30.0, (GLfloat)j/8.0);
      glEnd();
      glBegin(GL_LINE_STRIP);
      for (i = 0; i <= 30; i++)
         glEvalCoord2f((GLfloat)j/8.0, (GLfloat)i/30.0);
      glEnd();
   }
   //glEvalMesh2( GL_LINE, 0, 20, 0, 20 );
   glPopMatrix ();
   glFlush();
}

void init(void)
{
   glClearColor (0.0, 0.0, 0.0, 0.0);
   /*
    GL_MAP1_VERTEX_3 -- specifies that 3-dimensional control points are
                  provided and 3-D vertices should be produced
    0   -- min u
    1   -- max u
    3   -- ustride, number of values to advance in the data between two
         consecutive control points ( see diagram below )
    4   -- order of u ( = degree + 1 )
    0   -- min v
    1   -- max v
    12  -- vstride ( see diagram below )
    4   -- order of v ( = degree + 1 )
   */
   glMap2f(GL_MAP2_VERTEX_3, 0, 1, 3, 4,
           0, 1, 12, 4, &ctrlpoints[0][0][0]);
   glEnable(GL_MAP2_VERTEX_3);
   /*
    glMapGrid2f() -- defines a grid going from u1 to u2; v1 to v2 in
                 evenly-spaced steps
    20  --  number of u steps
    0.0 --  u1 ( starting u )
    1.0 --  u2 ( ending u )
    20  --  number of v steps
    0.0 --  v1 ( starting v )
    1.0 --  v2 ( ending v )

    use with glEvalMesh2()
   */
   //glMapGrid2f(20, 0.0, 1.0, 20, 0.0, 1.0);
   glEnable(GL_DEPTH_TEST);
   glShadeModel(GL_FLAT);
}

void reshape(int w, int h)
{
   glViewport(0, 0, (GLsizei) w, (GLsizei) h);
   glMatrixMode(GL_PROJECTION);
   glLoadIdentity();
   if (w <= h)
      glOrtho(-4.0, 4.0, -4.0*(GLfloat)h/(GLfloat)w,
              4.0*(GLfloat)h/(GLfloat)w, -4.0, 4.0);
   else
      glOrtho(-4.0*(GLfloat)w/(GLfloat)h,
              4.0*(GLfloat)w/(GLfloat)h, -4.0, 4.0, -4.0, 4.0);
   glMatrixMode(GL_MODELVIEW);
   glLoadIdentity();
}

void keyboard(unsigned char key, int x, int y)
{
   switch (key) {
      case 27:
         exit(0);
         break;
   }
}

int main(int argc, char** argv)
{
   glutInit(&argc, argv);
   glutInitDisplayMode (GLUT_SINGLE | GLUT_RGB | GLUT_DEPTH);
   glutInitWindowSize (500, 500);
   glutInitWindowPosition (100, 100);
   glutCreateWindow (argv[0]);
   init ();
   glutDisplayFunc(display);
   glutReshapeFunc(reshape);
   glutKeyboardFunc(keyboard);
   glutMainLoop();
   return 0;
}
```