# Projective transformation

Michel Donnet

January 16, 2024
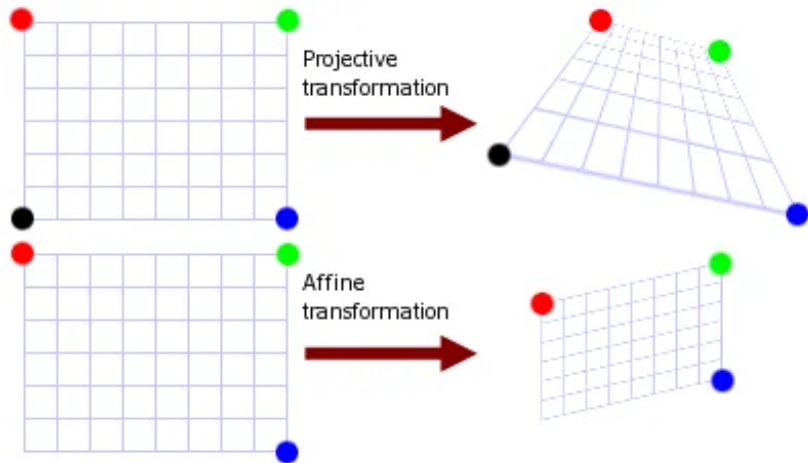
# Projective transformation vs affine transformation



Figure 1: source: graphicsmill.com

# Rappel: affine matrix transformation

$$A = \begin{bmatrix} a_{11} & a_{12} & b_1 \\ a_{21} & a_{22} & b_2 \\ 0 & 0 & 1 \end{bmatrix}$$

# Projective transformation

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \frac{a_{11}w + a_{12}z + b_1}{c_1 w + c_2 z + 1} \\ \frac{a_{21}w + a_{22}z + b_2}{c_1 w + c_2 z + 1} \end{bmatrix}$$

A projective transformation matrix is on the form

$$\begin{bmatrix} x' \\ y' \\ p \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & b_1 \\ a_{21} & a_{22} & b_2 \\ c_1 & c_2 & 1 \end{bmatrix} \times \begin{bmatrix} w \\ z \\ 1 \end{bmatrix}$$

with

$$\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} \frac{x'}{p} \\ \frac{y'}{p} \end{bmatrix}$$
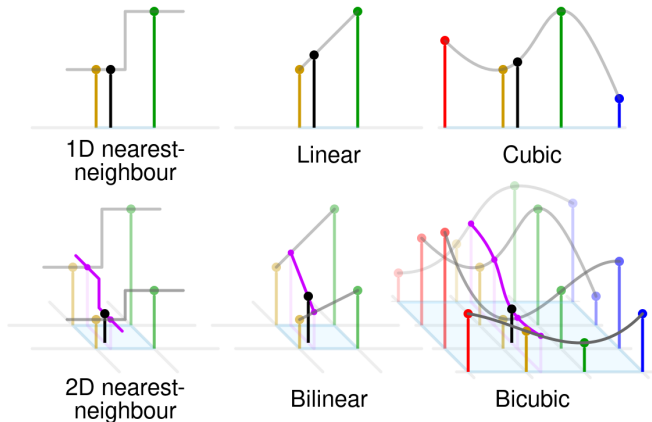
# Note

To have pretty results (or not too bad results...), we must make an interpolation



Figure 2: source: wikipedia