

Programming #2: Part I (4190.562)

Due: April 18, 2016

A bicubic Bézier surface

$$S(u, v) = \sum_{i=0}^3 \sum_{j=0}^3 \mathbf{b}_{ij} B_i^3(u) B_j^3(v) = \sum_{i=0}^3 \sum_{j=0}^3 (x_{ij}, y_{ij}, z_{ij}) B_i^3(u) B_j^3(v),$$

for $0 \leq u, v \leq 1$, can be used for the deformation of a 3D shape given as a point cloud: $\{\mathbf{p}_k \mid k = 1, \dots, N\}$.

Part I: For each point \mathbf{p}_k , compute the closest point $S(u_k, v_k)$ and bind \mathbf{p}_k to the local frame at $S(u_k, v_k)$ (determined by the tangent and normal directions). When we edit the bicubic Bézier surface $S(u, v)$, each point \mathbf{p}_k should move to the corresponding position in the new local frame at $S(u_k, v_k)$ under the shape deformation of $S(u, v)$.