

Programming #2-2 (4190.667)

Due: May 27, 2015

Design an interactive system that can control the shape of two bicubic Bézier surfaces:

$$S_1(u, v) = \sum_{i=0}^3 \sum_{j=0}^3 \mathbf{p}_{ij} B_i^3(u) B_j^3(v), \quad S_2(s, t) = \sum_{k=0}^3 \sum_{l=0}^3 \mathbf{q}_{kl} B_k^3(s) B_l^3(t), \quad 0 \leq u, v, s, t \leq 1,$$

by dragging their control points.

Part I: Using the subdivision algorithm discussed in the textbook and the AABB tree, implement an algorithm for computing the intersection curve between the two surfaces and the self-intersection curve of each surface.

Part II: Using the Bézier basis functions pre-evaluated and the Filip condition for surfaces, implement an algorithm for computing the intersection curve between the two surfaces and the self-intersection curve of each surface.

Part III: Given a point \mathbf{p} and a bicubic Bézier surface $S(u, v)$, implement an algorithm for computing the shortest distance from \mathbf{p} to the surface $S(u, v)$.