CMPE 460 Computer Graphics

Assignment #4

In this assignment, you are required to render a Teapot, using Bezier patches.

In the source file provided; the following objects are defined:

* #define TEAPOT\_NB\_PATCHES 28

The teapot consists of 28 different Bezier patches.

* #define ORDER 3

Each patch is of order (3,3).

* struct vertex { float x, y, z; };

A basic vertex of three coordinates.

* struct vertex teapot\_cp\_vertices[]

The list of all control point vertices.

* short teapot\_patches[][ORDER + 1][ORDER + 1]

Index arrays for each patch.

-Define control points and related Bezier patches.

-Define ways to manipulate the control points and the corresponding patches.

-From the control points, using the Bezier patch equation, define vertices with a parametric resolution. Remember that in a Bezier patch, a point is defined as where are Bernstein polynomials and are the control points, indexed by i and j.

-Each patch will consist of a number of triangles. Using the ray tracing technique, the teapot should be rendered, whose geometry will be defined by the parametric vertices, calculated out of the control points. A proper way of ray – triangle intersection should be implemented. For a more realistic rendering, Phong shading (diffuse, specular, ambient components) should also be implemented, with a point light source.

For the mathematics of the Bezier Patches and for how you can generate vertices out of them, you can take a look into <https://en.wikibooks.org/wiki/OpenGL_Programming/Modern_OpenGL_Tutorial_07>.

You can also check the source code at the following link, which contains an OpenGL based rendering of the Bezier Teapot.

<https://gitlab.com/wikibooks-opengl/modern-tutorials/-/blob/master/bezier_teapot/teapot.cpp>