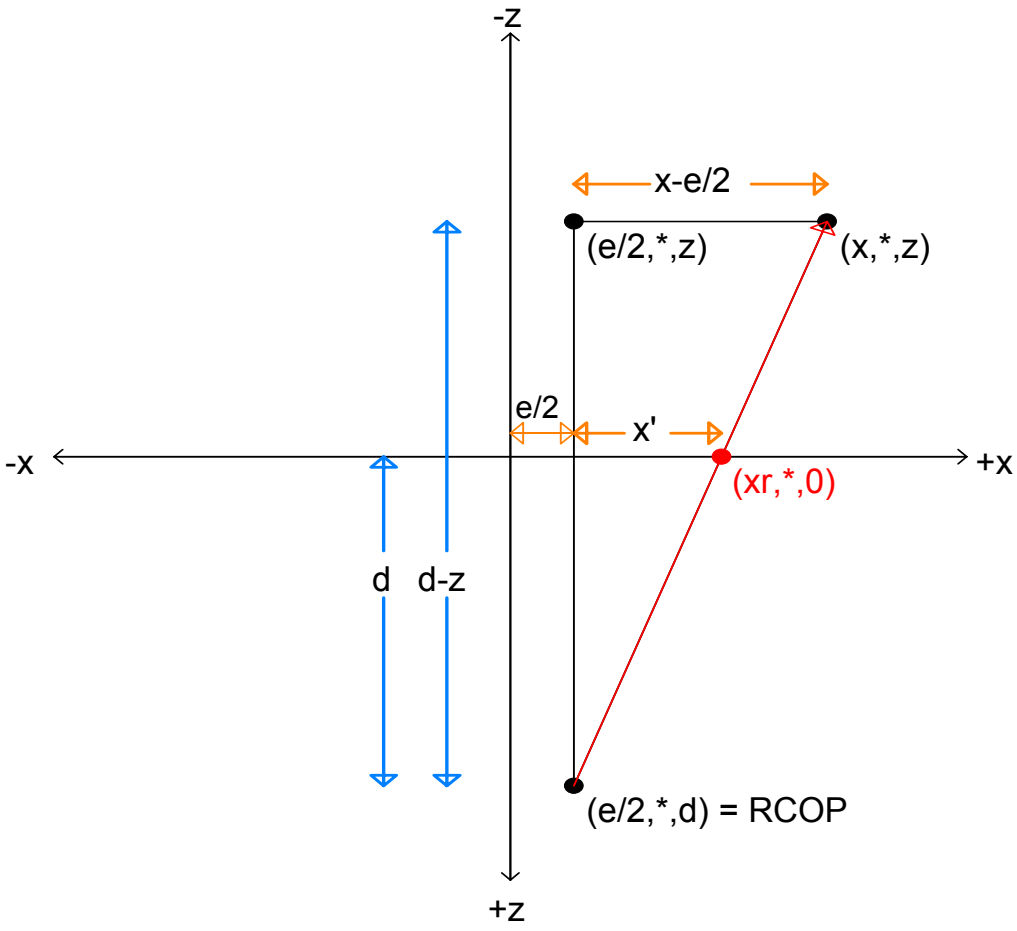
Deriving the Formula for Perspective Projection from the Right Eye.



Notes: Right hand coordinates
Orthographic view down from +y.
RCOP = right center of projection, d units from the plane.
e/2 = ½ eye separation, * above means omitted.
≈ 1.1 inches

xr = x' + e/2	construction
x'/(x-e/2) = d / (d-z)	similar triangles

Note that z is a negative value in the diagram. The length is d-z, not d+z

$x' = (x-e/2)*d/(d-z)$ multiplication

$xr-e/2 = (x-e/2)*d/(d-z)$ substitution

$xr = (x-e/2)*d/(d-z) + e/2*[(d-z)/(d-z)]$

addition and multiplication by 1

$xr = (d*x - e*z/2)/(d-z)$ cancel terms

$xl = (d*x + e*z/2)/(d-z)$ left eye: the sign for e changes

$yb = d*y/(d-z)$ there is no shift for the eye position in the y direction

$x_r = (dx-ez/2)/(d-z)$ Other notation

$x_l = (dx+ez/2)/(d-z)$

$y_b = dy/(d-z)$

Second Approach For The Right Eye

Derivation using Points and Vectors

(xr,yb,0) = s * [(x,y,z) – (e/2,0,d)] + (e/2, 0, d)
projected point = Scaled vector from RCOP + RCOP

RCOP = right eye center of projection

0 = s * (z-d) + d Equation for the z coordinate
s = d / (d-z) Solving for the scale factor s.

xr = s*(x-e/2) + e/2 Equation for the x coordinate
yb = s*y Equation for the y coordinate

xr = (d*x-e*z/2) / (d-z) Substitute for s and simplify
yb = d*y / (d-z) Note yb is the same for both eyes
xl = (d*x + e*z/2) / (d-z) The sign changes for e using the LCOP