

Homework #4 (4190.410)

Due: November 4, 2011

Implement an OpenGL program that supports an interactive editing of a bicubic Bézier surface:

$$S(u, v) = \sum_{i=0}^3 \sum_{j=0}^3 \mathbf{p}_{ij} B_i^3(u) B_j^3(v), \quad \text{for } 0 \leq u, v \leq 1,$$

where $\mathbf{p}_{ij} = (x_{ij}, y_{ij}, z_{ij})$ are the control points of the Bézier surface $S(u, v)$. The user should be able to manipulate each control point interactively on the display window using mouse, and the surface should be rendered with a texture. You may assume a parallel projection of the surface to the xy -plane: $z = 0$.

You may employ three different modes: (i) rotation of the surface about the mid-point $S(\frac{1}{2}, \frac{1}{2})$, (ii) translation of the surface along the xy -direction, and (iii) editing of each control point $\mathbf{p}_{ij} = (x_{ij}, y_{ij}, z_{ij})$ constrained in the plane $z = z_{ij}$ (which is parallel to the xy -plane).