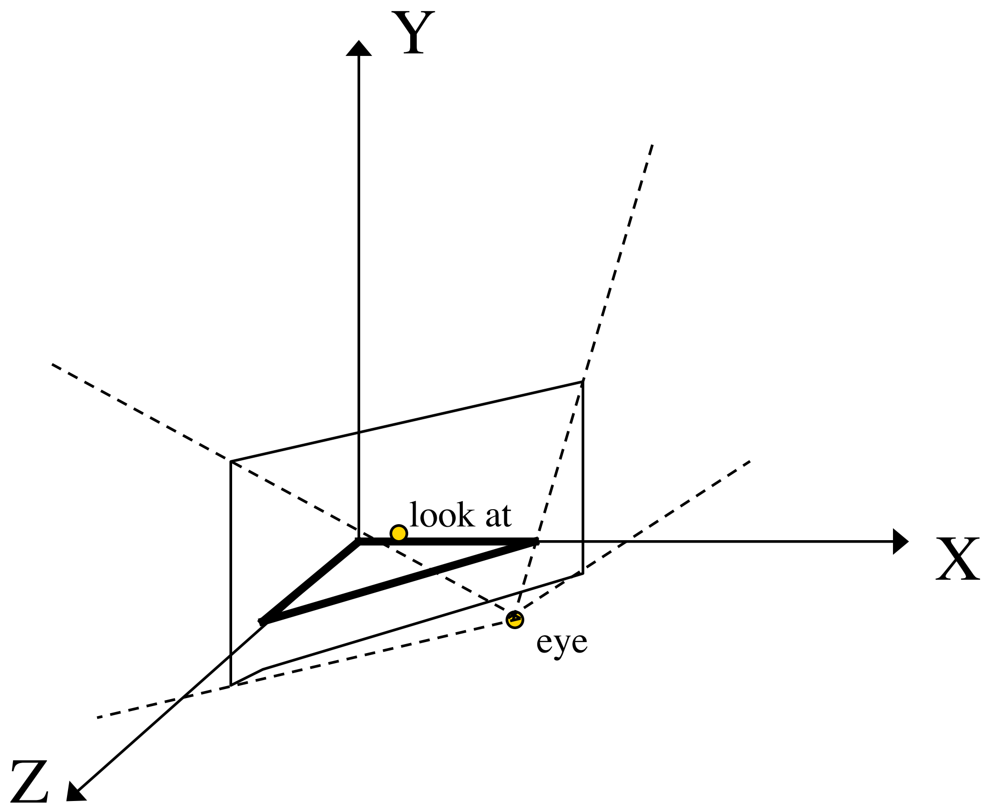
3D Viewing example

- Object: triangle A(0,0,0), B(1,0,0), C(0,0,1)

- Eye: (3,1,3)
- Look at point: (2,1,2)
- Up vector (0,1,0)

- near = 0.1, far = 10
- fovy = 45 degrees
- aspect = 2.0
- viewport: 200x100 pixels

3D Viewing example



Step 1: Modeling transformation

- Nothing to do here; we've defined our object in world coordinates

Step 2: Viewing transformation

- Multiply each vertex by V, defined as:

$$V = \begin{pmatrix} u_x & u_y & u_z & d_x \\ v_x & v_y & v_z & d_y \\ n_x & n_y & n_z & d_z \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

Step 2: Viewing transformation

- n = eye – look = [1,0,1]/sqrt(2)
- u = up x n = [1,0,-1]/sqrt(2)
- v = n x u = [0,1,0]
- d_x = -eye • u = 0
- d_y = -eye • v = -1
- d_z = -eye • n = -6/sqrt(2)

Step 2: Viewing transformation

- VA = A′ = (0, -1, -6/sqrt(2))
- VB = B′ = (1/sqrt(2), -1, -5/sqrt(2))
- VC = C′ = (-1/sqrt(2), -1, -5/sqrt(2))

- These are the locations of the points in eye coordinates

Step 3: Projection

- Project points onto near clipping plane, so d = -0.1
- A′ projects to A″ = (0, -sqrt(2)/60)
- B′ projects to B″ = (1/50, -sqrt(2)/50)
- C′ projects to C″ = (-1/50, -sqrt(2)/50)
- These are the locations of the points in clip coordinates

Step 4: Clipping

- The corners of the viewing window (on the near clipping plane) are: (-0.082, -0.041) and (0.082, 0.041)
- All three projected vertices are inside this window, so no clipping is necessary

Window-viewport transform

- translate by (0.082, 0.041), scale by (1219.5, 1219.5)
- A″ becomes A‴ = (100, 20.73)
- B″ becomes B‴ = (124.39, 15.85)
- C″ becomes C‴ = (75.61, 15.85)

Final rendered image