Formulas

These formulas are provided for your reference. You may or may not find them necessary.

- The product $q_1 q_2$ of two quaternions $q_1 = (s_1, v_1)$ and $q_2 = (s_2, v_2)$ is

$$q_1 q_2 = (s_1 s_2 - v_1 \cdot v_2, s_1 v_2 + s_2 v_1 + v_1 \times v_2)$$

- If $q = (s, v)$ is the unit quaternion corresponding to a rotation applied to a point p, the rotated point $p^{'}$ is given by

$$p^{'} = s^{\,2} p + v(p.v) + 2s(v \times p) + v \times (v \times p)$$

- Axis-angle representation of a rotation of a point p by θ about an axis specified by the unit vector u to obtain the rotated point $p^{'}$:

$$p^{'} = (p \cdot u)u + \cos\theta[p - (p.u)u] + \sin\theta(u \times p)$$

- Combined illumination model equation in OpenGL is:

$$I = k_e + k_a I_a + \sum_i \frac{1}{(a_0 + a_1 d_i + a_2 d_i^2)} \{I_{l_i}[k_d(N.L_i) + k_s(V.R_i)^{n_s}]\}$$

- Let $Bez_{k,n}(u)$ be the kth Bezier blending function of a Bezier curve of degree n. Then:

$$Bez_{k,n}(u) = \binom{n}{k} u^k (1-u)^{n-k}$$

  where $\binom{n}{k} = \frac{n!}{k!(n-k)!}$

- The dot product of two vectors $\vec{A} = (a_1, a_2, a_3)$ and $\vec{B} = (b_1, b_2, b_3)$ is:
  $\vec{A} \cdot \vec{B} = a_1 b_1 + a_2 b_2 + a_3 b_3$.

- The cross product of two vectors $\vec{A} = (a_1, a_2, a_3)$ and $\vec{B} = (b_1, b_2, b_3)$ is:
  $\vec{A} \times \vec{B} = (a_2 b_3 - a_3 b_2, a_3 b_1 - a_1 b_3, a_1 b_2 - a_2 b_1)$.

- The two solutions of a quadratic equation $ax^2 + bx + c = 0$ are: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$