Homogeneous coordinates

$T = \begin{bmatrix} I & t \\ O^T & 1 \end{bmatrix}$ → Translation matrix

↳ O is an $n \times 1$ vector where $n \times n$ is the shape of I and $n \times 1$ is the shape of t. 1 is just a single number

$x' = Tx$

↳ Translates point x by t

$R = \begin{bmatrix} R & O \\ O^T & 1 \end{bmatrix}$ → Rotation matrix

$M = \begin{bmatrix} mI & O \\ O^T & 1 \end{bmatrix}$ → Scale change matrix

m → Scaling factor

$S = \begin{bmatrix} mR & t \\ O^T & 1 \end{bmatrix}$ → Similarity transform matrix

Rigid transform with rescaling

Shape remains same

Size changes

$A = \begin{bmatrix} A & t \\ O^T & 1 \end{bmatrix}$ → Affine transform

Involves any of reflection, rotation, scaling, and translation

$P = \begin{bmatrix} A & t \\ P^T & 1 \end{bmatrix}$ → Projective transform

Line to line mapping

- ⊛ R, T → Preserve all of distances, angles, lines, parallelism and collinearity
- ⊛ M, S → Preserve angles, lines, parallelism and collinearity
- ⊛ A → Preserves lines, parallelism and collinearity
- ⊛ P → Preserves lines and collinearity

⊛ Preserving lines here means the line to line mapping