



Viewing & Perspective

CSE167: Computer Graphics
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Homogeneous Transformations

$$\mathbf{v}' = \mathbf{M} \cdot \mathbf{v}$$

$$\begin{bmatrix} v'_x \\ v'_y \\ v'_z \\ 1 \end{bmatrix} = \begin{bmatrix} a_x & b_x & c_x & d_x \\ a_y & b_y & c_y & d_y \\ a_z & b_z & c_z & d_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} v_x \\ v_y \\ v_z \\ 1 \end{bmatrix}$$

$$v'_x = a_x v_x + b_x v_y + c_x v_z + d_x$$

$$v'_y = a_y v_x + b_y v_y + c_y v_z + d_y$$

$$v'_z = a_z v_x + b_z v_y + c_z v_z + d_z$$

$$1 = 0v_x + 0v_y + 0v_z + 1$$

3D Transformations

- So far, we have studied a variety of useful 3D transformations:
 - Rotations
 - Translations
 - Scales
 - Shears
 - Reflections
 - These are examples of *affine* transformations
 - These can all be combined into a single 4x4 matrix, with $[0\ 0\ 0\ 1]$ on the bottom row
 - This implies 12 constants, or 12 degrees of freedom (DOFs)
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