Viewing Transformations
Viewing transformations

- Transform **vertices** from world coordinate descriptions to screen coordinate description
Decomposition of viewing transforms

Viewing transforms depend on: camera position and orientation, type of projection, field of view, image resolution.
Viewport transform

\[(x, y, z) \rightarrow (x', y', z')\]

\[(x, y, z) \in [-1, 1]^3 \quad x' \in [-0.5, n_x - 0.5] \quad y' \in [-0.5, n_y - 0.5]\]
Viewport transform

Camera transform

Projection transform

Viewport transform

Viewport matrix $M_{vp}$

<whiteboard>
Orthographic Projection Transform

Camera transform

Projection transform

Viewport transform

$M_{orth}$

<whiteboard>
Camera Transform

1. Camera transform
2. Projection transform
3. Viewport transform
Camera Transform

How do we specify the camera configuration?
Camera Transform

How do we specify the camera configuration?
Camera Transform

How do we specify the camera configuration?

gaze direction
Camera Transform

How do we specify the camera configuration?

up vector
Camera Transform

How do we specify the camera configuration?
Camera Transform

Camera transform

Projection transform

Viewport transform

$w = -\frac{g}{\|g\|}$

$u = \frac{t \times w}{\|t \times w\|}$

$v = w \times u$

$M_{cam}$ <whiteboard>