Camera

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Viewing

COP is the origin of the camera frame for perspective views in the computer graphics system.
Viewing

- perspective view
  - Views with a finite COP

- Parallel view
  - Views with a COP at infinity.
  - The origin of the camera usually lines in the projection plane.
Initial camera position

FIGURE 5.12  Initial camera position.
FIGURE 5.13  Movement of the camera and object frames. (a) Initial configuration. (b) Configuration after change in the model-view matrix.
Model View Matrix
Euler angles: roll, pitch, yaw
Example

- cube_camera.html
Projection

- Parallel projection
  - Orthographic/orthogonal projection projectors are perpendicular to the view plane.
Clipping (View) Volume

The near (front) clipping plane is located a distance near from the eye (origin).

The far (back) clipping plane is located a distance far from the eye (origin).
Normalization

**FIGURE 5.25** Mapping a view volume to the canonical view volume.
Transformations for normalization

**FIGURE 5.26** Affine transformations for normalization.

*WebGL: ortho(left, right, bottom, ytop, near, far)*
Oblique Projection

(x, y, z)

(x_p', y_p', z_p)
Oblique Projection

FIGURE 5.29 Oblique projection. (a) Top view. (b) Side view.
Oblique Projection

- xy-shear, z unchanged

\[
H(\theta,\phi) = \begin{bmatrix}
1 & 0 & \cot \theta & 0 \\
0 & 1 & \cot \phi & 0 \\
0 & 0 & 1 & 0 \\
0 & 0 & 0 & 1
\end{bmatrix}
\]

- projectionMatrix = \( STH \)