Assignment 5

Saturday, March 31, 2018 10:16 PM

1. $$\begin{bmatrix} ux & vx & wx & tx \\ uy & vy & wy & ty \\ uz & vz & wz & tz \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 & 0 & tx \\ 0 & 1 & 0 & ty \\ 0 & 0 & 1 & tz \\ 0 & 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} ux & vx & wx & 0 \\ uy & vy & wy & 0 \\ uz & vz & wz & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$\left(\begin{bmatrix} 1 & 0 & 0 & tx \\ 0 & 1 & 0 & ty \\ 0 & 0 & 1 & tz \\ 0 & 0 & 0 & 1 \end{bmatrix} * \begin{bmatrix} ux & vx & wx & 0 \\ uy & vy & wy & 0 \\ uz & vz & wz & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \right)^{-1}$$

$$= \begin{bmatrix} ux & vx & wx & 0 \\ uy & vy & wy & 0 \\ uz & vz & wz & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}^{-1} * \begin{bmatrix} 1 & 0 & 0 & tx \\ 0 & 1 & 0 & ty \\ 0 & 0 & 1 & tz \\ 0 & 0 & 0 & 1 \end{bmatrix}^{-1}$$

$$= \begin{bmatrix} ux & uy & uz & -ux*tx - uy*ty - uz*tz \\ vx & vy & vz & -vx*tx - vy*ty - vz*tz \\ wx & wy & wz & -wx*tx - wy*ty - wz*tz \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

2. It rotates 90° CCW, then translates 1 in both x and y.

3. $$\begin{bmatrix} 1 & 0 & 0 & tx \\ 0 & 1 & 0 & ty \\ 0 & 0 & 1 & tz \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix} = \begin{bmatrix} x+tx \\ x+ty \\ x+tz \\ 1 \end{bmatrix} \xrightarrow{\text{homogenize}} \begin{bmatrix} x+tx \\ x+ty \\ x+tz \\ 1 \end{bmatrix}$$

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$$\begin{bmatrix} 1 & 0 & 0 & tx \\ 0 & 1 & 0 & ty \\ 0 & 0 & 1 & tz \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} hx \\ hy \\ hz \\ h \end{bmatrix} = \begin{bmatrix} hx+htx \\ hx+hty \\ hx+htz \\ h \end{bmatrix} \xrightarrow{\text{homogenize}} \begin{bmatrix} x+tx \\ x+ty \\ x+tz \\ 1 \end{bmatrix}$$

4. With Gouraud, color is computed at each vertex of all meshes, averaging nearby triangles. Phong averages at each pixel instead.

5. Because it averages color at each vertex, a large primitive will be defined by the color at each spaced out vertex, leading to large parts of the shape lacking proper color calculation.