CSE-4303 CSE5365 Computer Graphics
Practice Problems 05

Given the equation of a parametric surface

$$\mathbf{x(u,v) = 4u^3v^3 - 9u^3v^2 + 5u^3v - 3u^2v^3 + 8uv^3 + u^3v^3 + 4}$$

$$\mathbf{y(u,v) = 7u^3v^3 + 8u^3v^2 + 5u^3 + 2u^2v^2 + 2uv^3 + 7}$$

$$\mathbf{z(u,v) = -2u^3v^3 + u^3v + 2u^3 + 9u^2v + 5uv + 16}$$

- Find the normal to this surface at u=0.3 and v=0.6

CSE-4303 CSE5365 Computer Graphics
Practice Problems 05

Consider a parametric surface S(u,v). This surface is cubic in the u direction and linear in the v direction. The parametric equations of the two curves at the two boundaries (curves which correspond to v=0 and v=1) are given:

Parametric equation of the curve corresponding to v=0: $\mathbf{C1(u) = 3u^3-5u^2 +3u+10}$

Parametric equation of the curve corresponding to v=1 $\mathbf{C2(u) = 2u^3+4u^2 +10u-7}$

- Find the coefficient matrix C for this surface.
- Find the geometry vector for this surface assuming that the geometry vector in the v direction is specified by a point at v=0 and a point at v=1 and the geometry vector in the u direction is Hermite geometry.

CSE-4303 CSE5365 Computer Graphics
Practice Problems 05

Equation of a cubic curve is given as:

$\mathbf{x(t) = 4t^3 - 6t^2 -11\ t +18}$
$\mathbf{y(t) = 3t^3 + 6t^2 + 12\ t -8}$
$\mathbf{z(t) = 4t^2 -5t -2}$

- Find the numerical values of the Hermite geometry vector for this curve.
- Find the numerical values of the Bezier geometry vector for this curve.

CSE-4303 CSE5365 Computer Graphics
Practice Problems 05

Consider a parametric cubic-linear surface. $S(u,v)=[U]^T[M_B]^T[G][M_L][V]$

The geometry vector in the u direction is defined by Bezier and the geometry vector in the v direction is defined as p_0 , $\frac{dp_0}{dv}$

- Find the geometry matrix [G] for this surface.

  Note: All elements should be specified explicitly as $p_{u,v}$ or derivatives of it. Do not use implicit forms such as p_1, p_2, p_3, p_4.

CSE-4303 CSE5365 Computer Graphics
Practice Problems 05

Consider a bi-quadric parametric surface. $S(u,v)=[U]^T[M_{Q1}]^T[G][M_{Q2}][V]$

The geometry vector in the u direction is defined as: $p_0, \frac{dp_0}{du}, \frac{dp_1}{du}$ and the geometry vector in the v direction is defined as: $p_0, \frac{dp_1}{dv}, p_1$

- Find the geometry matrix [G] for this surface.

  Note: All elements should be specified explicitly as $p_{u,v}$ or derivatives of it. Do not use implicit forms such as p_1, p_2, p_3, p_4.

- If the equation for this surface is given as: $s(u,v) = 5u^2 v^2 + 8u^2 v + 4u^2 + 6uv^2 + 7v - 2v^2 + 10$

  Find the numerical values for the geometry vector, [G], for this surface.