CS 155

Notes on Projection

The projection matrix CPM depends on the type of projection, orthographic or perspective, and on various parameters of the viewing system. For orthographic viewing the projection matrix is

$$\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & \alpha \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

where α =VVNEAR. A point in the viewing volume at $(x, y, z, 1)$ projects to the point $(x, y, \text{VVNEAR}, 1)$ in the projection plane.

For perspective viewing the projection matrix is

$$\begin{bmatrix} \beta & 0 & 0 & 0 \\ 0 & \beta & 0 & 0 \\ 0 & 0 & \gamma & -\gamma\sigma \\ 0 & 0 & 1 & -\sigma \end{bmatrix}$$

where β =VVNEAR-EYE, γ =VVNEAR, and σ =EYE. A point $(x, y, z, 1)$ maps to

$$((\text{VVNEAR-EYE})x, (\text{VVNEAR-EYE})y, \text{VVNEAR}(z\text{-EYE}), z\text{-EYE}).$$

Normalizing this point yields

$$((\text{VVNEAR-EYE})x/(z\text{-EYE}),\ (\text{VVNEAR-EYE})y/(z\text{-EYE}), \text{VVNEAR}, 1).$$