

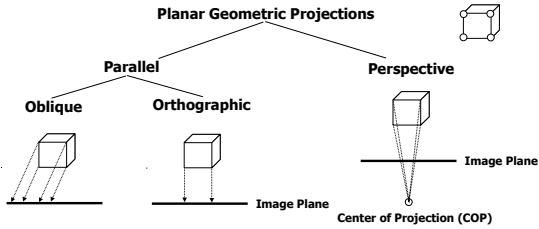
Projection

Viewing in 3D

- Planar Geometric Projections
- Parallel Orthographic Projections
- Perspective Projections

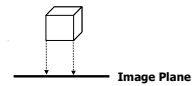
Planar Geometric Projections

- Maps points from camera coordinate system to the screen (image plane of the virtual camera).



Parallel Orthographic Projection

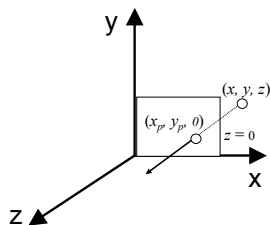
- Preserves X and Y coordinates.
- Preserves both distances and angles.



Parallel Orthographic Projection

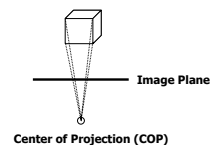
- $x_p = x$
- $y_p = y$
- $z_p = 0$

$$\begin{bmatrix} x_p \\ y_p \\ z_p \\ 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} x \\ y \\ z \\ 1 \end{bmatrix}$$

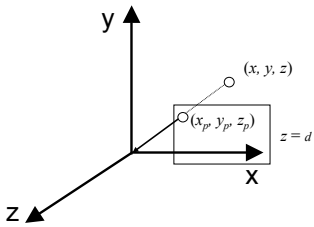


Perspective Projection

- Only preserves parallel lines that are parallel to the image plane.
- Line segments are shortened by distance.

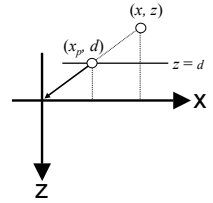


Perspective Projection



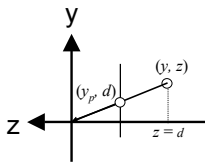
Perspective Projection

- $z_p = d$
- $x_p = (x \cdot d) / z$



Perspective Projection

- $z_p = d$
- $y_p = (y \cdot d) / z$



Perspective Projection

- $x_p = (x \cdot d) / z = x / (z / d)$
- $y_p = (y \cdot d) / z = y / (z / d)$
- $z_p = d = z / (z / d)$

Chalk Talk