CMPE 460 Computer Graphics

Assignment #4

In this assignment, you are required to render a teapot, or a part of it, which is defined as a collection of Bezier patches. The teapot consists of a rim, handle, spout, lid and body. Each of these parts consists of different number of bezier patches, in a total of 28 Bezier Patches for the whole object. You are given the “TeapotControlPoints.h” file, which contains the total 269 control points in an array (their 3D positions) and the 28 (3,3) Bezier Patches, in the form of an array of 28 2D arrays, where each 2D array contains indices into the control points array. 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. In that case, n=3 and m=3 and is a lookup into the index array (“teapot\_patches” ) for the current Bezier patch.

Theoretically, by iterating on this 28 elements-sized array (“teapot\_patches” ), you need to procedurally generate each vertex on a grid in the unit square, with a given resolution. The generated vertices will go into a vertex buffer. While generating the vertices for a patch, you need to keep the track of the vertex indices as well, such that you will be able to create vertex element buffers (index buffers). For the mathematics of the Bezier Patches and for how you can generate vertices out of them, you may take a look into <https://en.wikibooks.org/wiki/OpenGL_Programming/Modern_OpenGL_Tutorial_07>

You can use the vertex format from Assignment #2. For creating vertex buffers and initializing the related OpenGL objects, you can re-use parts of the Assignment #2 code or you can take a look into <https://learnopengl.com> tutorials.

For any questions, you can contact me at: [ufukcbicici@yahoo.com](mailto:ufukcbicici@yahoo.com).

Notes:

1. The “teapot\_patches” array in the “TeapotControlPoints.h” file contains 1-based indices. In order to get a control point by using this array, you need to subtract 1 from the index like : teapot\_patches[patch\_index][i][j] – 1
2. Please submit your source code, a small report and screenshots of the teapot, in different vertex resolutions.
3. There will be a small bonus if you render different parts of the teapot (rim, handle, body, etc.) with different colors.

Deadline: 09.05.2018, 09:00