

Examples of common geometric transformations

Translation by (α, β)

$$\begin{aligned}x &= x + \alpha \\y &= y + \beta\end{aligned}$$

Rotation (counter clockwise) by α around $(0, 0)$

$$\begin{aligned}x &= x \cos \alpha - y \sin \alpha \\y &= x \sin \alpha + y \cos \alpha\end{aligned}$$

Rotation (counter clockwise) by α around (c_x, c_y)

$$\begin{aligned}x &= (x - c_x) \cos \alpha - (y - c_y) \sin \alpha + c_x \\y &= (x - c_x) \sin \alpha + (y - c_y) \cos \alpha + c_y\end{aligned}$$

Scaling by s around $(0, 0)$

$$\begin{aligned}x &= sx \\y &= sy\end{aligned}$$

Scaling by s around (c_x, c_y)

$$\begin{aligned}x &= s(x - c_x) + c_x \\y &= s(y - c_y) + c_y\end{aligned}$$

Affine Affine transformation is the most general transformation that preserves lines and ratios of distances of points on a line.

$$\begin{aligned}x &= a_x x + b_x y + c_x \\y &= a_y x + b_y y + c_y\end{aligned}$$

Perspective Projection

$$\begin{aligned}x &= \frac{a_x x + b_x y + c_x}{A_x x + B_x y + C_x} \\y &= \frac{a_y x + b_y y + c_y}{A_y x + B_y y + C_y}\end{aligned}$$