

Newman and Sproull 3D Clipping for OpenGL

Visibility conditions for an endpoint (x, y, z, w) in clip coordinates are:

$$-1 \leq x/w \leq +1$$

$$-1 \leq y/w \leq +1$$

$$-1 \leq z/w \leq +1$$

or equivalently using the "clip vector,"

$$C = [w + x, w - x, w + y, w - y, w + z, w - z] \geq 0$$

or $C_i = [c_{i1}, c_{i2}, c_{i3}, c_{i4}, c_{i5}, c_{i6}] \geq 0$ for endpoint i .

Each c_{ij} is proportional to the distance of point i from the j^{th} clipping plane.

The parametric form of a straight line from p_1 to p_2 is $p = p_1 + t(p_2 - p_1)$.

With this form for p , if one endpoint is in the clip volume and the other endpoint is outside according to the j^{th} clipping plane, then the clip point is given by

$$t = c_{1j} / (c_{1j} - c_{2j})$$

where C_1 is the clip vector for p_1 and C_2 is the clip vector for p_2 . Once t is calculated for the j^{th} clipping plane, then endpoint outside the clipping surface is replaced by a new one calculated from the expression for p . Then a new clip vector is calculated for this endpoint; if no mistakes have been made, the j^{th} component of the new clip vector for this endpoint will be 0.

After a clipping step, check again for trivial acceptance or trivial rejection. If neither condition applies, then clip to another candidate clipping plane.