CAMERA SPACE TO CLIP SPACE

ORTHOGRAPHIC TRANSFORM

Orthographic projection from camera space to clipspace is parametrized by 2 diagonal ends of the view box

(left, bottom, near) and (right, top, far)
or
(l, b, n) and (r, t, f)

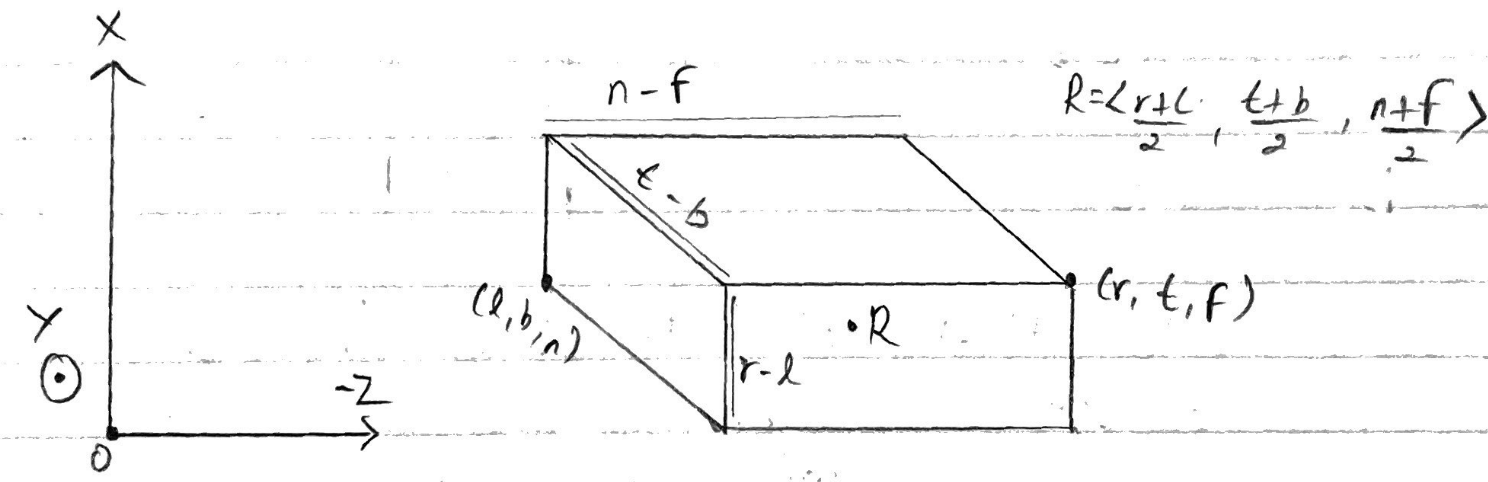

Fig: View box.

We translate the center of view box to origin and scale the box to 2×2×2 cube which is our clipspace. Any vertices inside viewbox will contribute to final image.

The scale and transform operation could be expressed as matrix multiplication as:

$$T = \begin{bmatrix} 2/_{r-l} & 0 & 0 & 0 \\ 0 & 2/_{t-b} & 0 & 0 \\ 0 & 0 & 2/_{n-f} & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 0 & 0 & -\frac{l+r}{2} \\ 0 & 1 & 0 & -\frac{t+b}{2} \\ 0 & 0 & 1 & -\frac{n+f}{2} \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Note that $n-f$ is a +ve term.

$$T = \begin{bmatrix} 2/_{r-l} & 0 & 0 & -\frac{l+r}{r-l} \\ 0 & 2/_{t-b} & 0 & -\frac{t+b}{t-b} \\ 0 & 0 & 2/_{n-f} & -\frac{n+f}{n-f} \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

Also, note that this transforms 'n' as z coordinate in camera space to 1 and 'f' to -1. If the api expects that in reverse order for depth testing, above transformation could be adapted as such:

$$T = \begin{bmatrix} 2/_{r-l} & 0 & 0 & -\frac{l+r}{r-l} \\ 0 & 2/_{t-b} & 0 & -\frac{t+b}{t-b} \\ 0 & 0 & -(2/_{n-f}) & \frac{n+f}{n-f} \\ 0 & 0 & 0 & 1 \end{bmatrix}$$