CS 418: Interactive Computer Graphics
In-class Worksheet: Bezier Patches

Bezier Patches

Bilinear Patches

A bilinear patch is a finite piece of a parametric surface defined by four control points $b_{0,0}$ $b_{1,0}$ $b_{0,1}$ and $b_{1,1}$

Points on the patch can be found by evaluating:
$X(u, v) = (1 - v)p^u + vq^u$
with
$p^u = (1 - u)b_{0,0} + ub_{1,0}$ $\quad$ $q^u = (1 - u)b_{0,1} + ub_{1,1}$

1. **A Bilinear Patch**
   Suppose our control points are

   $b_{0,0}$=(0,0,0) $b_{1,0}$=(1,0,0) $b_{0,1}$=(0,1,0) $b_{1,1}$=(1,1,1)

   What point on the patch is found by evaluating X(0.25, 0.5)?

2. Bezier Patch

Bezier Patch

A Bezier patch is a finite piece of a parametric surface defined by a control net of points. The points on the patch are evaluated using

$$X(u,v) = [B_0^m(u) \dots B_m^m(u)] \begin{bmatrix} b_{0,0} & \cdots & b_{0,n} \\ \vdots & \ddots & \vdots \\ b_{m,0} & \cdots & b_{m,n} \end{bmatrix} \begin{bmatrix} B_0^n(v) \\ \vdots \\ B_n^n(v) \end{bmatrix}$$

a. For quadratic Bezier curves we have
$B_0^2(t) = (1-t)^2, B_1^2(t) = 2t(1-t), B_2^2(t) = t^2$
Suppose we have $B = \begin{bmatrix} (0,0,6) & (3,0,0) & (6,0,0) \\ (0,3,3) & (3,3,0) & (6,3,0) \\ (0,6,6) & (3,6,0) & (6,6,0) \end{bmatrix}$

What point is X(0.5,0.5)?